



**National Aeronautics and
Space Administration
Langley Research Center**

**Scientific and Technical
Information Program Office**

Scientific and Technical Aerospace Reports

STAIR

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NASA STI Program ... in Profile

Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA scientific and technical information (STI) program plays a key part in helping NASA maintain this important role.

The NASA STI program operates under the auspices of the Agency Chief Information Officer. It collects, organizes, provides for archiving, and disseminates NASA's STI. The NASA STI program provides access to the NASA Aeronautics and Space Database and its public interface, the NASA Technical Report Server, thus providing one of the largest collections of aeronautical and space science STI in the world. Results are published in both non-NASA channels and by NASA in the NASA STI Report Series, which includes the following report types:

- **TECHNICAL PUBLICATION.** Reports of completed research or a major significant phase of research that present the results of NASA Programs and include extensive data or theoretical analysis. Includes compilations of significant scientific and technical data and information deemed to be of continuing reference value. NASA counterpart of peer-reviewed formal professional papers but has less stringent limitations on manuscript length and extent of graphic presentations.
- **TECHNICAL MEMORANDUM.** Scientific and technical findings that are preliminary or of specialized interest, e.g., quick release reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.
- **CONTRACTOR REPORT.** Scientific and technical findings by NASA-sponsored contractors and grantees.

- **CONFERENCE PUBLICATION.** Collected papers from scientific and technical conferences, symposia, seminars, or other meetings sponsored or co-sponsored by NASA.
- **SPECIAL PUBLICATION.** Scientific, technical, or historical information from NASA programs, projects, and missions, often concerned with subjects having substantial public interest.
- **TECHNICAL TRANSLATION.** English-language translations of foreign scientific and technical material pertinent to NASA's mission.

Specialized services also include creating custom thesauri, building customized databases, and organizing and publishing research results.

For more information about the NASA STI program, see the following:

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- Phone the NASA STI Help Desk at (301) 621-0390
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7115 Standard Drive
Hanover, MD 21076-1320

Introduction

Scientific and Technical Aerospace Reports (STAR) is an online information resource listing citations and abstracts of NASA and worldwide aerospace-related scientific and technical information (STI). Updated biweekly, *STAR* highlights the most recent additions to the NASA Aeronautics and Space Database. Through this resource, the NASA STI Program provides timely access to the most current aerospace-related research and development (R&D) results.

STAR subject coverage includes all aspects of aeronautics and space research and development, supporting basic and applied research, and application, as well as aerospace aspects of Earth resources, energy development, conservation, oceanography, environmental protection, urban transportation and other topics of high national priority. The listing is arranged first by 11 broad subject divisions, then within these divisions by 76 subject categories and includes two indexes: subject and author.

STAR includes citations to R&D results reported in:

- NASA, NASA contractor, and NASA grantee reports
- Reports issued by other U.S. Government agencies, domestic and foreign institution, universities, and private firms
- Translations
- NASA-owned patents and patent applications
- Other U.S. Government agency and foreign patents and patent applications
- Domestic and foreign dissertations and theses

The NASA STI Program

The NASA STI Program was established to support the objectives of NASA's missions and research to advance aeronautics and space science. By sharing information, the NASA STI Program ensures that the U.S. maintains its preeminence in aerospace-related industries and education, minimizes duplication of research, and increases research productivity.

Through the NASA Center for AeroSpace Information (CASI), the NASA STI Program acquires, processes, archives, announces, and disseminates both NASA's internal STI and world-wide STI. The results of 20th and 21st century aeronautics and aerospace research and development, a worldwide investment totaling billions of dollars, have been captured, organized, and stored in the NASA Aeronautics and Space Database. New information is continually announced and made available as it is acquired, making this a dynamic and historical collection of value to business, industry, academia, federal institutions, and the general public.

The STI Program offers products and tools that allow efficient access to the wealth of information derived from global R&D efforts. In addition, customized services are available to help tailor this valuable resource to meet your specific needs.

For more information on the most up-to-date NASA STI, visit the STI Program's Web site at <http://www.sti.nasa.gov>.

NASA STI Availability Information

NASA Center for AeroSpace Information (CASI)

Through NASA CASI, the NASA STI Program offers many information products and services to the aerospace community and to the public, including access to a selection of full text of the NASA STI. Free registration with the program is available to NASA, U.S. Government agencies and contractors. To register, contact CASI at help@sti.nasa.gov. Others should visit the program at www.sti.nasa.gov. The 'search selected databases' button provides access to the NASA Technical Reports Server (NTRS) – the publicly available contents of the NASA Aeronautics and Space Database.

Each citation in *STAR* indicates a 'Source of Availability.' When CASI is indicated, the user can order this information directly from CASI using the [STI Online Order Form](#), e-mail to help@sti.nasa.gov, or telephone the STI Help Desk at 301-621-0390. Before ordering you may access [price code tables](#) for STI documents and videos. When information is not available from CASI, the source of the information is indicated when known.

NASA STI is also available to the public through Federal information organizations. NASA CASI disseminates publicly available NASA STI to the National Technical Information Service (NTIS) and to the Federal Depository Library Program (FDLP) through the Government Printing Office (GPO). In addition, NASA patents are available online from the U.S. Patent and Trademark Office.

National Technical Information Service (NTIS)

The National Technical Information Service serves the American public as a central resource for unlimited, unclassified U.S. Government scientific, technical, engineering, and business related information. For more than 50 years NTIS has provided businesses, universities, and the public timely access to well over 2 million publications covering over 350 subject areas. Visit NTIS at <http://www.ntis.gov>.

The Federal Depository Library Program (FDLP)

The U.S. Congress established the **Federal Depository Library Program** to ensure access for the American public to U.S. Government information. The program acquires and disseminates information products from all three branches of the U.S. Government to nearly 1,300 Federal depository libraries nationwide. The libraries maintain these information products as part of their existing collections and are responsible for assuring that the public has free access to the information. Locate the Federal depository libraries at <http://www.gpoaccess.gov/index.html>.

The U.S. Patent and Trademark Office (USPTO)

The U.S. Patent and Trademark Office provides online access to full text patents and patent applications. The database includes patents back to 1976 plus some pre-1975 patents. Visit the USPTO at <http://www.uspto.gov/patft/>.

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[Subject Term Index](#)

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SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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01

AERONAUTICS (GENERAL)

Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft. For specific topics in aeronautics, see categories 02 through 09. For information related to space vehicles see 12 Astronautics.

20080031021; Emil Finn and Associates Pty., New South Wales, Australia

Investigation of Limit Design Lateral Ground Maneuver Load Conditions

Finn, E.; Gleich, R.; Green, K.; Saccarelli, R.; Szot, M.; Jun. 2007; 165 pp.; In English

Contract(s)/Grant(s): GA-23F-0106J00021; DTFAC-04-C-00008

Report No.(s): PB2007-114756; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of this project was to instrument a Boeing 747SP aircraft and then develop and compile acceleration, force, and landing gear loads data (as well as aircraft system data) into a database for a variety of ground maneuvers. This information was analyzed to provide landing gear reaction loads during each aircraft maneuver. Relationships describing low- and high-speed exits, S-turns, circle turns, and turns with loss of friction on the inside (main and wing) gear, as well as differential loads between the landing gear, were examined. These relationships provide directly measured information on lateral loads not previously available.

NTIS

Loads (Forces); Boeing Aircraft; Friction; Wings

02

AERODYNAMICS

Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans, and other elements of turbomachinery. For related information see also 34 Fluid Mechanics and Thermodynamics.

20080031117 NASA Langley Research Center, Hampton, VA, USA

Wind Tunnel Testing of Powered Lift, All-Wing STOL Model

Collins, Scott W.; Westra, Bryan W.; Lin, John C.; Jones, Gregory S.; Zeune, Cal H.; July 22, 2008; 11 pp.; In English; 2008 International Powered Lift Conference, 22-24 Jul. 2008, London, UK; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 561581.02.08.07.20.04; Copyright; Avail.: CASI: [A03](#), Hardcopy

Short take-off and landing (STOL) systems can offer significant capabilities to warfighters and, for civil operators thriving on maximizing efficiencies they can improve airspace use while containing noise within airport environments. In order to provide data for next generation systems, a wind tunnel test of an all-wing cruise efficient, short take-off and landing (CE STOL) configuration was conducted in the National Aeronautics and Space Administration (NASA) Langley Research Center (LaRC) 14- by 22-foot Subsonic Wind Tunnel. The test's purpose was to mature the aerodynamic aspects of an integrated powered lift system within an advanced mobility configuration capable of CE STOL. The full-span model made use of steady flap blowing and a lifting centerbody to achieve high lift coefficients. The test occurred during April through June of 2007 and included objectives for advancing the state-of-the-art of powered lift testing through gathering force and moment data, on-body pressure data, and off-body flow field measurements during automatically controlled blowing conditions. Data were obtained for variations in model configuration, angles of attack and sideslip, blowing coefficient, and height above ground. The

database produced by this effort is being used to advance design techniques and computational tools for developing systems with integrated powered lift technologies.

Author

Short Takeoff Aircraft; Powered Lift Aircraft; Wind Tunnel Tests; Aerodynamic Coefficients; Angle of Attack; Systems Integration; Airspace

20080031119 NASA Langley Research Center, Hampton, VA, USA

Overview of CFD Validation Experiments for Circulation Control Applications at NASA

Jones, G. S.; Lin, J. C.; Allan, B. G.; Milholen, W. E.; Rumsey, C. L.; Swanson, R. C.; July 22, 2008; 16 pp.; In English; 2008 International Powered Lift Conference, 22-24 Jul. 2008, London, UK; Original contains color illustrations

Contract(s)/Grant(s): WBS 561581.02.08.07.20.04; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031119>

Circulation control is a viable active flow control approach that can be used to meet the NASA Subsonic Fixed Wing project s Cruise Efficient Short Take Off and Landing goals. Currently, circulation control systems are primarily designed using empirical methods. However, large uncertainty in our ability to predict circulation control performance has led to the development of advanced CFD methods. This paper provides an overview of a systematic approach to developing CFD tools for basic and advanced circulation control applications. This four-step approach includes 'Unit', 'Benchmark', 'Subsystem', and 'Complete System' experiments. The paper emphasizes the ongoing and planned 2-D and 3-D physics orientated experiments with corresponding CFD efforts. Sample data are used to highlight the challenges involved in conducting circulation control computations and experiments.

Author

Computational Fluid Dynamics; Control Systems Design; Takeoff; Powered Lift Aircraft; Performance Prediction; Control Surfaces; Aerodynamic Characteristics; Flow Distribution; Engine Control

20080032440 NASA Langley Research Center, Hampton, VA, USA

Parametric Study of High Frequency Pulse Detonation Tubes

Cutler, Andrew D.; July 20, 2008; 13 pp.; In English; 44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 20-23 Jul. 2008, Hartford, CT, USA; Original contains color illustrations

Contract(s)/Grant(s): NCC1-03011; NNL06AA07A; WBS 526282.01.07.04.06; No Copyright; Avail.: CASI: [A03](#),

Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080032440>

This paper describes development of high frequency pulse detonation tubes similar to a small pulse detonation engine (PDE). A high-speed valve injects a charge of a mixture of fuel and air at rates of up to 1000 Hz into a constant area tube closed at one end. The reactants detonate in the tube and the products exit as a pulsed jet. High frequency pressure transducers are used to monitor the pressure fluctuations in the device and thrust is measured with a balance. The effects of injection frequency, fuel and air flow rates, tube length, and injection location are considered. Both H₂ and C₂H₄ fuels are considered. Optimum (maximum specific thrust) fuel-air compositions and resonant frequencies are identified. Results are compared to PDE calculations. Design rules are postulated and applications to aerodynamic flow control and propulsion are discussed.

Author

Pulse Detonation Engines; Pressure Sensors; Aerodynamic Characteristics; Flow Velocity; Fuel Flow; Air Flow; Pressure Oscillations; Resonant Frequencies

20080032558 NASA Glenn Research Center, Cleveland, OH, USA

Unsteady Analysis of Blade and Tip Heat Transfer as Influenced by the Upstream Momentum and Thermal Wakes

Ameri, Ali A.; Rigby, David L.; Steinhilber, Erlendur; Heidmann, James D.; Fabian, John C.; July 2008; 16 pp.; In English; 2008 Expo 2008 Gas Turbine Technical Congress and Exposition, June 2008, Berlin, Germany; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 984754.02.07.03.16.06

Report No.(s): NASA/TM-2008-215257; GT2008-51242; E-16520; Copyright; Avail.: CASI: [A03](#), Hardcopy

The effect of the upstream wake on the blade heat transfer has been numerically examined. The geometry and the flow conditions of the first stage turbine blade of GE s E3 engine with a tip clearance equal to 2 percent of the span was utilized. Based on numerical calculations of the vane, a set of wake boundary conditions were approximated, which were subsequently imposed upon the downstream blade. This set consisted of the momentum and thermal wakes as well as the variation in

modeled turbulence quantities of turbulence intensity and the length scale. Using a one-blade periodic domain, the distributions of unsteady heat transfer rate on the turbine blade and its tip, as affected by the wake, were determined. Such heat transfer coefficient distribution was computed using the wall heat flux and the adiabatic wall temperature to desensitize the heat transfer coefficient to the wall temperature. For the determination of the wall heat flux and the adiabatic wall temperatures, two sets of computations were required. The results were used in a phase-locked manner to compute the unsteady or steady heat transfer coefficients. It has been found that the unsteady wake has some effect on the distribution of the time averaged heat transfer coefficient on the blade and that this distribution is different from the distribution that is obtainable from a steady computation. This difference was found to be as large as 20 percent of the average heat transfer on the blade surface. On the tip surface, this difference is comparatively smaller and can be as large as four percent of the average.

Author

Heat Transfer; Wakes; Turbulent Heat Transfer; Boundary Conditions; Turbine Blades; Temperature Effects; Wall Temperature; Upstream

03

AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; airport ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in 09 Research and Support Facilities (Air). Air traffic control is covered in 04 Aircraft Communications and Navigation. For related information see also 16 Space Transportation and Safety and 85 Technology Utilization and Surface Transportation.

20080031024 SRA International, Inc., San Antonio, TX, USA

FAA Finite Element Design Procedure for Rigid Pavements

Guo, E.; Ricalde, L.; Kawa, I.; Aug. 2007; 97 pp.; In English

Contract(s)/Grant(s): DTFA03-92-D-00035

Report No.(s): PB2007-114754; No Copyright; Avail.: National Technical Information Service (NTIS)

FEDFAA, Finite Element Design Federal Aviation Administration, is a computer program for both airport rigid and flexible pavement thickness design. NIKE3D (a general-purpose, three-dimensional finite element method (3D-FEM) computer program) is the selected engine for critical stress calculation for airport rigid pavement design. The calculated edge stresses are used in the FEDFAA failure model to determine the slab thickness. Since FEDFAA is a tool for thickness design rather than for analysis, certain program modifications and selection of available elements in NIKE3D have been made during FEDFAA development; it includes (1) selection of the nonconforming eight-node solid element to model all layers of the pavement except the subgrade, (2) introduction of the infinite element to model the infinitely deep subgrade, (3) mesh densities in vertical and horizontal directions, and (4) slab size and width of subbase extension have been determined to fit the needs of the design. A procedure has also been developed to calculate the critical stress of the pavement from the stresses calculated by NIKE3D at the element Gaussian points.

NTIS

Design Analysis; Finite Element Method; Pavements; Runways

20080031025 Boeing Co., Seattle, WA, USA

Object-Oriented Technology Verification Phase 3 Report - Structural Coverage at the Source-Code and Object-Code Levels

Chilenski, J. J.; Kurtz, J. L.; Aug. 2007; 67 pp.; In English

Report No.(s): PB2007-114752; No Copyright; Avail.: CASI: [A04](#), Hardcopy

The Federal Aviation Administration (FAA) sponsored this 3-year, three-phase research to provide information for developing FAA policy and guidance for the use of Object-Oriented Technology in Aviation (OOTiA) systems and to support harmonization with international certification authorities on the use and verification of OOTiA. This Report, (Phase 3), documents the results of an investigation into issues and acceptance criteria for the use of structural coverage analysis (SCA) at the source-code (SC) versus object-code (OC) or executable object-code (EOC) levels within object-oriented technology (OOT) in commercial aviation to satisfy objectives 5-8 of table A-7 in RTCA DO-178B/EUROCAE ED-12B. The intent of SCA is to provide an objective assessment (measure) of the completeness of the requirements-based tests and supports the demonstration of the absence of unintended function. An analysis of several OOT features and the satisfaction of DO-178B/EUROCAE ED-12B Table A-7 Objective 5 for modified condition decision coverage indicates that either a mix of SC coverage and OC/EOC coverage, or coverage of the OC/EOC with SC to OC/EOC traceability, may be required for

software Levels A-C. This differs from the current practice where the coverage analysis is conducted against either the SC or OC/EOC, and SC to OC/EOC traceability is only needed for Level A software.

NTIS

Airline Operations; Commercial Aircraft; Object-Oriented Programming; Structural Analysis

20080031026 Boeing Co., Seattle, WA, USA

Object-Oriented Technology Verification Phase 2 Handbook - Data Coupling and Control Coupling

Chilenski, J. J.; Kurtz, J. L.; Aug. 2007; 30 pp.; In English

Report No.(s): PB2007-114751; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The purpose of this Handbook is to provide guidelines into issues and acceptance criteria for the verification (confirmation) of data coupling and control coupling (DCCC) within object-oriented technology (OOT) in commercial aviation. The intent of the structural coverage analyses (confirmation) of DCCC is to provide an objective assessment (measure) of the completeness of the requirements-based tests of the integrated components. Unfortunately, no measurable adequacy criterion is provided in RTCA DO-178B/EUROCAE ED-12B for Objective 8 of Table A-7. A review of the published literature concerning integration verification found that coverage of intercomponent dependencies as an acceptable adequacy criterion (measure) of integration testing in both non-OOT and OOT software was well motivated. This approach is known as coupling-based integration testing. This Handbook, therefore, employs the coverage of intercomponent dependencies as a measurable adequacy criterion to satisfy DO-178B/EUROCAE ED-12B Table A-7 Objective 8. One limitation of the coverage of intercomponent dependencies used in this Handbook is that any use of polymorphism in the OOT must conform to the Liskov Substitution Principle.

NTIS

Airline Operations; Commercial Aircraft; Handbooks; Object-Oriented Programming

20080031027 Boeing Co., Seattle, WA, USA

Object-Oriented Technology Verification Phase 3 Handbook - Structural Coverage at the Source-Code and Object-Code Levels

Chilenski, J. J.; Kurtz, J. L.; Jun. 2007; 24 pp.; In English

Report No.(s): PB2007-114750; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The purpose of this Handbook is to provide guidelines into issues and acceptance criteria for the use of structural coverage analysis (SCA) at the source-code (SC) versus object-code (OC) or executable object-code (EOC) levels when using object-oriented technology (OOT) in commercial aviation to satisfy Objectives 5 through 8 of Table A-7 in RTCA DO-178B/EUROCAE ED-12B. OOT has been used extensively throughout the non-safety-critical software and computer-based systems industry. OOT has also been used in safety-critical medical and automotive systems and is now being used in the commercial airborne software and systems domain. However, as with any new technology, there are concerns and issues relating to its adoption within safety-critical systems. The intent of the SCA is to provide an objective assessment (measure) of the completeness of the requirements-based tests and supports the demonstration of the absence of unintended function. An analysis of several OOT features (methods tables, constructors, initializers, finalizers, and finally blocks) and the satisfaction of DO-178B/EUROCAE ED-12B Table A-7 Objective 5 for modified condition decision coverage (MCDC) indicates that either a mix of SC and OC/EOC coverage analyses or SC to OC/EOC traceability may be required for all software levels requiring SCA in DO-178B/EUROCAE ED-12B (Levels A-C). This differs from the current practice where the coverage analysis is conducted against either the SC or OC/EOC, and SC to OC/EOC traceability is needed for Level A only. The differences between SC and OC/EOC coverage analyses for the OOT features and MCDC are identified. An approach for dealing with the differences is provided for each issue identified.

NTIS

Handbooks; Object-Oriented Programming; Safety; Structural Analysis

20080031028 William J. Hughes Technical Center, Atlantic City, NJ, USA; Hi-Tec Systems, Egg Harbor, NJ, USA

14 CFR Part 137 Oversight Model

Woodford, S.; Kolli, V.; Agava, C.; Aug. 2007; 77 pp.; In English

Contract(s)/Grant(s): DTFA03-00-D-00021

Report No.(s): PB2007-114749; No Copyright; Avail.: National Technical Information Service (NTIS)

The purpose of this task was to provide research, project planning, and program support to accomplish the development of 14 CFR Part 137 Oversight Model. Representatives from the Federal Aviation Administration (FAA), Flight Standards

District Office, and other Subject Matter Experts met several times during 2003-2004 to develop a system-engineering model of the generic functions of FAA oversight of the Title 14 Code of Federal Regulations (CFR) Part 137 agricultural aircraft operations. From these meetings, the team developed the 14 CFR Part 137 Oversight Model (OM). OM, Version 2.0, serves as the foundation for the FAA research and engineering and development efforts to support a system safety approach to aviation safety oversight. This model will be used in the development of safety performance measures and risk indicators; work processes to support the collection of data to be used in analysis; and analytical methods, including information presentation.

NTIS

General Aviation Aircraft; Product Development; Systems Engineering; Support Systems

20080031029 Government Accountability Office, Washington, DC, USA

Federal User Fees: Key Aspects of International Air Passenger Inspection Fees Should Be Addressed Regardless of Whether Fees Are Consolidated

Sep. 2007; 56 pp.; In English

Report No.(s): PB2007-114745; GAO-07-1131; No Copyright; Avail.: CASI: [A04](#), Hardcopy

International air passengers arriving in the USA are subject to an inspection to ensure they possess legal entry and immigration documents and do not bring in contraband, such as illegal drugs, counterfeit goods, or harmful pests and prohibited agriculture products. With the creation of the Department of Homeland Security (DHS) in 2003, the customs, immigration, and agriculture inspections activities were integrated into one program led by DHS's office of Customs and Border Protection (CBP). However, the three fees--whose collections totaled about \$1 billion in fiscal year 2006--linked to these inspections remain statutorily distinct and are coadministered by CBP, Immigration and Customs Enforcement (ICE), both within DHS, and the Department of Agriculture's Animal Plant Health Inspection Service (APHIS). GAO was asked to examine how the fees are set, collected, and distributed, and the benefits and challenges of this process to agencies and stakeholders, including implications of consolidating these fees under the authority of DHS. The process of setting, collecting, and distributing separate, dissimilar fees creates challenges for agencies and stakeholders.

NTIS

Air Transportation; Inspection; Passengers; Transportation

20080031052 Robinson Aviation (RVA), Inc., Oklahoma City, OK, USA

Air Safety Project for Republic of Bulgaria. (Final Report, Public Version)

Jun. 2006; 17 pp.; In English

Report No.(s): PB2007-113664; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Following a December 2002 U.S. FAA assessment placing Bulgaria in Category 2 of FAA's International Aviation Safety Assessment (IASA) Program, this project was undertaken to provide the DGCAA with technical assistance in its effort to regain Category 1 status. RVA technical experts in Aviation Law, Operations and Airworthiness met with their DGCAA counterparts in Sofia in September and November 2004 and submitted a Report of Initial Evaluation and Recommended Actions to the DGCAA in December 2004. Collaborative efforts continued with extensive in Sofia in May 2005, and, most recently, in April 2006. At RVA's Recommendation, the DGCAA completed an internal IASA-based audit in January 2006 and developed a plan (Petrova/Alexiev Report of 18 January 2006) to address each of the audit items. In mid-January 2006, JAA performed an Operations Standardization Team (OPST) audit. With certain exceptions, the audit team found that DGCAA arrangements for safety oversight of commercial aircraft operations were in compliance with JAR-OPS procedures. As for each of the exceptions, DGCAA corrective actions are ongoing and scheduled for completion during the current year.

NTIS

Air Transportation; Aircraft Safety; Bulgaria; Flight Safety; International Trade; Marketing

20080031089 Federal Aviation Administration, Washington, DC USA

National Plan of Integrated Airport Systems (NPIAS) (2007-2011): Report of the Secretary of Transportation to the USA Congress, Pursuant to Section 47103 of Title 49, USA Code

Sep. 29, 2006; 258 pp.; In English

Report No.(s): PB2007-114772; No Copyright; Avail.: National Technical Information Service (NTIS)

The National Plan of Integrated Airport Systems (NPIAS) for 2007 to 2011 is submitted to Congress in accordance with Section 47103 of Title 49 of the USA Code. A national airport plan has been prepared at regular intervals since the mid-1940's when the U.S. civil airport system was in its infancy. The plan identifies 3,431 airports that are significant to national air

transportation, and therefore, eligible to receive grants under the Federal Aviation Administration (FAA) Airport Improvement Program (AIP). The report estimates that over the next five years, there will be \$41.2 billion of AIP eligible infrastructure development for all segments of civil aviation. Since 2000, the aviation industry has been battered with 9/11, the spread of Severe Acute Respiratory Syndrome (SARS), and record high fuel prices. Over the last five years, major restructuring and downsizing among the mainline legacy carriers has occurred along with rapid growth among low-cost carriers, and exceptional growth among regional carriers. Two of the legacy carriers have filed for bankruptcy protection and two have recently emerged from bankruptcy protection. Jet fuel, which is an airlines second largest expense, have more than doubled in cost in the past six years, hampering the ability of the carriers to return to profitability or emerge from bankruptcy.

NTIS

Airports; Construction; Position (Location); Systems Integration; Transportation; United States

20080032222 Congressional Research Service, Washington, DC, USA

Environmental Impacts of Airport Operations, Maintenance, and Expansion. CRS Report for Congress (Updated June 22, 2007)

Luther, L.; Jun. 22, 2007; 22 pp.; In English

Report No.(s): PB2008-100488; CRS-RL33949-REV; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Funding authorization for Federal Aviation Administration (FAA) programs set forth in the Vision 100 Century of Aviation Reauthorization Act (P.L. 108-176, hereafter referred to as Vision 100) are set to expire at the end of FY2007. During the current reauthorization process, methods to address the environmental impacts associated with airport operations and expansion are likely to be debated. This issue is important to various stakeholders, particularly those whose health, property values, and quality of life may be affected by such impacts. The concerns of community members and local, state, and tribal agencies regarding environmental impacts have led to the delay and cancellation of some airport expansion projects. To better understand the need for funding environment-related airport projects research and compliance assistance, this report provides an overview of noise, water quality, and air quality issues associated with airport operations. Also discussed are the environmental review requirements of the National Environmental Policy Act of 1969 (NEPA) and the environmental provisions in proposed legislation to reauthorize FAA programs.

NTIS

Air Pollution; Airports; Environmental Surveys; Federal Budgets; Maintenance; Noise Pollution; Pollution Control; Water Pollution

20080032232 Boeing Co., Seattle, WA, USA

Object-Oriented Technology Verification Phase 2 Report - Data Coupling and Control Coupling

Chilenski, J. J.; Kurtz, J. L.; Aug. 2007; 61 pp.; In English

Report No.(s): PB2007-114760; No Copyright; Avail.: CASI: [A04](#), Hardcopy

This Report documents the results of an investigation into issues and acceptance criteria for the verification (i.e., confirmation in DO-178B) of data coupling and control coupling (DCCC) within object-oriented technology (OOT) in commercial aviation. OOT has been used extensively throughout the non-safety-critical software and computer-based systems industry. OOT has also been used in safety-critical medical and automotive systems and has been introduced in the commercial airborne software and systems domain. However, as with any new technology, there are concerns and issues relating to its adoption within safety-critical systems. The intent of the structural coverage analyses (confirmation) of DCCC is to provide an objective assessment (measurement) of the completeness of the requirements-based tests of the integrated components. A review of the published literature concerning integration verification found that coverage of intercomponent dependencies as an acceptable adequacy criterion of integration testing in both non-OOT and OOT software was well motivated. This approach is known as coupling-based integration testing. This Report, therefore, recommends the coverage of intercomponent dependencies as a measurable adequacy criterion to satisfy RTCA DO-178B/EUROCAE ED-12B Table A-7 Objective 8.

NTIS

Airline Operations; Commercial Aircraft; Object-Oriented Programming

04

AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also 06 Avionics and Aircraft Instrumentation; 17 Space Communications, Spacecraft Communications, Command and Tracking; and 32 Communications and Radar.

20080031316 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Integrated GPS/INS Navigation System Based on Gyroscope Free IMU

MarquesFilho, Edmundo Alberto; [2007]; 131 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14490-TDI/1171; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A07](#), Hardcopy

The present work has the objective of analyzing the performance of a low cost strapdown inertial navigation system (INS), based on a gyroscope free inertial measurement unit (IMU) that only uses multiple accelerometers and is aided by GPS receptor data. The availability of low cost, size and weight accelerometers with medium performance and more robustness when compared to gyroscopes of the same technology is the main motivation. The inertial measurement unit is composed by an specific array of accelerometers in such way that linear and angular accelerations can be computed. Since measurements degrade rapidly with time an external source of information, the GPS receptor data, are used to bound the growing errors in long range navigation applications. The GPS/INS loosely integrated approach is implemented by a Kalman filter. A model of errors for the accelerometer-based IMU and INS are derived and used by the Kalman filter to estimate and compensate for the navigation errors. The performance of the integrated system is assessed by using computer simulation of a simple trajectory vehicle.

Author

Global Positioning System; Inertial Navigation; Accelerometers; Navigation; Technology Assessment

05

AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance and evaluation, and aircraft and flight simulation technology. For related information see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles see 85 Technology Utilization and Surface Transportation.

20080031022 Analog Interfaces, Inc., Alliance, OH, USA

Extended Material Testing Research and Technical Enhancements of IPAM3 Equipment for Determining Aging of Wire Insulation in Aircraft

Denny, W. M.; Puterbaugh, D.; Jul. 2007; 149 pp.; In English

Report No.(s): PB2007-114755; No Copyright; Avail.: National Technical Information Service (NTIS)

The Indenter is a nondestructive test method that monitors the aging of wires by measuring changes in compressive modulus, a mechanical property of insulation and jacket materials. When wires age, significant changes occur in a mechanical property before any changes occur in an electrical property. That is, the mechanical properties must change to the point of embrittlement and cracking before significant electrical changes are observed. Changes in mechanical properties typically have been evaluated by Elongation-at-Break (EAB) testing. However, EAB testing is destructive and requires relatively large specimens, making it undesirable for analyzing installed cables. As an alternative to EAB tests, Indenter tests that measure compressive modulus provide a systematic indication of material aging. Thus, Indenter data obtained during a research project that also obtained EAB (or other) data at the same level of aging can be correlated to predict remaining cable life. The goal of this research project was to develop the Indenter further so that it would be a nonintrusive, easy-to-use, nondestructive portable test device to help assess the aging condition of wires in aircraft. Significant enhancements to the design of the Indenter (both in hardware and software) during this project have advanced the state of the art of this technology and resulted in a more accurate, reliable, and easier-to-use instrument.

NTIS

Aging (Materials); Augmentation; Insulation; Wire

20080031023 Lawrence Livermore National Lab., Livermore, CA USA

Statistical Testing and Material Model Characterization of Aluminum and Titanium for Transport Airplane Rotor Burst Fragment Shielding

Kay, G.; Goto, D.; Couch, R.; Aug. 2007; 26 pp.; In English

Report No.(s): PB2007-114753; No Copyright; Avail.: National Technical Information Service (NTIS)

A previous Lawrence Livermore National Laboratory study focused on experimental measurements that could be used to derive material model representations of aluminum alloy 2024-T3 and the titanium alloy Ti-6Al-4V for use in ballistic impact simulations. The measurements included tensile and compression Hopkinson Bar stress-strain curves and ballistic limit data from gun experiments. The Johnson-Cook model was selected as a means to provide a general-purpose description of material constitutive response and fracture. The results of that project suggested that, for a given material, there might be difficulty in applying a single set of Johnson-Cook parameters to the predictions of penetration through plates of significantly different thicknesses. The present project was designed to explore the suspected thickness effect and to establish greater validity for the Johnson-Cook parameterization. Activities again included both Hopkinson Bar and ballistic tests. The data obtained indicated that the constitutive parameters obtained for the Johnson-Cook model from the previous study are valid for plate material in the range of thicknesses evaluated. The Johnson-Cook failure parameters are not sensitive to this data. The current data also confirmed the anisotropic response of the titanium plate materials and the isotropic response of the aluminum plate material. The Johnson-Cook failure parameters were recalibrated in an attempt to attain consistency between simulations and the available ballistic limit measurements. The Johnson-Cook failure algorithm, as currently implemented, did not do an adequate job in determining the type of target failure for the target thicknesses and material considered in this study (aluminum 2024-T3/T351). This is especially important as petaling failure modes tend to absorb less energy than the shear localization failure modes. However, the Johnson-Cook failure algorithm does appear to be able to do an adequate job when the range of target thicknesses is restricted.

NTIS

Aluminum; Fragments; Gas Turbines; Mathematical Models; Rotors; Shielding; Titanium; Transport Aircraft

20080031091 Government Accountability Office, Washington, DC, USA

Defense Acquisitions: Navy Faces Challenges Constructing the Aircraft Carrier Gerald R. Ford within Budget

Aug. 2007; 57 pp.; In English

Report No.(s): PB2007-114538; GAO-07-866; No Copyright; Avail.: CASI: [A04](#), Hardcopy

The Navy is investing over \$3 billion to develop technologies for a new type of aircraft carrier--the Ford class--and it expects to spend almost \$11 billion to design and construct the USS Gerald R. Ford (CVN 78)--the lead ship of the class. New technologies are to improve the carrier's performance and reduce crew size. The Navy requested authorization of CVN 78 in its fiscal year 2008 budget. GAO was asked to assess the Navy's ability to meet its goals for developing the new carrier. Specifically, this report assesses (1) the extent to which technology development could affect the capability and construction of CVN 78, (2) the status of efforts to achieve design stability, and (3) the challenges to building CVN 78 within budget. To accomplish this, our work includes analysis of test reports, development schedules, and ship progress reviews; interviews with Navy and other officials; and examinations of cost estimates and our own past work. Delays in technology development may lead to increases in CVN 78's planned construction costs and potential reductions in the ship's capability at delivery. CVN 78's success depends on on-time delivery and insertion of fully mature and operational technologies in order to manage construction costs and enhance ship capabilities.

NTIS

Navy; Procurement; Ships; Construction

20080032231 Iowa State Univ. of Science and Technology, Ames, IA USA; Honeywell Engines and Systems, Phoenix, AZ, USA; General Electric Aircraft Engines, Cincinnati, OH, USA; Pratt and Whitney Aircraft, East Hartford, CT, USA

Transducer Variability Study

Friedlford, J.; Roberts, R.; Margetan, F.; Degtyar, A.; Hassan, W.; Jul. 2007; 508 pp.; In English

Report No.(s): PB2007-114759; No Copyright; Avail.: National Technical Information Service (NTIS)

Phased array technology may provide a significant tool for improving ultrasonic inspections of rotating jet-engine components. Two studies were performed to explore the capability of commercial vendors to manufacture the phased array transducers needed for sensitive aerospace inspections. The first, the variability study, involved the purchase and characterization of a small number of nominally identical phased array transducers. The goals were (1) to develop a set of portable measurement protocols that could readily be applied to quantify key operating characteristics of phased array transducers, and (2) to use those protocols to document differences in transducer operating characteristics. Two 10-MHz

transducer designs were examined. The simpler design contained 15 elements in a planar annular array configuration, with the center element being a conventional transducer that could be removed from the array. Three phased array transducers with this design were purchased from two vendors. The complex design contained 110 elements arranged in a curved, segmented annular array. Three transducers of this design were purchased from a single vendor. For each transducer, various operating characteristics that influence detection sensitivity were measured at three test sites. These included beam diameter near the focal depth, center frequency, and frequency bandwidth. For the operating characteristics studied, the measured transducer-to-transducer variability have been summarized in a series of graphs and tables presented in this report.

NTIS

Forging; Jet Engines; Transducers; Variability

20080032234 Sandia National Labs., Albuquerque, NM, USA

Visual Inspection Results of Aged Boeing 737 and 747 Single-Element, Dual-Load Path Flight Control Components

DiMambro, J.; Jacob, Z.; Langwell, G.; Montano, I. P.; Roach, D. P.; Aug. 2007; 206 pp.; In English

Contract(s)/Grant(s): DTFA03-95-X-900002

Report No.(s): PB2007-114758; No Copyright; Avail.: National Technical Information Service (NTIS)

As part of the Federal Aviation Administration (FAA) Aging Aircraft Programs coverage of nonstructural systems, Sandia National Laboratories undertook an initial study of aged single-element, dual-load path (SE-DLP) linkages from primary flight control systems on recently retired Boeing 737 and 747 aircraft. This work was done in cooperation with the aircraft manufacturer and was accomplished at the FAA Airworthiness Assurance Nondestructive Inspection Validation Center, operated by Sandia National Laboratories. The SE-DLP flight control components tested are critical; their failure would affect the continued functionality of the flight control system or subsystem and consequently degrade the safety of flight. For example, the ability of the crew to safely land the aircraft in unusual operating conditions would be questionable. Furthermore, no prior studies have investigated aged Boeing SE-DLP flight control components. This report highlights the evaluation results of the aged SE-DLP flight control components investigated in this study.

NTIS

Boeing 737 Aircraft; Flight Control; Inspection; Loads (Forces); Visual Observation

20080032339 Honeywell International, Inc., Morristown, NJ, USA

Apparatus and Method for Bearing Lubrication in Turbine Engines

Zalewski, G. J., Inventor; Robinson, D. J., Inventor; Kyler, M., Inventor; Loper, D., Inventor; 9 Mar 04; 21 pp.; In English

Contract(s)/Grant(s): DAAH23-02-C-0122

Patent Info.: Filed 9 Mar 04; US-Patent-Appl-SN-10-797-844

Report No.(s): PB2007-113314; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A lubrication system includes an inlet conduit having an inboard end attached to a bearing support and an outboard end for receiving lubricant. A lubricant inlet assembly is attached to the inlet conduit outboard end and has an inlet cap with a receptacle, an inlet cap body, and a cap base. The inlet receptacle is configured to mate with a lubricant supply line, where the inlet cap body has an outer cap enclosing an inner cap, the outer cap having a convoluted wall. An inlet conduit termination fitting has an outboard fitting section, with an o-ring in a circumferential groove, disposed inside the inlet cap, and an inboard fitting section attached to the inlet conduit outboard end. A cap heat shield encloses the inlet cap and a conduit heat shield is attached to the inlet conduit. The lubricant inlet assembly is mounted to an engine casing with a low-conductivity insulating gasket between the cap base and the engine casing.

NTIS

Bearings; Lubrication; Turbine Engines; Engine Design; Aeronautical Engineering

20080032515 McDonnell-Douglas Corp., Saint Louis, MO, USA

Nonlinear Finite Element Analysis Techniques for Hypersonic Vehicles

Cliffitt, G.; Wilson, T.; Coyle, J.; October 29, 1990; 7 pp.; In English; AIAA Second International Aerospace Planes Conference, 29-31 Oct. 1990, Orlando, FL, USA; Original contains black and white illustrations

Report No.(s): AIAA Paper-90-5220; Copyright; Avail.: CASI: [A02](#), Hardcopy

Linear structural theory has traditionally provided the basis for flight vehicle analysis and design. Structural testing has verified the linear approach an acceptable analysis tool. Hypersonic vehicle designs, such as the National Aerospace Plane (NASP), will require advanced structural concepts which are difficult to analyze with linear theory. Conservatism inherent in linear theory may lead to a nonoptimum structure. In addition, the NASP will be subject to complex combined

thermal-mechanical loadings which cannot be accurately analyzed using linear theory. The need for an analysis approach that can remove the conservatisms but still correctly handle complex loadings needs to be developed.

Author

Finite Element Method; Hypersonic Vehicles; National Aerospace Plane Program; Structural Design; Fabrication; Nonlinearity

20080032603 NASA Glenn Research Center, Cleveland, OH, USA

Probabilistic Usage of the Multi-Factor Interaction Model

Chamis, Christos C.; July 2008; 23 pp.; In English; 22nd ASC Technical Conference, 17-19 Sep. 2007, Seattle, WA, USA; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 561581.02.08.03.15.03

Report No.(s): NASA/TM-2008-215246; E-16168-1; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080032603>

A Multi-Factor Interaction Model (MFIM) is used to predict the insulating foam mass expulsion during the ascending of a space vehicle. The exponents in the MFIM are evaluated by an available approach which consists of least squares and an optimization algorithm. These results were subsequently used to probabilistically evaluate the effects of the uncertainties in each participating factor in the mass expulsion. The probabilistic results show that the surface temperature dominates at high probabilities and the pressure which causes the mass expulsion at low probabibil

Author

Probability Theory; Foams; Insulation; Expulsion

20080032612 Idaho National Engineering Lab., Idaho Falls, ID, USA

Cost Benefit Analysis Modeling Tool for Electric vs. ICE Airport Ground Support Equipment Development and Results

Morrow, K.; Hochard, D.; Francfort, J.; Feb. 2007; 90 pp.; In English

Report No.(s): DE2007-911917; INL/EXT-07-12270; No Copyright; Avail.: National Technical Information Service (NTIS)

This report documents efforts to develop a computer tool for modeling the economic payback for comparative airport ground support equipment (GSE) that are propelled by either electric motors or gasoline and diesel engines. The types of GSE modeled are pushback tractors, baggage tractors, and belt loaders. The GSE modeling tool includes an emissions module that estimates the amount of tailpipe emissions saved by replacing internal combustion engine GSE with electric GSE. This report contains modeling assumptions, methodology, a users manual, and modeling results. The model was developed based on the operations of two airlines at four USA airports.

NTIS

Airports; Baggage; Cost Analysis; Cost Effectiveness; Ground Support Equipment; Ice; Internal Combustion Engines; Tractors

06

AVIONICS AND AIRCRAFT INSTRUMENTATION

Includes all avionics systems, cockpit and cabin display devices, and flight instruments intended for use in aircraft. For related information see also 04 Aircraft Communications and Navigation; 08 Aircraft Stability and Control; 19 Spacecraft Instrumentation and Astrionics; and 35 Instrumentation and Photography.

20080031176 NASA Glenn Research Center, Cleveland, OH, USA

Aircraft Engine On-Line Diagnostics Through Dual-Channel Sensor Measurements: Development of an Enhanced System

Kobayashi, Takahisa; Simon, Donald L.; June 2008; 22 pp.; In English; ASME Turbo Expo 2008, 9-13 Jun. 2008, Berlin, Germany; Original contains color illustrations

Contract(s)/Grant(s): WBS 645856.02.07.03.03.01

Report No.(s): NASA/TM-2008-215229; GT2008-50346; E-16516; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031176>

In this paper, an enhanced on-line diagnostic system which utilizes dual-channel sensor measurements is developed for the aircraft engine application. The enhanced system is composed of a nonlinear on-board engine model (NOBEM), the hybrid

Kalman filter (HKF) algorithm, and fault detection and isolation (FDI) logic. The NOBEM provides the analytical third channel against which the dual-channel measurements are compared. The NOBEM is further utilized as part of the HKF algorithm which estimates measured engine parameters. Engine parameters obtained from the dual-channel measurements, the NOBEM, and the HKF are compared against each other. When the discrepancy among the signals exceeds a tolerance level, the FDI logic determines the cause of discrepancy. Through this approach, the enhanced system achieves the following objectives: 1) anomaly detection, 2) component fault detection, and 3) sensor fault detection and isolation. The performance of the enhanced system is evaluated in a simulation environment using faults in sensors and components, and it is compared to an existing baseline system.

Author

Diagnosis; On-Line Systems; Aircraft Engines; Sensors; Systems Health Monitoring; Channels (Data Transmission)

20080031200 Pratt and Whitney Aircraft, East Hartford, CT, USA; Verocel, Westford, MA, USA

Real-Time Operating Systems and Component Integration Considerations in Integrated Modular Avionics Systems Report

Krodel, J.; Romanski, G.; Aug. 2007; 51 pp.; In English

Contract(s)/Grant(s): DTFA03-03-P10486

Report No.(s): PB2007-114757; No Copyright; Avail.: CASI: [A04](#), Hardcopy

The combination of rigorous development assurance and verification assurance has led to safe and reliable operation within civil aviation systems and equipment. Historically, such systems were designed as federated architectures, yet significantly successful efforts in integrated modular avionics (IMA) system integration have occurred, such as the Boeing 777 aircraft. This technical report can be used to formulate a basis for evaluating the integration of real-time operating systems (RTOS) and other associated modules that support partitioning in space, time, input/output, communications, and other shared resources on an IMA system. Several role players (platform supplier, RTOS supplier, application supplier, and the IMA system integrator) in IMA system development are discussed, and their roles of integrating multiple functions at different integration stages are detailed.

NTIS

Avionics; Modules; Real Time Operation; Systems Integration

20080031603 Lathrop and Gage, LC, Boulder, CO, USA

Optical Air Data Systems and Methods

Caldwell, L. M., Inventor; OBrien, M. J., Inventor; Weimer, C. S., Inventor; Nelson, L. D., Inventor; 11 Apr 05; 22 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAS4-0243

Patent Info.: Filed Filed 11 Apr 05; US-Patent-Appl-SN-11-103020; US 2005/0248748

Report No.(s): PB2007-108628; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031603>

Systems and methods for sensing air outside a moving aircraft are presented. In one embodiment, a system includes a laser for generating laser energy. The system also includes one or more transceivers for projecting the laser energy as laser radiation to the air. Subsequently, each transceiver receives laser energy as it is backscattered from the air. A computer processes signals from the transceivers to distinguish molecular scattered laser radiation from aerosol scattered laser radiation and determines one or more air parameters based on the scattered laser radiation. Such air parameters may include air speed, air pressure, air temperature and aircraft orientation angle, such as yaw, angle of attack and sideslip.

Author

Telemetry; Aircraft Stability; Optoelectronic Devices; Laser Applications; Aircraft Instruments; Airborne Lasers; Optical Measuring Instruments

AIRCRAFT PROPULSION AND POWER

Includes primary propulsion systems and related systems and components, e.g., gas turbine engines, compressors, and fuel systems; and onboard auxiliary power plants for aircraft. For related information see also 20 Spacecraft Propulsion and Power; 28 Propellants and Fuels; and 44 Energy Production and Conversion.

20080031112 Williams International, Walled Lake, MI, USA

The General Aviation Propulsion (GAP) Program

July 2008; 65 pp.; In English

Contract(s)/Grant(s): NCC3-514; WBS 984754.02.07.03.11.02

Report No.(s): NASA/CR-2008-215266; E-16536; No Copyright; Avail.: CASI: [A04](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031112>

The General Aviation Propulsion (GAP) Program Turbine Engine Element focused on the development of an advanced small turbofan engine. Goals were good fuel consumption and thrust-to-weight ratio, and very low production cost. The resulting FJX-2 turbofan engine showed the potential to meet all of these goals. The development of the engine was carried through to proof of concept testing of a complete engine system. The proof of concept engine was ground tested at sea level and in altitude test chambers. A turboprop derivative was also sea-level tested.

Author

Turbofan Engines; Turbine Engines; Engine Design; General Aviation Aircraft; Propulsion; Thrust-Weight Ratio; Altitude Tests

20080031609 Honeywell International, Inc., Morristown, NJ, USA

Fuel-Air Mixing Apparatus for Reducing Gas Turbine Combustor Exhaust Emissions

Zupanc, F. J., Inventor; Yankowich, P. R., Inventor; 21 May 04; 8 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAS3-01136

Patent Info.: Filed Filed 21 May 04; US-Patent-Appl-SN-10-850871; US 2005/0257530

Report No.(s): PB2007-109175; No Copyright; Avail.: CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031609>

A fuel-air mixer for use in a combustion chamber of a gas turbine engine is provided. The fuel air mixing apparatus comprises an annular fuel injector having a plurality of discrete plain jet orifices, a first swirler wherein the first swirler is located upstream from the fuel injector and a second swirler wherein the second swirler is located downstream from the fuel injector. The plurality of discrete plain jet orifices are situated between the highly swirling airstreams generated by the two radial swirlers. The distributed injection of the fuel between two highly swirling airstreams results in rapid and effective mixing to the desired fuel-air ratio and prevents the formation of local hot spots in the combustor primary zone. A combustor and a gas turbine engine comprising the fuel-air mixer of the present invention are also provided as well as a method using the fuel-air mixer of the present invention.

Author

Combustion Chambers; Exhaust Emission; Gas Turbine Engines; Gas Turbines; Premixing

20080032514 Sverdrup Technology, Inc., Cleveland, OH, USA

3D Computation of Hypersonic Nozzle

Lai, H.; October 29, 1990; 24 pp.; In English; AIAA Second International Aerospace Planes Conference, 28-31 Oct. 1990, Orlando, FL, USA; Original contains poor quality, truncated or crooked pages

Contract(s)/Grant(s): NAS3-24105; NAS3-25266

Report No.(s): AIAA Paper 90-5203; Copyright; Avail.: CASI: [A03](#), Hardcopy

Numerical results of a National Aerospace Plane (NASP)-like nozzle configuration are presented. The nozzle has characteristically a very large area ratio designed to operate in the hypersonic regime. The overall flowfield consists of the internal expansion from a stagnation reservoir and the external exhaust plume in a quiescent environment. The solutions were obtained for two experimental conditions at an underexpanded pressure ratio of 44000 and an overexpanded pressure ratio of 2495. These conditions produce flows expanding to high Mach numbers in the hypersonic range. At the nozzle entrance, the flow has a supersonic Mach number of 4.3 in the inviscid region. In the external expansion and exhaust regions, the flow expands to a maximum Mach number of 12.3 for the case of high pressure ratio, whereas a shock wave exists for the low

pressure ratio case. The solutions from these three-dimensional calculations were compared to the experimental data for pressure distributions.

Author

National Aerospace Plane Program; Aerospace Planes; Hypersonic Nozzles; Three Dimensional Models; Numerical Analysis; Aerospace Engineering; Technology Assessment

20080032562 NASA Glenn Research Center, Cleveland, OH, USA

Automated Power Assessment for Helicopter Turboshaft Engines

Simon, Donald L.; Litt, Jonathan S.; July 2008; 15 pp.; In English; 64th Annual Forum and Technology Display (AHS Forum 64), 29 Apr. - 1 May 2008, Montreal, Canada; Original contains color illustrations

Contract(s)/Grant(s): WBS 645846.02.07.03.01

Report No.(s): NASA/TM-2008-215270; E-16541; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080032562>

An accurate indication of available power is required for helicopter mission planning purposes. Available power is currently estimated on U.S. Army Blackhawk helicopters by performing a Maximum Power Check (MPC), a manual procedure performed by maintenance pilots on a periodic basis. The MPC establishes Engine Torque Factor (ETF), an indication of available power. It is desirable to replace the current manual MPC procedure with an automated approach that will enable continuous real-time assessment of available power utilizing normal mission data. This report presents an automated power assessment approach which processes data currently collected within helicopter Health and Usage Monitoring System (HUMS) units. The overall approach consists of: 1) a steady-state data filter which identifies and extracts steady-state operating points within HUMS data sets; 2) engine performance curve trend monitoring and updating; and 3) automated ETF calculation. The algorithm is coded in MATLAB (The MathWorks, Inc.) and currently runs on a PC. Results from the application of this technique to HUMS mission data collected from UH-60L aircraft equipped with T700-GE-701C engines are presented and compared to manually calculated ETF values. Potential future enhancements are discussed.

Author

Helicopter Engines; Turbine Engines; Systems Health Monitoring; Turboshafes; Real Time Operation; Maintenance

20080032563 NASA Glenn Research Center, Cleveland, OH, USA

Benchmarking Gas Path Diagnostic Methods: A Public Approach

Simon, Donald L.; Bird, Jeff; Davison, Craig; Volponi, Al; Iverson, R. Eugene; July 2008; 23 pp.; In English; Turbo Expo 2008 Gas Turbine Technical Congress and Exposition, 9-13 Jun. 2008, Berlin, Germany; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 645846.02.07.03.01

Report No.(s): NASA/TM-2008-215271; GT2008-51360; E-16542; Copyright; Avail.: CASI: A03, Hardcopy

14. ABSTRACT Recent technology reviews have identified the need for objective assessments of engine health management (EHM) technology. The need is two-fold: technology developers require relevant data and problems to design and validate new algorithms and techniques while engine system integrators and operators need practical tools to direct development and then evaluate the effectiveness of proposed solutions. This paper presents a publicly available gas path diagnostic benchmark problem that has been developed by the Propulsion and Power Systems Panel of The Technical Cooperation Program (TTCP) to help address these needs. The problem is coded in MATLAB (The MathWorks, Inc.) and coupled with a non-linear turbofan engine simulation to produce 'snap-shot' measurements, with relevant noise levels, as if collected from a fleet of engines over their lifetime of use. Each engine within the fleet will experience unique operating and deterioration profiles, and may encounter randomly occurring relevant gas path faults including sensor, actuator and component faults. The challenge to the EHM community is to develop gas path diagnostic algorithms to reliably perform fault detection and isolation. An example solution to the benchmark problem is provided along with associated evaluation metrics. A plan is presented to disseminate this benchmark problem to the engine health management technical community and invite technology solutions.

Author

Propulsion System Performance; Turbofan Engines; Propulsion System Configurations; Fault Detection; Management Systems; Noise Intensity; Actuators

20080032599 Advanced Technologies, Inc., Starkville, MS, USA

System Study for Axial Vane Engine Technology

Badley, Patrick R.; Smith, Michael R.; Gould, Cedric O.; July 2008; 80 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNC-04VN19P; WBS 984754.02.07.03.11.02

Report No.(s): NASA/CR-2008-215175; E-16418; No Copyright; Avail.: CASI: [A05](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080032599>

The purpose of this engine feasibility study was to determine the benefits that can be achieved by incorporating positive displacement axial vane compression and expansion stages into high bypass turbofan engines. These positive-displacement stages would replace some or all of the conventional compressor and turbine stages in the turbine engine, but not the fan. The study considered combustion occurring internal to an axial vane component (i.e., Diesel engine replacing the standard turbine engine combustor, burner, and turbine); and external continuous flow combustion with an axial vane compressor and an axial vane turbine replacing conventional compressor and turbine systems.

Author

Diesel Engines; Turbofan Engines; Turbocompressors; Axial Flow Turbines; Combustion Chambers; Continuum Flow

20080032604 Pratt and Whitney Aircraft, East Hartford, CT, USA

Enhanced Self Tuning On-Board Real-Time Model (eSTORM) for Aircraft Engine Performance Health Tracking

Volponi, Al; Simon, Donald L., Technical Monitor; July 2008; 58 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAS3-01138; WBS 645846.02.07.03.03.01

Report No.(s): NASA/CR-2008-215272; FR-26751; E-16543; No Copyright; Avail.: CASI: [A04](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080032604>

A key technological concept for producing reliable engine diagnostics and prognostics exploits the benefits of fusing sensor data, information, and/or processing algorithms. This report describes the development of a hybrid engine model for a propulsion gas turbine engine, which is the result of fusing two diverse modeling methodologies: a physics-based model approach and an empirical model approach. The report describes the process and methods involved in deriving and implementing a hybrid model configuration for a commercial turbofan engine. Among the intended uses for such a model is to enable real-time, on-board tracking of engine module performance changes and engine parameter synthesis for fault detection and accommodation.

Author

Turbofan Engines; Aircraft Engines; Fault Detection; Gas Turbine Engines; Performance Prediction; Real Time Operation; Diagnosis

08

AIRCRAFT STABILITY AND CONTROL

Includes flight dynamics, aircraft handling qualities, piloting, flight controls, and autopilots. For related information see also 05 Aircraft Design, Testing and Performance; and 06 Avionics and Aircraft Instrumentation.

20080031166 Textron Bell Helicopter, Fort Worth, TX, USA

Flight Control Development for the ARH-70 Armed Reconnaissance Helicopter Program

Christensen, Kevin T.; Campbell, Kip G.; Griffith, Carl D.; Ivler, Christina M.; Tischler, Mark B.; Harding, Jeffrey W.; May 2008; 19 pp.; In English; American Helicopter Society 63rd Annual Forum, 1-3 May 2007, Virginia Beach, VA, USA; Original contains black and white illustrations

Contract(s)/Grant(s): NNA05CP80A; Copyright; Avail.: Other Sources

In July 2005, Bell Helicopter won the U.S. Army's Armed Reconnaissance Helicopter competition to produce a replacement for the OH-58 Kiowa Warrior capable of performing the armed reconnaissance mission. To meet the U.S. Army requirement that the ARH-70A have Level 1 handling qualities for the scout rotorcraft mission task elements defined by ADS-33E-PRF, Bell equipped the aircraft with their generic automatic flight control system (AFCS). Under the constraints of the tight ARH-70A schedule, the development team used modern parameter identification and control law optimization techniques to optimize the AFCS gains to simultaneously meet multiple handling qualities design criteria. This paper will show how linear modeling, control law optimization, and simulation have been used to produce a Level 1 scout rotorcraft for

the U.S. Army, while minimizing the amount of flight testing required for AFCS development and handling qualities evaluation of the ARH-70A.

Author

Automatic Flight Control; Control Theory; Flight Tests; Helicopters; Rotary Wing Aircraft; Reconnaissance; Controllability; Design Analysis

12

ASTRONAUTICS (GENERAL)

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms. For specific topics in astronautics see *categories 13 through 20*. For extraterrestrial exploration see *91 Lunar and Planetary Science and Exploration*.

20080031296 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Study of the Dynamics of Small Space Debris and Meteoroids

CelestinodePaulaSantos, Claudia Celeste; [2007]; 264 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14463-TDI/1144; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A12](#), Hardcopy

In the last decades, the exploration and utilization of satellites' environment while in orbits around the Earth became relevant to technological progress. The knowledge of the flow and the dynamics of meteoroid particles, as well as space debris that can affect the performance of space missions, is highly important. The goal of this work was to obtain the orbital evolution of a particle cloud orbiting around the Earth, which is under the effect of several perturbations. The goal was to develop a global study of the several perturbations applied to the space debris problem, as well as meteoroid clouds, so that a density/flow map of particles could be obtained, taking into account the altitude and particle size. A hypothetical belt of material around the Earth was considered. This belt was composed of particles of different sizes and it was subjected to different perturbations of high or low intensity. The intensities depend on the altitude as well as on the size of the particles. Thus, for a specific particle size, these perturbations can produce regions with high density of particles and others, practically, without particles. These structures will always depend on time and there is a lifetime for their existence. The knowledge of these structures and their lifetimes is extremely useful in the planning of space missions.

Author (revised)

Satellite Orbits; Orbit Perturbation; Meteoroids; Space Debris

14

GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and test chambers and simulators. Also includes extraterrestrial bases and supporting equipment. For related information see also *09 Research and Support Facilities (Air)*.

20080031060 NASA Marshall Space Flight Center, Huntsville, AL, USA

Marshall Space Flight Center's Impact Testing Facility Capabilities

Evans, Steve; Finchum, Andy; Hubbs, Whitney; Gray, Perry; April 28, 2008; 1 pp.; In English; 12th DoD Electromagnetic Windows Symposium, 28 Apr. - 1 May 2008, Alabama, USA; No Copyright; Avail.: Other Sources; Abstract Only

Marshall Space Flight Center's (MSFC) Impact Testing Facility (ITF) serves as an important installation for space and missile related materials science research. The ITF was established and began its research in spacecraft debris shielding in the early 1960s, then played a major role in the International Space Station debris shield development. As NASA became more interested in launch debris and in-flight impact concerns, the ITF grew to include research in a variety of impact genres. Collaborative partnerships with the DoD led to a wider range of impact capabilities being relocated to MSFC as a result of the closure of Particle Impact Facilities in Santa Barbara, California. The Particle Impact Facility had a 30 year history in providing evaluations of aerospace materials and components during flights through rain, ice, and solid particle environments at subsonic through hypersonic velocities. The facility's unique capabilities were deemed a 'National Asset' by the DoD. The ITF now has capabilities including environmental, ballistic, and hypervelocity impact testing utilizing an array of air, powder, and two-stage light gas guns to accommodate a variety of projectile and target types and sizes. Relocated test equipment was dated and in need of upgrade. Numerous upgrades including new instrumentation, triggering circuitry, high speed

photography, and optimized sabot designs have been implemented. Other recent research has included rain drop demise characterization tests to obtain data for inclusion in on-going model development. Future ITF improvements will be focused on continued instrumentation and performance enhancements. These enhancements will allow further, more in-depth, characterization of rain drop demise characterization and evaluation of ice crystal impact. Performance enhancements also include increasing the upper velocity limit of the current environmental guns to allow direct environmental simulation for missile components. The current and proposed ITF capabilities range from rain to micrometeoroids allowing the widest test parameter range possible for materials investigations in support of space, atmospheric, and ground environments. These test capabilities including hydrometeor, single/multi-particle, ballistic gas guns, exploding wire gun, and light gas guns combined with Smooth Particle Hydrodynamics Code (SPHC) simulations represent the widest range of impact test capabilities in the country.

Author

Impact Tests; Test Facilities; Test Equipment; Instruments

20080031446 NASA Marshall Space Flight Center, Huntsville, AL, USA; NASA Marshall Space Flight Center, Huntsville, AL, USA

NASA's Ares I and Ares V Launch Vehicles--Effective Space Operations Through Efficient Ground Operations

Singer, Christopher E.; Dumbacher, Daniel L.; Lyles, Gary M.; Onken, Jay F.; May 12, 2008; 18 pp.; In English; AIAA SpaceOps2008, 12-16 May 2008, Heidelberg, Germany; Original contains black and white illustrations; No Copyright;

Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031446>

The USA (U.S.) is charting a renewed course for lunar exploration, with the fielding of a new human-rated space transportation system to replace the venerable Space Shuttle, which will be retired after it completes its missions of building the International Space Station (ISS) and servicing the Hubble Space Telescope. Powering the future of space-based scientific exploration will be the Ares I Crew Launch Vehicle, which will transport the Orion Crew Exploration Vehicle to orbit where it will rendezvous with the Altair Lunar Lander, which will be delivered by the Ares V Cargo Launch Vehicle (fig. 1). This configuration will empower rekindled investigation of Earth's natural satellite in the not too distant future. This new exploration infrastructure, developed by the National Aeronautics and Space Administration (NASA), will allow astronauts to leave low-Earth orbit (LEO) for extended lunar missions and preparation for the first long-distance journeys to Mars. All space-based operations - to LEO and beyond - are controlled from Earth. NASA's philosophy is to deliver safe, reliable, and cost-effective architecture solutions to sustain this multi-billion-dollar program across several decades. Leveraging 50 years of lessons learned, NASA is partnering with private industry and academia, while building on proven hardware experience. This paper outlines a few ways that the Engineering Directorate at NASA's Marshall Space Flight Center is working with the Constellation Program and its project offices to streamline ground operations concepts by designing for operability, which reduces lifecycle costs and promotes sustainable space exploration.

Author

Ground Operational Support System; Ares I Launch Vehicle; Ares V Cargo Launch Vehicle; Cost Effectiveness; Space Exploration; Low Earth Orbits

15

LAUNCH VEHICLES AND LAUNCH OPERATIONS

Includes all classes of launch vehicles, launch/space vehicle systems, and boosters; and launch operations. For related information see also *18 Spacecraft Design, Testing and Performance*; and *20 Spacecraft Propulsion and Power*.

20080031424 NASA Marshall Space Flight Center, Huntsville, AL, USA

Integrated Vehicle Ground Vibration Testing in Support of NASA Launch Vehicle Loads and Controls Analysis

Tuma, Margaret L.; Davis, Susan R.; Askins, Bruce R.; Salyer, Blaine H.; May 12, 2008; 2 pp.; In English; JANNAF 2008, 12-16 May 2008, Newton, MA, USA; No Copyright; Avail.: Other Sources; Abstract Only

The National Aeronautics and Space Administration (NASA) Ares Projects Office (APO) is continuing to make progress toward the final design of the Ares I crew launch vehicle and Ares V cargo launch vehicle. Ares I and V will form the space launch capabilities necessary to fulfill NASA's exploration strategy of sending human beings to the Moon, Mars, and beyond. As with all new space vehicles there will be a number of tests to ensure the design can be Human Rated. One of these is the Integrated Vehicle Ground Vibration Test (IVGVT) that will be measuring responses of the Ares I as a system. All structural systems possess a basic set of physical characteristics unique to that system. These unique characteristics include items such

as mass distribution, frequency and damping. When specified, they allow engineers to understand and predict how a structural system like the Ares I launch vehicle behaves under given loading conditions. These physical properties of launch vehicles may be predicted by analysis or measured through certain types of tests. Generally, these properties are predicted by analysis during the design phase of a launch vehicle and then verified through testing before the vehicle is Human Rated. The IVGVT is intended to measure by test the fundamental dynamic characteristics of Ares I during various phases of operational/flight. This testing includes excitations of the vehicle in lateral, longitudinal, and torsional directions at vehicle configurations representing different trajectory points. During the series of tests, properties such as natural frequencies, mode shapes, and transfer functions are measured directly. These data will then be used to calibrate loads and Guidance, Navigation, and Controls (GN&C) analysis models for verifying analyses of Ares I. NASA launch vehicles from Saturn to Shuttle have undergone Ground Vibration Tests (GVTs) leading to successful launch vehicles. A GVT was not performed on the unmanned Delta III. This vehicle was lost during launch. Subsequent analyses indicated that had a GVT been conducted on the vehicle, problems with vehicle modes and control may have been discovered and corrected, avoiding loss of the vehicle/mission. This paper will address GVT planning, set-up, conduction and analyses, for the Saturn and Shuttle programs, and also focus on the current and on-going planning for the Ares I and V IVGVT.

Author

Loads (Forces); Vibration Tests; Ground Tests; Ares I Launch Vehicle; Ares 5 Cargo Launch Vehicle; NASA Programs

20080031432 NASA Marshall Space Flight Center, Huntsville, AL, USA

Integrated Vehicle Ground Vibration Testing of Manned Spacecraft: Historical Precedent

Lemke, Paul R.; Tuma, Margaret L.; Askins, Bruce R.; May 12, 2008; 2 pp.; In English; JANNAF 2008, 12-16 May 2008, Newton, MA, USA

Contract(s)/Grant(s): NNM05AB50C; No Copyright; Avail.: Other Sources; Abstract Only

For the first time in nearly 30 years, NASA is developing a new manned space flight launch system. The Ares I will carry crew and cargo to not only the International Space Station, but onward for the future exploration of the Moon and Mars. The Ares I control system and structural designs use complex computer models for their development. An Integrated Vehicle Ground Vibration Test (IVGVT) will validate the efficacy of these computer models. The IVGVT will reduce the technical risk of unexpected conditions that could place the vehicle or crew in jeopardy. The Ares Project Office's Flight and Integrated Test Office commissioned a study to determine how historical programs, such as Saturn and Space Shuttle, validated the structural dynamics of an integrated flight vehicle. The study methodology was to examine the historical record and seek out members of the engineering community who recall the development of historic manned launch vehicles. These records and interviews provided insight into the best practices and lessons learned from these historic development programs. The information that was gathered allowed the creation of timelines of the historic development programs. The timelines trace the programs from the development of test articles through test preparation, test operations, and test data reduction efforts. These timelines also demonstrate how the historical tests fit within their overall vehicle development programs. Finally, the study was able to quantify approximate staffing levels during historic development programs. Using this study, the Flight and Integrated Test Office was able to evaluate the Ares I Integrated Vehicle Ground Vibration Test schedule and workforce budgets in light of the historical precedents to determine if the test had schedule or cost risks associated with it.

Author

Ares I Launch Vehicle; Ground Tests; Vibration Tests; Manned Space Flight; Aerospace Safety; Control Systems Design; Structural Design; Computerized Simulation

20080031448 NASA Marshall Space Flight Center, Huntsville, AL, USA; NASA Marshall Space Flight Center, Huntsville, AL, USA

Factors which Limit the Value of Additional Redundancy in Human Rated Launch Vehicle Systems

Anderson, Joel M.; Stott, James E.; Ring, Robert W.; Hatfield, Spencer; Kaltz, Gregory M.; May 12, 2008; 10 pp.; In English; AIAA SpaceOps 2008, 12-16, Heidelberg, Germany; Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A02](#), Hardcopy

The National Aeronautics and Space Administration (NASA) has embarked on an ambitious program to return humans to the moon and beyond. As NASA moves forward in the development and design of new launch vehicles for future space exploration, it must fully consider the implications that rule-based requirements of redundancy or fault tolerance have on system reliability/risk. These considerations include common cause failure, increased system complexity, combined serial and parallel configurations, and the impact of design features implemented to control premature activation. These factors and others must be considered in trade studies to support design decisions that balance safety, reliability, performance and system complexity to achieve a relatively simple, operable system that provides the safest and most reliable system within the

specified performance requirements. This paper describes conditions under which additional functional redundancy can impede improved system reliability. Examples from current NASA programs including the Ares I Upper Stage will be shown.
Author

Launch Vehicles; Space Exploration; Redundancy; Fault Tolerance; Reliability Engineering; Systems Engineering

20080031466 NASA Marshall Space Flight Center, Huntsville, AL, USA; NASA Glenn Research Center, Cleveland, OH, USA

Integrated Vehicle Ground Vibration Testing in Support of Launch Vehicle Loads and Controls Analysis

Askins, Bruce R.; Davis, Susan R.; Salyer, Blaine H.; Tuma, Margaret L.; May 12, 2008; 13 pp.; In English; Joint Army-Navy-NASA-Air Force (JANNAF) Conference, 12-16 May 2008, Massachusetts, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031466>

All structural systems possess a basic set of physical characteristics unique to that system. These unique physical characteristics include items such as mass distribution and damping. When specified, they allow engineers to understand and predict how a structural system behaves under given loading conditions and different methods of control. These physical properties of launch vehicles may be predicted by analysis or measured by certain types of tests. Generally, these properties are predicted by analysis during the design phase of a launch vehicle and then verified by testing before the vehicle becomes operational. A ground vibration test (GVT) is intended to measure by test the fundamental dynamic characteristics of launch vehicles during various phases of flight. During the series of tests, properties such as natural frequencies, mode shapes, and transfer functions are measured directly. These data will then be used to calibrate loads and control systems analysis models for verifying analyses of the launch vehicle. NASA manned launch vehicles have undergone ground vibration testing leading to the development of successful launch vehicles. A GVT was not performed on the inaugural launch of the unmanned Delta III which was lost during launch. Subsequent analyses indicated had a GVT been performed, it would have identified instability issues avoiding loss of the vehicle. This discussion will address GVT planning, set-up, execution and analyses, for the Saturn and Shuttle programs, and will also focus on the current and on-going planning for the Ares I and V Integrated Vehicle Ground Vibration Test (IVGVT).

Author

Ground Tests; Vibration Tests; Launch Vehicles; Design Analysis; Load Carrying Capacity; Control Systems Design

20080031492 NASA Marshall Space Flight Center, Huntsville, AL, USA

Technical Progress on the Ares I-X Flight Test

Davis, S.R.; Robinson, K.F.; Flynn, K.C.; May 12, 2008; 31 pp.; In English; Joint Army-Navy-NASA-Air Force (JANNAF) Conference, 12-16 May 2008, Massachusetts, USA; Original contains color illustrations; No Copyright; Avail.:

CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031492>

Ares I-X will be NASA's first test flight for a new human-rated launch vehicle since 1981, and the team is well on its way toward completing the vehicle's design and hardware fabrication for an April 2009 launch. This uncrewed suborbital development test flight gives NASA its first opportunities to: gather critical data about the flight dynamics of the integrated launch vehicle; understand how to control its roll during flight; better characterize the stage separation environments during future flight; and demonstrate the first stage recovery system. The Ares I-X Flight Test Vehicle (FTV) incorporates a mix of flight and mockup hardware. It is powered by a four-segment solid rocket booster, and will be modified to include a fifth, spacer segment; the upper stage, Orion crew exploration vehicle, and launch abort system are simulator hardware to make the FTV aerodynamically similar to the same size, shape, and weight of Ares I. The Ares IX first stage includes an existing Shuttle solid rocket motor and thrust vector control system controlled by an Ascent Thrust Vector Controller (ATVC) designed and built by Honeywell International. The avionics system will be tested in a dedicated System Integration Laboratory located at Lockheed Martin Space Systems (LMSS) in Denver, Colorado. The Upper Stage Simulator (USS) is made up of cylindrical segments that will be stacked and integrated at Kennedy Space Center (KSC) for launch. Glenn Research Center is already building these segments, along with their internal access structures. The active Roll Control System (RoCS) includes two thruster units harvested from Peacekeeper missiles. Duty cycle testing for RoCS was conducted, and fuel tanking and detanking tests will occur at KSC in early 2008. This important flight will provide valuable experience for the ground operations team in integrating, stacking, and launching Ares I. Data from Ares I-X will ensure the safety and reliability of America's newest launch vehicle.

Author

Technology Assessment; Ares 1 Launch Vehicle; Flight Tests

20080032426 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Stellar Imager (SI) Vision Mission and the Benefits of an Ares V Launch

Carpenter, Kenneth F.; April 25, 2008; 1 pp.; In English; Ares V Astronomy Workshop', 25-27 Apr. 2008, California, USA; No Copyright; Avail.: Other Sources; Abstract Only

The Stellar Imager (SI) is a UV/Optical, Space-Based Interferometer designed to enable 0.1 milli-arcsecond (mas) spectral imaging of stellar surfaces and, via asteroseismology, stellar interiors and of the Universe in general. The ultra-sharp images of the Stellar Imager will revolutionize our view of many dynamic astrophysical processes by transforming point sources into extended sources, and snapshots into evolving views. SI's science focuses on the role of magnetism in the Universe, particularly on magnetic activity on the surfaces of stars like the Sun. SI's prime goal is to enable long-term forecasting of solar activity and the space weather that it drives. SI will also revolutionize our understanding of the formation of planetary systems, of the habitability and climatology of distant planets, and of many magneto-hydrodynamically controlled processes in the Universe. SI is a 'Flagship and Landmark Discovery Mission' in the 2005 Heliophysics Roadmap and a potential implementation of the UVOI in the 2006 Science Program for NASA's Astronomy and Physics Division. In this paper we briefly discuss the science goals, technology needs, and baseline design of the SI Mission, and then describe the benefits to the mission that a launch on an Ares V, with its larger payload shroud, would produce. Additional information on SI can be found at: <http://hires.gsfc.nasa.gov/si/>.

Author

Ares 5 Cargo Launch Vehicle; Asteroseismology; Astrophysics; Sun

20080032611 NASA Glenn Research Center, Cleveland, OH, USA

Cryogenic Fluid Transfer for Exploration

Chato, David J.; July 2008; 14 pp.; In English; Space Cryogenics Workshop, 11-13 Jul. 2007, Huntsville, AL, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 253225.04.01.02.04.01.03

Report No.(s): NASA/TM-2008-215286; E-16556; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080032611>

This paper discusses current plans and issues for exploration that involve the use of cryogenic transfer. The benefits of cryogenic transfer to exploration missions are examined. The current state of the art of transfer technology is reviewed. Mission concepts of operation for exploration are presented, and used to qualitatively discuss the performance benefits of transfer. The paper looks at the challenges faced to implement a cryogenic transfer system and suggest approaches to address them with advanced development research. Transfer rates required for exploration are shown to have already been achieved in ground test. Cost-effective approaches to the required on-orbit demonstration are suggested.

Author

Cryogenic Fluids; Ground Tests; Hydrogen; Cryogenics

16

SPACE TRANSPORTATION AND SAFETY

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. For related information see also *03 Air Transportation and Safety; 15 Launch Vehicles and Launch Operations; and 18 Spacecraft Design, Testing and Performance*. For space suits see *54 Man/System Technology and Life Support*.

20080030988 NASA Marshall Space Flight Center, Huntsville, AL, USA

J-2X Abort System Development

Santi, Louis M.; Butas, John P.; Aguilar, Robert B.; Sowers, Thomas S.; May 12, 2008; 1 pp.; In English; 2008 JANNAF Propulsion Meeting/24th Propulsion Systems Hazards/Joint Subcommittee Meeting, 12-16 May 2008, Newton, MA, USA

Contract(s)/Grant(s): NNM05AB50C; No Copyright; Avail.: Other Sources; Abstract Only

The J-2X is an expendable liquid hydrogen (LH2)/liquid oxygen (LOX) gas generator cycle rocket engine that is currently being designed as the primary upper stage propulsion element for the new NASA Ares vehicle family. The J-2X engine will contain abort logic that functions as an integral component of the Ares vehicle abort system. This system is responsible for detecting and responding to conditions indicative of impending Loss of Mission (LOM), Loss of Vehicle (LOV), and/or catastrophic Loss of Crew (LOC) failure events. As an earth orbit ascent phase engine, the J-2X is a high power density propulsion element with non-negligible risk of fast propagation rate failures that can quickly lead to LOM, LOV, and/or LOC events. Aggressive reliability requirements for manned Ares missions and the risk of fast propagating J-2X failures dictate the

need for on-engine abort condition monitoring and autonomous response capability as well as traditional abort agents such as the vehicle computer, flight crew, and ground control not located on the engine. This paper describes the baseline J-2X abort subsystem concept of operations, as well as the development process for this subsystem. A strategy that leverages heritage system experience and responds to an evolving engine design as well as J-2X specific test data to support abort system development is described. The utilization of performance and failure simulation models to support abort system sensor selection, failure detectability and discrimination studies, decision threshold definition, and abort system performance verification and validation is outlined. The basis for abort false positive and false negative performance constraints is described. Development challenges associated with information shortfalls in the design cycle, abort condition coverage and response assessment, engine-vehicle interface definition, and abort system performance verification and validation are also discussed.

Author

Rocket Engines; Abort Apparatus; Systems Health Monitoring; Rocket Engine Design; Systems Engineering; Engine Failure; Fault Detection; Aerospace Safety

20080031115 NASA Langley Research Center, Hampton, VA, USA

Models in the Design and Validation of Eddy Current Inspection for Cracking in the Shuttle Reaction Control System Thruster

Aldrin, John C.; July 23, 2008; 25 pp.; In English; 35th Annual Review of Progress in Quantitative Nondestructive Evaluation (QNDE), 20-25 Jul. 2008, Chicago, IL, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 377816.06.02.03.05; Copyright; Avail.: CASI: [A03](#), Hardcopy

Two numerical methods, FEM and VIM, were used to simulate eddy current NDE for cracks in a complex thruster geometry. Model demonstrated trends observed in experimental studies. Sensitivity studies performed to determine the ideal probe orientations and frequencies for varying crack lengths. To make an accurate comparison between designs using simulation: a) Need accurate measurement models; b) Must include all critical variances in measurements. MAPOD study outlined with preliminary design results.

Derived from text

Eddy Currents; Crack Propagation; Nondestructive Tests; Thrusters; Space Shuttles; Numerical Analysis; Cracks; Inspection

20080031341 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Space Vehicle Trajectory Monitoring in Real Time: Support to Decision Making for Flight Safety Group

Louis, Joao Emile; [2007]; 153 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14605-TDI/1185; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A08](#), Hardcopy

Whenever satellites or scientific experiments are launched from vehicles, it is more than natural that the successful accomplishment of the mission is of interest to all the involved parties. In such activities, several teams with determined targets contribute as participating members. In terms of safety, the Flight Safety (SVO) team is responsible for protecting the public, internal and external to the operation. This group counts not only on pre-flight and post-flight information but also on the present status of the flight in order to conduct analysis. Information are constantly received from several tracking means such as radar and telemetry and they refer to the position of the vehicle. It is of fundamental importance to display such information in a proper way to the SVO as decisions such as aborting a flight, have to be made. Usually, launching centers are already equipped with tools to assist making such decisions. In order to contribute to the task of deciding on flight continuity, this dissertation proposes another method to conduct analysis of the trend of the actual trajectory. At each instant of the flight, a new trajectory calculation is conducted using the same facilities that predict a trajectory. This calculation occurs simultaneously with the flight and the characteristics of the vehicle and flight events are maintained as predicted. The only information received are duration of the flight and the vehicle position. Based on this information a new trajectory is determined and this results in a trajectory extrapolation obtained from the duration of the flight. These results enable the SVO to analyze not only the projection of the trend of the trajectory, but also the trajectory the vehicle should traverse, considering the initial conditions such as wind or any perturbation on leaving the launch pad. The results will be presented graphically by projecting the new determined trajectory on a computer monitor over a cartographic map. This display makes use of existing graphical tools for the internet known as open web standard technologies.

Author (revised)

Spacecraft Trajectories; Trajectory Measurement; Flight Safety; Decision Making; Trajectory Planning; Decision Support Systems

20080031529 NASA Marshall Space Flight Center, Huntsville, AL, USA

Space Shuttle Orbiter Atlantis Liquid Oxygen Prevalve Detent Roller Cracking Investigation

Holleman, Elizabeth; Eddleman, David; Richard, James; Jacobs, Rebecca; May 07, 2008; 10 pp.; In English; The 39th Aerospace Mechanisms Symposium, 7-9 May 2008, Alabama, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031529>

During routine inspections of the Space Shuttle's Main Propulsion System (MPS) Liquid Oxygen (LO2) pre-valve, the mechanism provided to maintain the valve in the open position was found cracked. The mechanism is a Vespel roller held against the valve visor by a stack of Belleville springs. The roller has been found cracked 3 times. All three instances were in the same valve in the same location. There are 6 pre-valves on each orbiter, and only one has exhibited this problem. Every-flight inspections were instituted and the rollers were found to be cracked after only one flight. Engineers at Marshall Space Flight Center, Johnson Space Center and Kennedy Space Center worked together to determine a solution. There were several possible contributors to the failure: a mis-aligned visor, an out of specification edge with a sharp radius, an out of specification tolerance stack up of a Belleville spring stack that caused un-predicted loads on the Vespel SP-21 roller, and a dimple machined into the side of the roller to indicate LO2 compatibility that created a stress riser. The detent assembly was removed and replaced with parts that were on the low-side of the tolerance stack up to eliminate the potential for high loads on the detent roller. After one flight, the roller was inspected and showed fewer signs of wear and no cracks.

Author

Space Shuttle Orbiters; Cracks; Valves; Liquid Oxygen; Propulsion; Loads (Forces); Wear

20080031610 Stetina Brunda Garred and Brucker, Aliso Viejo, CA, USA

Method of Evaluation of Space Systems for Safety Assurance and Residual Risk to Flightcrew

Galutia, Barry Clifford, Inventor; Young, Doug Harold, Inventor; 11 May 04; 20 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAS8-01100

Patent Info.: Filed Filed 11 May 04; US-Patent-Appl-SN-10-843042; US 2005/0256682

Report No.(s): PB2007-109167; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031610>

A process for evaluating space systems for safety assurance and residual risk to the flight crew. The process includes a success oriented System Safety phase which attempts to reduce the probability of failure with respect to the loss of a crew member as low as practical; a failure oriented SPACESAFE phase which assumes that at least one Safety Critical Subsystem has failed and attempts to engineer a risk mitigation design minimize adverse effects on the crew; and an Integration phase which complimentary integrates the System Safety phase with the SPACESAFE phase. Such process allows for increased flight crew safety by minimizing risk of failures that contribute to loss of a crew member.

Author

Manned Space Flight; Aerospace Safety; Aerospace Systems; System Failures; Countermeasures; Risk Assessment; Safety Management

20080031644 American Inst. of Aeronautics and Astronautics, Reston, VA, USA

Squeeze Play for the Shuttle

Jones, Thomas D.; Aerospace America; March 2008; ISSN 0740-722X; Volume 46, No. 3; 7 pp.; In English; Original contains color illustrations; Copyright; Avail.: Other Sources

The Space Shuttle program is facing retirement in September 2010. This article reviews the work yet to do to complete construction of the International Space Station (ISS) the planned missions and the possible alternatives for servicing the ISS after the Shuttle retirement.

CASI

International Space Station; Space Shuttles; Space Transportation System Flights; Payload Delivery (STS); Space Shuttle Payloads

SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes space systems telemetry; space communications networks; astronavigation and guidance; and spacecraft radio blackout. For related information see also *04 Aircraft Communications and Navigation*; and *32 Communications and Radar*.

20080031417 Johns Hopkins Univ., Laurel, MD, USA

Low-Power Photonic Telemetry System and Method for Spacecraft Monitoring

Fielhauer, K. B., Inventor; Boone, B. G., Inventor; 2 Nov 04; 13 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAS5-97271

Patent Info.: Filed 2 Nov 04; US-Patent-Appl-SN-10-979697; US 2005/0240341

Report No.(s): PB2007-104099; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031417>

An optical telemetry system and method for monitoring the location and status of a spacecraft (e.g., a satellite, a missile, a manned vehicle, etc.) using an optical communication link in an extraterrestrial environment. The system is optimally suited for monitoring the status and location of the spacecraft during a separation procedure of a spacecraft from its launch vehicle and uses a low-power optical communication link between a support craft and a spacecraft to obtain data. The data is then processed by the support craft and relayed to sources external to the support craft using the launch vehicle's telemetry system. Moreover, the system and method can also be used to monitor the status and location of an array (e.g., a three-dimensional array) of space vehicles traveling in space (e.g., an array of satellites).

Author

Optical Communication; Telemetry; Management Systems; Spacecraft Tracking; Optical Tracking

20080031744 NASA Goddard Space Flight Center, Greenbelt, MD, USA

General Mission Analysis Tool (GMAT) Mathematical Specifications

Hughes, Steve; [2007]; 95 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: [A05](#), Hardcopy

The General Mission Analysis Tool (GMAT) is a space trajectory optimization and mission analysis system developed by NASA and private industry in the spirit of the NASA Mission. GMAT contains new technology and is a testbed for future technology development.

Derived from text

Trajectory Optimization; User Manuals (Computer Programs)

20080032378 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Optimizations of a Hardware Decoder for Deep-Space Optical Communications

Cheng, Michael K.; Nakashima, Michael A.; Moision, Bruce E.; Hamkins, Jon; IEEE Transactions On Circuits and Systems--I: Regular Papers; March 2, 2007; Volume 55, No. 2, pp. 644-658; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40884>; <http://dx.doi.org/10.1109/TCSI.2007.913733>

The National Aeronautics and Space Administration has developed a capacity approaching modulation and coding scheme that comprises a serial concatenation of an inner accumulate pulse-position modulation (PPM) and an outer convolutional code [or serially concatenated PPM (SCPPM)] for deep-space optical communications. Decoding of this code uses the turbo principle. However, due to the nonbinary property of SCPPM, a straightforward application of classical turbo decoding is very inefficient. Here, we present various optimizations applicable in hardware implementation of the SCPPM decoder. More specifically, we feature a Super Gamma computation to efficiently handle parallel trellis edges, a pipeline-friendly 'maxstar top-2' circuit that reduces the max-only approximation penalty, a low-latency cyclic redundancy check circuit for window-based decoders, and a high-speed algorithmic polynomial interleaver that leads to memory savings. Using the featured optimizations, we implement a 6.72 megabits-per-second (Mbps) SCPPM decoder on a single field-programmable gate array (FPGA). Compared to the current data rate of 256 kilobits per second from Mars, the SCPPM coded scheme represents a throughput increase of more than twenty-six fold. Extension to a 50-Mbps decoder on a board with multiple FPGAs follows naturally. We show through hardware simulations that the SCPPM coded system can operate within 1 dB of the Shannon capacity at nominal operating conditions.

Author

Field-Programmable Gate Arrays; Optical Communication; Pulse Position Modulation; Decoders; Rates (Per Time); Computation

20080032610 NASA Glenn Research Center, Cleveland, OH, USA; NASA Glenn Research Center, Cleveland, OH, USA
Hardware Architecture Study for NASA's Space Software Defined Radios

Reinhart, Richard C.; Scardelletti, Maximilian C.; Mortensen, Dale J.; Kacpura, Thomas J.; Andro, Monty; Smith, Carl; Liebetreu, John; July 2008; 13 pp.; In English; Wireless and Microwave Technology Conference (WAMI), 4-5 Dec. 2006, Clearwater, FL, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 439432.04.07.01

Report No.(s): NASA/TM-2008-215283; E-16550; Copyright; Avail.: CASI: [A03](#), Hardcopy

This study defines a hardware architecture approach for software defined radios to enable commonality among NASA space missions. The architecture accommodates a range of reconfigurable processing technologies including general purpose processors, digital signal processors, field programmable gate arrays (FPGAs), and application-specific integrated circuits (ASICs) in addition to flexible and tunable radio frequency (RF) front-ends to satisfy varying mission requirements. The hardware architecture consists of modules, radio functions, and interfaces. The modules are a logical division of common radio functions that comprise a typical communication radio. This paper describes the architecture details, module definitions, and the typical functions on each module as well as the module interfaces. Trade-offs between component-based, custom architecture and a functional-based, open architecture are described. The architecture does not specify the internal physical implementation within each module, nor does the architecture mandate the standards or ratings of the hardware used to construct the radios.

Author

Field-Programmable Gate Arrays; Radio Equipment; NASA Space Programs; Signal Analyzers; Signal Processing; Computer Programs; Application Specific Integrated Circuits; Modules; Radio Frequencies

20080032648 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

JPL VLBI Analysis Center Report for 2007

Jacobs, Chris; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 214-217; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

This report describes the activities of the JPL VLBI analysis center for the year 2007. We continue to do celestial reference frame, terrestrial reference frame, earth orientation, and spacecraft navigation work using the VLBI technique. There are several areas of our work that are undergoing active development. In 2007, an important development was the effort to move earth orientation and reference frame work to Mark 5 recording and software correlation. Our international collaboration to build celestial frames at K (24 GHz) and Q-bands (43 GHz) has matured to near a part-per-billion accuracy as has our in-house work to build a reference at X/Ka-bands (8.4/32 GHz). We are also studying the use of arrays for spacecraft tracking.

Author

Earth Orientation; Superhigh Frequencies; Very Long Base Interferometry; Spacecraft Tracking; Space Navigation

18

SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and spacecraft control and stability characteristics. For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance*; *39 Structural Mechanics*; and *16 Space Transportation and Safety*.

20080030995 NASA Marshall Space Flight Center, Huntsville, AL, USA

ISS Charging Hazards and Low Earth Orbit Space Weather Effects

Minow, Joseph; Parker, L.; Coffey, V.; Wright K.; Koontz, S.; Edwards, D.; May 18, 2008; 1 pp.; In English; 12th International Symposium on Equatorial Aeronomy, 18024 May 2008, Crete, Greece; Copyright; Avail.: Other Sources; Abstract Only

Current collection by high voltage solar arrays on the International Space Station (ISS) drives the vehicle to negative floating potentials in the low Earth orbit daytime plasma environment. Pre-flight predictions of ISS floating potentials Φ greater than $|-100 \text{ V}|$ suggested a risk for degradation of dielectric thermal control coatings on surfaces in the U.S. sector due to arcing and an electrical shock hazard to astronauts during extravehicular activity (EVA). However, hazard studies conducted by the ISS program have demonstrated that the thermal control material degradation risk is effectively mitigated during the lifetime of the ISS vehicle by a sufficiently large ion collection area present on the vehicle to balance current collection by the solar arrays. To date, crew risk during EVA has been mitigated by operating one of two plasma contactors during EVA

to control the vehicle potential within Phi less than or equal to $|-40 \text{ V}|$ with a backup process requiring reorientation of the solar arrays into a configuration which places the current collection surfaces into wake. This operation minimizes current collection by the solar arrays should the plasma contactors fail. This paper presents an analysis of F-region electron density and temperature variations at low and midlatitudes generated by space weather events to determine what range of conditions represent charging threats to ISS. We first use historical ionospheric plasma measurements from spacecraft operating at altitudes relevant to the 51.6 degree inclination ISS orbit to provide an extensive database of F-region plasma conditions over a variety of solar cycle conditions. Then, the statistical results from the historical data are compared to more recent in-situ measurements from the Floating Potential Measurement Unit (FPMU) operating on ISS in a campaign mode since its installation in August, 2006.

Author

International Space Station; Spacecraft Charging; Space Weather; Solar Arrays; F Region; Low Earth Orbits; Risk Assessment; Plasma Probes; Aerospace Safety

20080031465 NASA Marshall Space Flight Center, Huntsville, AL, USA; NASA Goddard Space Flight Center, Greenbelt, MD, USA

Controlling Charging and Arcing on a Solar Powered Auroral Orbiting Spacecraft

Ferguson, Dale C.; Rhee, Michael S.; May 11, 2008; 15 pp.; In English; 33rd IEEE Photovoltaic Specialists Conference, 11-16 May 2008, California, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031465>

The Global Precipitation Measurement satellite (GPM) will be launched into a high inclination (65 degree) orbit to monitor rainfall on a global scale. Satellites in high inclination orbits have been shown to charge to high negative potentials, with the possibility of arcing on the solar arrays, when three conditions are met: a drop in plasma density below approximately $10,000 \text{ cm}^{-3}$, an injection of energetic electrons of energy more than 7-10 keV, and passage through darkness. Since all of these conditions are expected to obtain for some of the GPM orbits, charging calculations were done using first the Space Environment and Effects (SEE) Program Interactive Spacecraft Charging Handbook, and secondly the NASA Air-force Spacecraft Charging Analyzer Program (NASCAP-2k). The object of the calculations was to determine if charging was likely for the GPM configuration and materials, and specifically to see if choosing a particular type of thermal white paint would help minimize charging. A detailed NASCAP-2k geometrical model of the GPM spacecraft was built, with such a large number of nodes that it challenged the capability of NASCAP-2k to do the calculations. The results of the calculations were that for worst-case auroral charging conditions, charging to levels on the order of -120 to -230 volts could occur on GPM during night-time, with differential voltages on the solar arrays that might lead to solar array arcing. In sunlit conditions, charging did not exceed -20 V under any conditions. The night-time results were sensitive to the spacecraft surface materials chosen. For non-conducting white paints, the charging was severe, and could continue unabated throughout the passage of GPM through the auroral zone. Somewhat conductive (dissipative) white paints minimized the night-time charging to levels of -120 V or less, and thus were recommended for GPM thermal control. It is shown that the choice of thermal control paints is important to prevent arcing on high inclination orbiting spacecraft solar arrays as well as for GEO satellites, even for solar array designs chosen to minimize arcing.

Author

Spacecraft Charging; Arcs; Solar Arrays; Thermal Control Coatings; Paints; Auroral Zones; Electrical Resistivity

20080031678 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Integration and Testing Challenges of Small, Multiple Satellite Missions: Experiences from the Space Technology 5 Project

Sauerwein, Timothy A.; Gotomski, Thomas; April 08, 2008; 1 pp.; In English; No Copyright; Avail.: Other Sources;

Abstract Only

The ST5 technology demonstration mission led by GSFC of NASA's New Millennium Program managed by JPL consisted of three micro satellites (approximately 30 kg each) deployed into orbit from the Pegasus XL launch vehicle. In order to meet the launch date schedule of ST5, a different approach was required rather than the standard I&T approach used for single, room-sized satellites. The three spacecraft were designed, integrated, and tested at NASA Goddard Space Flight Center. It was determined that there was insufficient time in the schedule to perform three spacecraft I&T activities in series using standard approaches. The solution was for spacecraft #1 to undergo integration and test first, followed by spacecraft #2 and #3 simultaneously. This simultaneous integration was successful for several reasons. Each spacecraft had a Lead Test Conductor who planned and coordinated their spacecraft through its integration and test activities. One team of engineers and

technicians executed the integration of all three spacecraft, learning and gaining knowledge and efficiency as spacecraft #1 integration and testing progressed. They became acutely familiar with the hardware, operation and processes for I&T, thus had the experience and knowledge to safely execute I&T for spacecraft #2 and #3. The integration team was extremely versatile; each member could perform many different activities or work any spacecraft, when needed. ST5 was successfully integrated, tested and shipped to the launch site per the I&T schedule that was planned three years previously. The I&T campaign was completed with ST5's successful launch on March 22, 2006.

Author

Microsatellites; Space Technology Experiments; Performance Tests; Systems Integration; Aerospace Engineering; Technology Utilization

20080031707 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

The Stability of the Rotational Motion of the Artificial Satellites

SantosCabette, Regina Elaine; [2007]; 226 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14809-TDI/1252; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A11](#), Hardcopy

Using a canonical formulation, in this work is analyzed the stability of the rotational motion of an artificial satellite considering perturbations due to the gravity gradient torque. Here Andoyer's variables are used to describe the rotational motion. One of the approaches that allow the analysis of the stability of Hamiltonian systems needs the reduction of the Hamiltonian to a normal form. Firstly equilibrium points are found and using generalized coordinates the Hamiltonian is expanded in the neighborhood of these points. In a next step a canonical linear transformation is used to diagonalize the matrix associated to the linear part of the system. Thus, the quadratic part of the Hamiltonian is normalized. Based in a Lie-Hori algorithm a semi-analytic process for normalization is applied and the Hamiltonian was normalized up to the fourth order. Once the Hamiltonian is normalized up to order four, an analysis of stability of the equilibrium point is performed using the theorem of Kovalev and Savichenko. This semi-analytical approach was applied considering some data sets of hypothetical satellites. For the considered satellites it was observed small cases of stable motion. This work contributes to space missions where the maintenance of stability of the attitude of satellite are required.

Author

Satellite Rotation; Artificial Satellites; Satellite Attitude Control; Motion Stability

20080032366 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

The Evolution of Deep Space Navigation: 1989-1999

Wood, Lincoln J.; June 30, 2008; 22 pp.; In English; F. Landis Markley Astronautics Symposium (AAS), 30 Jun. 2008, Cambridge, MA, USA

Report No.(s): AAS 08-311; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40880>

The exploration of the planets of the solar system using robotic vehicles has been underway since the early 1960s. During this time the navigational capabilities employed have increased greatly in accuracy, as required by the scientific objectives of the missions and as enabled by improvements in technology. This paper is the second in a chronological sequence dealing with the evolution of deep space navigation. The time interval covered extends from the 1989 launch of the Magellan spacecraft to Venus through a multiplicity of planetary exploration activities in 1999. The paper focuses on the observational techniques that have been used to obtain navigational information, propellant-efficient means for modifying spacecraft trajectories, and the computational methods that have been employed, tracing their evolution through a dozen planetary missions.

Author

Space Navigation; Magellan Spacecraft (NASA); Deep Space; Space Exploration; Space Missions; Spacecraft Trajectories

20080032501 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Dynamics of Movement of Opening of the Panels Mansions of the Satellite CBERS

Palerosi, Antonio Claret; 2008; 191 pp.; In Portuguese; Original contains black and white illustrations

Report No.(s): INPE-14461-TAE/66; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A09](#), Hardcopy

This work studies the dynamics of the solar panels deployment for the Chinese-Brazilian satellite CBERS. The objective of this analysis consists of (1) guaranteeing that there will be enough energy to conclude the deployment and (2) determining the angular velocity at in-orbit panel latch-up. The problem solution demands some deployment tests and the development of simulation dynamic models. The test results are used to adjust the parameters of a laboratory dynamic model. It is assumed

that if the adjusted model is able to accurately predict the motion in the laboratory, it will also be able to predict the motion in orbit after removing the laboratory influence and updating those parameters sensitive to the space environment. So, there are two different dynamic models: one more complex related to the laboratory and another one related to in-orbit conditions. The beginning of this work presents a detailed description of the problem and the simulation parameters determination. A discussion between the Lagrange formulation and the use of a computer package for dynamic analysis of mechanisms (ADAMS (Registered TradeMark)) is included. The problem solution using this package is justified. The work also describes the Lagrange formulation and the formulation used in ADAMS(Registered TradeMark), the dynamic models, the test results, the laboratory and in-orbit simulation results. Also, the procedure to adjust the model parameters to fit the test results is described. Excellent agreement was obtained between the laboratory adjusted model and the test results. The importance of the inclusion in the dynamic models of the synchronise mechanism, of the aerodynamic drag of the solar panels due to the laboratory atmosphere and of the solar panels deformations are discussed.

Author

Panels; Solar Cells; Satellites; Dynamic Models; Satellite Solar Energy Conversion; Spacecraft Power Supplies; Angular Velocity; Latch-Up; Satellite Design; Spacecraft Performance

20080032517 NASA Johnson Space Center, Houston, TX, USA

Observations, Ideas, and Opinions: Systems Engineering and Integration for Return to Flight

Gafka, George K.; March 2006; 55 pp.; In English; 2006 NASA Project Management Challenge, 21-22 Mar. 2006, Galveston, TX, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): 790249.05.01; No Copyright; Avail.: CASI: [A04](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080032517>

This presentation addresses project management and systems engineering and integration challenges for return to flight, focusing on the Thermal Protection System Tile Repair Project (TRP). The program documentation philosophy, communication with program requirements flow and philosophy and planned deliverables and documentation are outlined. The development of TRP 'use-as-is' analytical tools is also highlighted and emphasis is placed on the use flight history to assess pre-flight and real-time risk. Additionally, an overview is provided of the repair procedure, including an outline of the logistics deployment chart.

Derived from text

Systems Engineering; Systems Integration; Aerospace Systems; Thermal Protection

20080032549 NASA Johnson Space Center, Houston, TX, USA

Optimal Total Pressure-Oxygen Concentration Levels for Future Spacecraft, Spacesuits, and Habitats

Scheuring, R. A.; Jones, J. A.; Conkin, J.; Gernhardt, M.; July 2008; 32 pp.; In English; Original contains color and black and white illustrations

Report No.(s): NASA/TP-2008-214775; S-1026; Copyright; Avail.: CASI: [A03](#), Hardcopy

This paper describes proposed environmental atmospheres for future long-duration spacecraft, spacesuits, and lunar and Mars habitats. Several atmospheric design points for the Constellation missions have been developed by the Environmental Atmosphere Working Group, ranging from normoxic to moderately hypoxic while simultaneously hypobaric. These environments were analyzed to achieve a balance among the risk of decompression sickness, the overhead required to perform an exploration extravehicular activity (EVA), short- and long-term human performance at less than normoxic levels of partial pressure of oxygen, and the fire hazard. Atmospheres in future vehicles for exploration missions will likely be less than standard atmospheric pressure, with an ambient inspired ppO₂ less than an Earth sea-level equivalent of 3.07 pounds per square inch, absolute, or 159 mmHg. A hypobaric and reduced-oxygen environment will be the integrated solution to safety, engineering, operational, and medical concerns that have as their goal routine and safe exploration of the lunar or martian surface. Constellation Program goals and proposed mission architecture emphasize EVA with exploration of planetary surfaces as the central driving operation. However, human physiology, materials, and equipment factors pose important limits that must be considered when choosing these atmospheric parameters.

Author

Oxygen; Space Suits; Extravehicular Activity; Lunar Surface; Mars Surface; Long Duration Space Flight; Pressure

20080032564 NASA Glenn Research Center, Cleveland, OH, USA

Lessons Learned From Atomic Oxygen Interaction With Spacecraft Materials in Low Earth Orbit

Banks, Bruce A.; deGroh, Kim, K.; Miller, Sharon K.; Waters, Deborah L.; July 2008; 19 pp.; In English; Ninth International Space Conference on Protection of Materials and Structures from the Space Environment (ICMSE-9), 20-23 May 2008, Toronto, Canada; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 691982.01.03.06.12.01

Report No.(s): NASA/TM-2008-215264; E-16531; Copyright; Avail.: CASI: [A03](#), Hardcopy

There have been five Materials International Space Station Experiment (MISSE) passive experiment carriers (PECs) (MISSE 1-5) to date that have been launched, exposed in space on the exterior of International Space Station (ISS) and then returned to Earth for analysis. An additional four MISSE PECs (MISSE 6A, 6B, 7A, and 7B) are in various stages of completion. The PECs are two-sided suitcase to size sample carriers that are intended to provide information on the effects of the low Earth orbital environment on a wide variety of materials and components. As a result of post retrieval analyses of the retrieved MISSE 2 experiments and numerous prior space experiments, there have been valuable lessons learned and needs identified that are worthy of being documented so that planning, design, and analysis of future space environment experiments can benefit from the experience in order to maximize the knowledge gained. Some of the lessons learned involve the techniques, concepts, and issues associated with measuring atomic oxygen erosion yields. These are presented along with several issues to be considered when designing experiments, such as the uncertainty in mission duration, scattering and contamination effects on results, and the accuracy of measuring atomic oxygen erosion.

Author

Earth Orbital Environments; Spaceborne Experiments; Aerospace Environments; Contamination; Low Earth Orbits; Lessons Learned; Design Analysis

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SPACECRAFT INSTRUMENTATION AND ASTRIONICS

Includes the design, manufacture, or use of devices for the purpose of measuring, detecting, controlling, computing, recording, or processing data related to the operation of space vehicles or platforms. For related information see also *06 Avionics and Aircraft Instrumentation*; for spaceborne instruments not integral to the vehicle itself see *35 Instrumentation and Photography*; for spaceborne telescopes and other astronomical instruments see *89 Astronomy*.

20080031737 NASA Goddard Space Flight Center, Greenbelt, MD, USA

LISA Instrument Performance

Livas, Jeffrey C.; Thorpe, James Ira; March 31, 2008; 1 pp.; In English; High Energy Astrophysics Division (HEAD) 2008 Meeting, 31 Mar - 3 Apr. 2008, Los Angeles, CA, USA; Original contains black and white illustrations; No Copyright;

Avail.: CASI: [A01](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031737>

Laser Interferometer Space Antenna (LISA) is designed to observe gravitational waves in the frequency band from $10(\text{exp } -1)$ to $10(\text{exp } -4)$ Hz where a rich spectrum of sources is expected. The measurements must be made from space to avoid the large motions of the earth that prevent the current generations (eg. LIGO) from operating at these frequencies. The technology and expected performance behind this measurement capability will be reviewed with an emphasis on the interferometric measurement system., including recent laboratory results showing a novel tunable frequency stabilized laser.

Author

Gravitational Waves; Laser Interferometry; Tunable Lasers

20080031738 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Gamma-Ray Large Area Space Telescope- GLAST Mission Overview

Moiseev, Alexander A.; October 03, 2007; 32 pp.; In English; International Forum, 'Space Science and the Problems of XXI Century', 1-5 Oct. 2007, Moscow, Russia; Original contains black and white illustrations; No Copyright; Avail.: CASI:

[A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031738>

This viewgraph presentation reviews the Gamma-ray Large Area Space Telescope (GLAST), and the instrumentation that

will be on the spacecraft: Large Area Telescope (LAT) and GLAST Burst Monitor (GBM). The presentation reviews in detail the LAT instrument.

CASI

Gamma Ray Telescopes; Spaceborne Telescopes; Astronomical Observatories; Satellite-Borne Instruments

20

SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information see also *07 Aircraft Propulsion and Power*, *28 Propellants and Fuels*, *15 Launch Vehicles and Launch Operations*, and *44 Energy Production and Conversion*.

20080031048 Auburn Univ., AL, USA; Entech, Inc., Keller, TX, USA; NASA Glenn Research Center, Cleveland, OH, USA; NASA Marshall Space Flight Center, Huntsville, AL, USA

A SEP Mission to Jupiter Using the Stretched Lens Array

Brandhorst, Henry W.; Rodiek, Julie A.; Ferguson, Dale C.; O'Neill, Mark J.; Piszczor, Michael F.; Oleson, Steve; May 05, 2008; 2 pp.; In English; Space Propulsion 2008: 5th International Spacecraft Propulsion Conference and 2nd International Symposium on Propulsion for Space Transportation, 5-9 May 2008, Heraklion, Crete, Greece; Original contains black and white illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

As space exploration continues to be a primary focus of NASA, solar electric propulsion (SEP) becomes a forerunner in the mode of transportation to reach other planets in our solar system. Several critical issues emerge as potential barriers to this approach such as reducing solar array radiation damage, operating the array at high voltage (>300 V) for extended times for Hall or ion thrusters, and designing an array that will be resistant to micrometeoroid impacts and the differing environmental conditions as the vehicle travels further into space. It is also of great importance to produce an array that is light weight to preserve payload mass fraction and to do this at a cost that is lower than today's arrays. This paper will describe progress on an array that meets all these requirements and will detail its use in a solar electric mission to Jupiter. From 1998-2001, NASA flew the Deep Space 1 mission that validated the use of ion propulsion for extended space missions. This highly successful two-year mission also used a novel SCARLET solar array that concentrated sunlight eight-fold onto small area solar cells. This array performed flawlessly and within 2% of its projected performance over the entire mission. That design has evolved into the Stretched Lens Array (SLA) shown in figure 1. The primary difference between SCARLET and the SLA is that no additional glass cover is used over the silicone lens. This has led to significant mass, cost and complexity reductions. The module shown in figure 1 is the latest version of the design. This design leads to a specific power exceeding 300 W/kg at voltages exceeding 300 V. In addition, this module has been tested to voltages over 1000 V while under hypervelocity particle impact in a plasma environment with no arcing. Furthermore array segments are under test for corona breakdown that can become a critical issue for long term, high voltage missions.

Author

Solar Electric Propulsion; Ion Propulsion; Space Missions; Space Exploration; Hall Thrusters; Deep Space 1 Mission; Solar Arrays; Lenses; Micrometeoroids; Hypervelocity Impact

20080031174 NASA Langley Research Center, Hampton, VA, USA

Pressure and Thrust Measurements of a High-Frequency Pulsed Detonation Tube

Nguyen, N.; Cutler, A. D.; July 02, 2008; 9 pp.; In English; 44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 20-23 Jul. 2008, Hartford, CT, USA

Contract(s)/Grant(s): NNL06AA16A; WBS 526282.01.07.04.06; No Copyright; Avail.: CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031174>

This paper describes measurements of a small-scale, high-frequency pulsed detonation tube. The device utilized a mixture of H₂ fuel and air, which was injected into the device at frequencies of up to 1200 Hz. Pulsed detonations were demonstrated in an 8-inch long combustion volume, at about 600 Hz, for the quarter wave mode of resonance. The primary objective of this experiment was to measure the generated thrust. A mean value of thrust was measured up to 6.0 lb, corresponding to H₂ flow based specific impulse of 2970 s. This value is comparable to measurements in H₂-fueled pulsed detonation engines (PDEs). The injection and detonation frequency for this new experimental case was much higher than typical PDEs, where frequencies are usually less than 100 Hz. The compact size of the device and high frequency of detonation yields a thrust-per-unit-volume of approximately 2.0 pounds per cubic inch, and compares favorably with other experiments, which typically have thrust-per-unit-volume of order 0.01 pound per cubic inch. This much higher volumetric efficiency results in a potentially

much more practical device than the typical PDE, for a wide range of potential applications, including high-speed boundary layer separation control, for example in hypersonic engine inlets, and propulsion for small aircraft and missiles.

Author

High Frequencies; Pulse Detonation Engines; Thrust Measurement; Pressure Measurement

20080031464 Pratt and Whitney Rocketdyne, West Palm Beach, FL, USA; NASA Marshall Space Flight Center, Huntsville, AL, USA

Development Status of the CECE Cryogenic Deep Throttling Demonstrator Engine

May 05, 2008; 10 pp.; In English; Space Propulsion 2008 - 2nd International Symposium on Propulsion for Space Transportation, 5-9 May 2008, Heraklion, Greece; Original contains color illustrations; Copyright; Avail.: Other Sources

As one of the first technology development programs awarded by NASA under the U.S. Space Exploration Policy (USSEP), the Pratt & Whitney Rocketdyne (PWR) Deep Throttling, Common Extensible Cryogenic Engine (CECE) program was selected by NASA in November 2004 to begin technology development and demonstration toward a deep throttling, cryogenic engine supporting ongoing trade studies for NASA's Lunar Lander descent stage. The CECE program leverages the maturity and previous investment of a flight-proven hydrogen/oxygen expander cycle engine, the PWR RL10, to develop and demonstrate an unprecedented combination of reliability, safety, durability, throttling, and restart capabilities in a high-energy, cryogenic engine. The testbed selected for the deep throttling demonstration phases of this program was a minimally modified RL10 engine, allowing for maximum current production engine commonality and extensibility with minimum program cost. Two series of demonstrator engine tests, the first in April-May 2006 and the second in March-April 2007, have demonstrated in excess of 10:1 throttling of the hydrogen/oxygen expander cycle engine. Both test series have explored a combustion instability ('chug') environment at low throttled power levels. These tests have provided an early demonstration of an enabling cryogenic propulsion concept with invaluable system-level technology data acquisition toward design and development risk mitigation for future CECE Demonstrator engine tests.

Author

Cryogenic Equipment; Hydrogen Oxygen Engines; Reliability; Throttling; Combustion Stability; Durability; Engine Tests; Propulsion; Cryogenics

20080031494 Pratt and Whitney Rocketdyne, Canoga Park, CA, USA; NASA Marshall Space Flight Center, Huntsville, AL, USA; NASA Johnson Space Center, Houston, TX, USA

Summary of Liquid Propulsion System Needs in Support of the Constellation Program

Lorier, Terry; Sumrall, Phil; Baine, Michael; May 05, 2008; 10 pp.; In English; Space Propulsion 2008, 5-9 May 2008, Heraklion, Greece; Original contains color illustrations; Copyright; Avail.: CASI: [A02](#), Hardcopy

In January 2004, the President of the USA established the Vision for Space Exploration (VSE) to complete the International Space Station, retire the Space Shuttle and develop its replacement, and expand the human presence on the Moon as a stepping stone to human exploration of Mars and worlds beyond. In response, NASA developed the Constellation Program, consisting of the components shown in Figure 1. This paper will summarize the manned spaceflight liquid propulsion system needs in support of the Constellation Program over the next 10 years. It will address all liquid engine needs to support human exploration from low Earth orbit (LEO) to the lunar surface, including an overview of engines currently under contract, those baselined but not yet under contract, and those propulsion needs that have yet to be initiated. There may be additional engine needs for early demonstrators, but those will not be addressed as part of this paper. Also, other portions of the VSE architecture, including the planned Orion abort test boosters and the Lunar Precursor Robotic Program, are not addressed here as they either use solid motors or are focused on unmanned elements of returning humans to the Moon.

Author

Space Exploration; Low Earth Orbits; Propulsion; Constellation Program; Lunar Programs; Space Flight

20080032217 Honeywell International, Inc., Morristown, NJ, USA

Phenolic Lamination Process for Hot Gas Components

Christensen, D. J., Inventor; Gratton, J. A., Inventor; 23 Jul 04; 9 pp.; In English

Contract(s)/Grant(s): F-0863099C0027

Patent Info.: Filed 23 Jul 04; US-Patent-Appl-SN-10-897 499

Report No.(s): PB2008-100402; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A method is provided for fabricating a missile component having a flow path therein. The resulting component is a phenolic laminate constructed of layers having cavities formed therein. The method includes bonding a plurality of phenolic

laminates to one another in a predetermined order and in a predetermined configuration, each phenolic laminate having a cavity formed therein, wherein the bonded phenolic laminates form the missile component and the cavities define the flow path.

NTIS

High Temperature Gases; Laminates; Missiles; Patent Applications; Propulsion System Configurations; Propulsion System Performance

20080032258 Virginia Univ., Charlottesville, VA, USA

Method and Apparatus for Dispersion Strengthened Bond Coats for Thermal Barrier Coatings

Wadley, H. N., Inventor; Wortman, D. J., Inventor; 24 Jul 03; 22 pp.; In English

Contract(s)/Grant(s): N00014-00-1-0438

Patent Info.: Filed 24 Jul 03; US-Patent-Appl-SN-10-522-076

Report No.(s): PB2007-113287; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A directed vapor deposition (DVD) method and system for applying at least one bond coating on at least one substrate for thermal barrier coating systems. The method and system provides for alloy strengthening in high temperature metallic alloys that can be melt or solid state processed to materials that one applies by vapor deposition. The creep strengthened coating contains nanoscopic particles of oxides, nitrides, borides, carbides, and other materials which are formed by reactive codeposition. An approach for reactive codeposition is plasma assisted directed vapor deposition. Accordingly, the resultant structure may be utilized for, but not limited thereto, high temperature coatings, e.g. for protecting rocket or power turbines, or diesel engine components. The resultant structure is has a greatly extended lifetime attributed in part to the elimination of coating spallation by the 'rumpling' mechanism.

NTIS

Dispersion Strengthening; Joints (Junctions); Patent Applications; Thermal Control Coatings; Vapor Deposition

23

CHEMISTRY AND MATERIALS (GENERAL)

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see *categories 25 through 29*. For astrochemistry see category *90 Astrophysics*.

20080030996 NASA Marshall Space Flight Center, Huntsville, AL, USA

Predicting Material Performance in the Space Environment from Laboratory Test Data, Static Design Environments, and Space Weather Models

Minow, Josep I.; Edwards, David L.; May 19, 2008; 1 pp.; In English; 9th International Space Conference 'Protection of Materials and Structures from Space Environments', 19-23 May 2008, Toronto, Canada; No Copyright; Avail.: Other Sources; Abstract Only

Qualifying materials for use in the space environment is typically accomplished with laboratory exposures to simulated UV/EUV, atomic oxygen, and charged particle radiation environments with in-situ or subsequent measurements of material properties of interest to the particular application. Choice of environment exposure levels are derived from static design environments intended to represent either mean or extreme conditions that are anticipated to be encountered during a mission. The real space environment however is quite variable. Predictions of the on orbit performance of a material qualified to laboratory environments can be done using information on 'space weather' variations in the real environment. This presentation will first review the variability of space environments of concern for material degradation and then demonstrate techniques for using test data to predict material performance in a variety of space environments from low Earth orbit to interplanetary space using historical measurements and space weather models.

Author

Aerospace Environments; Materials Selection; Space Weather; Environment Simulation; Performance Prediction

20080031044 Arizona State Dept. of Health, Phoenix, AZ, USA

Health Consultation: W. R. Grace Exfoliation Facility, 4220 W Glenrosa Avenue, Phoenix, Maricopa County, Arizona. EPA Facility ID: AZD051452563

January 2007; 35 pp.; In English

Report No.(s): PB2007-114278; No Copyright; Avail.: National Technical Information Service (NTIS)

This health consultation is based on a formal site evaluation prepared by the Arizona Department of Health Services

(ADHS) and summarizes an evaluation of exposure pathways and potential health impacts at a site in Arizona. To conduct a health consultation, a number of steps are necessary: Evaluating exposure; Evaluating health effects; Developing recommendations; and Soliciting community input.

NTIS

Arizona; Health; Medical Services

20080031409 Finnegan, Henderson, Farabow, Garrett, Dunner, LLP, Washington, DC, USA

Process of Forming and Modifying Particles and Compositions Produced Thereby

Talton, J. D., Inventor; McConville, C., Inventor; 23 Apr 03; 15 pp.; In English

Contract(s)/Grant(s): NAS9-00121; NIH-1R41DA14459-01

Patent Info.: Filed Filed 23 Apr 03; US-Patent-Appl-SN-10-512345; US 2005/0175707

Report No.(s): PB2007-104619; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031409>

The present invention relates to processes for forming particles including drugs in a solution, changing the bulk or surface properties of a drug particle, and/or microencapsulation drug particles, and compositions produced thereby. In some embodiments, the process described utilized mechanical agitation, more specifically low-frequency sonication, under controlled conditions, which provides mild shear forces during forming and/or precipitation to control the particle growth and mixing properties. Particle size can range from less than about 200 nanometers to greater than about one millimeter, depending on the processing conditions and application. The process described can be used to form a drug particle suspension, dry a wet powder slurry or suspension, as well as to improve the surface properties of the particle through conditioning the structure of the particle or particle surface and/or annealing the particle or particle surface. Annealing or conditioning drug particles may be used to force an amorphous to crystalline transition, creating a more stable powder, or smooth a particle surface. In addition, the process can be used to microencapsulate particles by suspending the microparticles in a non-solvent including a coating material (such as a biodegradable polymer) under controlled process conditions. The powder compositions produced thereby possess improved properties including, but not limited to, improved flow and dispersibility, controlled bioadhesion, stability, resistance to moisture, dissolution/release profiles, and/or bioavailabilities. This process, and the compositions produced, provide significant advantages in the manufacture of pharmaceutical particulate formulations, as well as biomedical, diagnostic, and chromatography particulate compositions, where sensitive macromolecules, such as proteins or DNA, are involved that would be degraded using more rigorous processing conditions or temperatures.

Author

Microparticles; Drugs; Formation; Surface Properties; Encapsulating

20080031614 NASA Johnson Space Center, Houston, TX, USA

Chemical Engineering at NASA

Collins, Jacob; April 08, 2008; 41 pp.; In English; 2006 AIChE Southwest Regional Conference, 6-8 Apr. 2006, Houston, TX, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): 992858.08.05.05.02; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031614>

This viewgraph presentation is a review of the career paths for chemicals engineer at NASA (specifically NASA Johnson Space Center.) The author uses his personal experience and history as an example of the possible career options.

CASI

Chemical Engineering; Occupation; Personnel Development

20080031638 Idaho National Engineering Lab., Idaho Falls, ID, USA

Electrochemical Corrosion Testing of Neutron Absorber Materials

Lister, T.; Mizia, R.; Erickson, A.; Trowbridge, T.; May 01, 2007; 69 pp.; In English

Contract(s)/Grant(s): DE-AC07-99ID-13727

Report No.(s): DE2007-912462; INL/EXT-06-11772; No Copyright; Avail.: National Technical Information Service (NTIS)

This report summarizes the results of crevice-corrosion tests for six alloys in solutions representative of ionic compositions inside the Yucca Mountain waste package should a breach occur. The alloys in these tests are Neutronit A978a (ingot metallurgy, hot rolled), Neutrosorb Plus 304B4 Grade Ab (powder metallurgy, hot rolled), Neutrosorb Plus 304B5

Grade Ab (powder metallurgy, hot rolled), Neutrosorb Plus 304B6 Grade Ab (powder metallurgy, hot rolled), Ni-Cr-Mo-Gd alloy2 (ingot metallurgy, hot rolled), and Alloy 22 (ingot metallurgy, hot rolled).

NTIS

Corrosion; Corrosion Tests; Cracks; Electrochemical Corrosion; Neutron Absorbers

20080031726 Idaho National Engineering Lab., Idaho Falls, ID, USA

Methods of Gas Phase Capture of Iodine from Fuel Reprocessing Off-Gas: A Literature Survey

Haefner, D. R.; Tranter, T. J.; Feb. 01, 2007; 25 pp.; In English

Contract(s)/Grant(s): DE-AC07-99ID-13727

Report No.(s): DE2007-911962; INL/EXT-07-12299; No Copyright; Avail.: Department of Energy Information Bridge

A literature survey was conducted to collect information and summarize the methods available to capture iodine from fuel reprocessing off-gases. Techniques were categorized as either wet scrubbing or solid adsorbent methods, and each method was generally described as it might be used under reprocessing conditions. Decontamination factors are quoted only to give a rough indication of the effectiveness of the method. No attempt is made to identify a preferred capture method at this time, although activities are proposed that would provide a consistent baseline that would aid in evaluating technologies.

NTIS

Adsorption; Iodine; Radioactive Wastes; Reclamation; Surveys; Vapor Phases

20080032213 Davis Wright Tremaine LLP, Los Angeles, CA, Los Angeles, CA, USA; California Inst. of Tech., Pasadena, CA, USA

Process to Upgrade Oil Using Metal Oxides

Tang, Y., Inventor; Zhang, A., Inventor; 7 Jul 05; 29 pp.; In English

Contract(s)/Grant(s): DE-FC26-02NT15383; DE-S-105-724

Patent Info.: Filed Filed 7 Jul 05; US-Patent-Appl-SN-11-176 716

Report No.(s): PB2008-100404; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Described herein are compositions and methods for using metal oxides to upgrade oil. Metal oxides may be used as catalysts to reduce the TAN of the oil by converting carboxylic acids such as naphthenic acids into non-corrosive products. In some cases, the conversion occurs by a decarboxylation of the carboxylic acid to produce CO(sub 2). A second process promoted by metal oxides is hydrocarbon cracking. Cracking decreases the viscosity and increases the API, and produces lower molecular-weight hydrocarbons that are useful for many fuels and lubricants. Reductions in TAN and the increases in API improve the quality of increase the value of oil.

NTIS

Crude Oil; Decontamination; Metal Oxides; Oils; Patent Applications

20080032214 Jenkins, Wilson, Taylor and Hunt, P.A., Durham, NC, USA; Tennessee Univ., Knoxville, TN, USA

Copolymers of Fluorinated Polydienes and Sulfonated Polystyrene

Mays, J. W., Inventor; Gido, S. P., Inventor; Huang, T., Inventor; Hong, K., Inventor; 21 Mar 05; 35 pp.; In English

Patent Info.: Filed Filed 21 Mar 05; US-Patent-Appl-SN-11-085 619

Report No.(s): PB2008-100406; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Copolymers of fluorinated polydienes and sulfonated polystyrene and their use in fuel cell membranes, batteries, breathable chemical-biological protective materials, and templates for sol-gel polymerization.

NTIS

Copolymers; Patent Applications; Polystyrene

20080032226 Taylor, Porter, Brooks and Phillips, L.L.P, Baton Rouge, LA, USA

Fabrication of a Completely Polymeric Microfluidic Reactor for Chemical Synthesis

Song, Y., Inventor; Kumar, C., Inventor; Hormes, J., Inventor; 16 Jul 04; 19 pp.; In English

Contract(s)/Grant(s): NSF/LEQSF(2001-04) RII-03

Patent Info.: Filed Filed 16 Jul 04; US-Patent-Appl-SN-10-893 688

Report No.(s): PB2008-100431; No Copyright; Avail.: CASI: [A03](#), Hardcopy

An inexpensive apparatus and method of fabricating completely polymeric (e.g., SU-8, PMMA, and PEEK) microfluidic reactors suitable for the synthesis of chemicals, particularly nanoparticles (e.g., mono, bi, tri, alloy, core-shell, polymeric, and metal-polymer nano-particles), is disclosed. A high precision process uses polymeric microfluidic patterning techniques and

a new microfluidic sealing technique, referred to as ‘flexible semi-solid transfer,’ to fabricate high aspect ratio polymeric micro-reactors. In one embodiment, high quality microfluidic channels are patterned onto a support substrate. The microfluidic structure is then sealed by transferring a polymeric material from a sacrificial substrate to the microfluidic structure, and cured. Then, the structure is bonded to a second support structure to form a micro-reactor.

NTIS

Fabrication; Microfluidic Devices; Nanoparticles; Patent Applications; Synthesis (Chemistry)

20080032255 Membrane Technology and Research, Inc., Menlo Park, CA, USA

Ultrafiltration Membrane and Process

Mairal, A. P., Inventor; Ly, J., Inventor; Ng, A., Inventor; Pinnau, I., Inventor; 29 Jun 04; 23 pp.; In English

Contract(s)/Grant(s): N00167-03-C-0021

Patent Info.: Filed Filed 29 Jun 04; US-Patent-Appl-SN-10-879-628

Report No.(s): PB2007-113295; No Copyright; Avail.: CASI: [A03](#), Hardcopy

An inorganic membrane suitable for ultrafiltration or nanofiltration, and methods for making and using the membrane. The membrane has a organic polymer deposited on the feed surface, but is not able to perform separations by solution-diffusion.

NTIS

Membranes; Patent Applications; Polymers

20080032567 Lawrence Livermore National Lab., Livermore, CA USA

Thermal Radiation from Nuclear Detonations in Urban Environments

Masrfs, R. E.; Moss, W. C.; Whitlock, B.; Jun. 07, 2007; 13 pp.; In English

Report No.(s): DE2007-912675; UCRL-TR-231593; No Copyright; Avail.: National Technical Information Service (NTIS)

There are three principal causes of prompt casualties from a nuclear detonation: nuclear (gamma-ray and neutron) radiation, thermal radiation, and blast. Common estimates of the range of these prompt effects indicate that thermal radiation has the largest lethal range. Non-lethal skin burns, flash blindness, and retinal burns occur out to much greater range. Estimates of casualties from thermal radiation assume air bursts over flat terrain. In urban environments with multiple buildings and terrain features, the extent of thermal radiation may be significantly reduced by shadowing. We have developed a capability for calculating the distribution of thermal energy deposition in urban environments using detailed 3D computer models of actual cities. The size, height, and radiated power from the fireball as a function of time are combined with ray tracing to calculate the energy deposition on all surfaces. For surface bursts less than 100 kt in locations with large buildings or terrain features, the calculations confirm the expected reduction in thermal damage.

NTIS

Cities; Damage; Detonation; Nuclear Explosions; Thermal Radiation

20080032600 NASA Glenn Research Center, Cleveland, OH, USA

Liquid Space Lubricants Examined by Vibrational Micro-Spectroscopy

Street, Kenneth W., Jr.; July 2008; 26 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 936374.04.03.01.03

Report No.(s): NASA/TM-2008-215184; E-16420; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080032600>

Considerable effort has been expended to develop liquid lubricants for satellites and space exploration vehicles. These lubricants must often perform under a range of harsh conditions such as vacuum, radiation, and temperature extremes while in orbit or in transit and in extremely dusty environments at destinations such as the Moon and Mars. Historically, oil development was guided by terrestrial application, which did not provide adequate space lubricants. Novel fluids such as the perfluorinated polyethers provided some relief but are far from ideal. With each new fluid proposed to solve one problem, other problems have arisen. Much of the work performed at the National Aeronautics and Space Administration (NASA) Glenn Research Center (GRC) in elucidating the mechanisms by which chemical degradation of space oils occur has been done by vibrational micro-spectroscopic techniques such as infrared and Raman, which this review details. Presented are fundamental lubrication studies as well as actual case studies in which vibrational spectroscopy has led to millions of dollars in savings and potentially prevented loss of mission.

Author

Infrared Radiation; Infrared Spectroscopy; NASA Programs; Chemical Attack; Lubricants; Artificial Satellites; Oils

20080032615 Idaho National Engineering Lab., Idaho Falls, ID, USA

RERTR Fuel Development and Qualification Plan

Wachs, D. M.; Jan. 2007; 65 pp.; In English

Report No.(s): DE2007-911912; INL/EXT-05-01017; No Copyright; Avail.: National Technical Information Service (NTIS)

In late 2003 it became evident that U-Mo aluminum fuels under development exhibited significant fuel performance problems under the irradiation conditions required for conversion of most high-powered research reactors. Solutions to the fuel performance issue have been proposed and show promise in early testing. Based on these results, a Reduced Enrichment Research and Test Reactor (RERTR) program strategy has been mapped to allow generic fuel qualification to occur prior to the end of FY10 and reactor conversion to occur prior to the end of FY14. This strategy utilizes a diversity of technologies, test conditions, and test types. Scoping studies using miniature fuel plates will be completed in the time frame of 2006-2008. Irradiation of larger specimens will occur in the Advanced Test Reactor (ATR) in the USA, the Belgian Reactor-2 (BR2) reactor in Belgium, and in the OSIRIS reactor in France in 2006-2009. These scoping irradiation tests provide a large amount of data on the performance of advanced fuel types under irradiation and allow the down selection of technology for larger scale testing during the final stages of fuel qualification. In conjunction with irradiation testing, fabrication processes must be developed and made available to commercial fabricators. The commercial fabrication infrastructure must also be upgraded to ensure a reliable low enriched uranium (LEU) fuel supply. Final qualification of fuels will occur in two phases. Phase I will obtain generic approval for use of dispersion fuels with density less than 8.5 g-U/cm³. In order to obtain this approval, a larger scale demonstration of fuel performance and fabrication technology will be necessary. Several Materials Test Reactor (MTR) plate-type fuel assemblies will be irradiated in both the High Flux Reactor (HFR) and the ATR (other options include the BR2 and Russian Research Reactor, Dmitrovgrad, Russia (MIR) reactors) in 2008-2009. Following postirradiation examination, a report detailing very-high density fuel behavior will be submitted to the U.S. Nuclear Regulatory Commission (NRC). Assuming acceptable fuel behavior, it is anticipated that NRC will issue a Safety Evaluation Report granting generic approval of the developed fuels based on the qualification report. It is anticipated that Phase I of fuel qualification will be completed prior to the end of FY10. Phase II of the fuel qualification requires development of fuels with density greater than 8.5 g-U/cm³. This fuel is required to convert the remaining few reactors that have been identified for conversion. The second phase of the fuel qualification effort includes both dispersion fuels with fuel particle volume loading on the order of 65 percent, and monolithic fuels. Phase II presents a larger set of technical unknowns and schedule uncertainties than phase I. The final step in the fuel qualification process involves insertion of lead test elements into the converting reactors. Each reactor that plans to convert using the developed high-density fuels will develop a reactor specific conversion plan based upon the reactor safety basis and operating requirements. For some reactors (FRM-II, High-Flux Isotope Reactor (HFIR), and RHF) conversion will be a one-step process. In addition to the U.S. fuel development effort, a Russian fuel development strategy has been developed. Contracts with Russian Federation institutes in support of fuel development for Russian are in place.

NTIS

Irradiation; Qualifications

20080032616 Idaho National Engineering Lab., Idaho Falls, ID, USA

Modeling the Pyrochemical Reduction of Spent UO(sub 2) Fuel in a Pilot-Scale Reactor. International Pyroprocessing Research Conference

Simpson, M. F.; Herrmann, S. D.; Aug. 2006; 16 pp.; In English

Report No.(s): DE2007-911908; INL/CON-06-11597; No Copyright; Avail.: Department of Energy Information Bridge

A kinetic model has been derived for the reduction of oxide spent nuclear fuel in a radial flow reactor. In this reaction, lithium dissolved in molten LiCl reacts with UO₂ and fission product oxides to form a porous, metallic product. As the reaction proceeds, the depth of the porous layer around the exterior of each fuel particle increases. The observed rate of reaction has been found to be only dependent upon the rate of diffusion of lithium across this layer, consistent with a classic shrinking core kinetic model. This shrinking core model has been extended to predict the behavior of a hypothetical, pilot-scale reactor for oxide reduction. The design of the pilot-scale reactor includes forced flow through baskets that contain the fuel particles. The results of the modeling indicate that this is an essential feature in order to minimize the time needed to achieve full conversion of the fuel.

NTIS

Conferences; Fuels; Oxides; Reclamation; Spent Fuels

COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

20080031528 NASA Marshall Space Flight Center, Huntsville, AL, USA; Mississippi State Univ., Mississippi State, MS, USA; HyPerComp Engineering, Inc., Brigham City, UT, USA

Development of COPVS for High pressure, In-Space, Cryogenic Fuel Storage

DeLay, Tom; Schneider, Judy; Dyess, Mark; Hastings, Chad; Noorda, Ryan; Noorda, Jared; Patterson, James; May 18, 2008; 1 pp.; In English; Society for the Advancement of Material and Process Engineering (SAMPE) Conference, 18-22 May 2008, California, USA; Copyright; Avail.: Other Sources; Abstract Only

Polymeric composite overwrapped pressure vessels (COPVs) provide an attractive material system to support developing commercial launch business and alternate fuel ventures. However to be able to design with these materials, the mechanical behavior of the materials must be understood with regards to processing, performance, damage tolerance, and environment. For the storage of cryogenic propellants, it is important to evaluate the materials performance and impact damage resistance at cryogenic temperatures in order to minimize weight and to ensure safety and reliability. To evaluate the ultimate performance, various polymeric COPV's have been statically burst tested at cryogenic conditions before and after exposure to irradiation. Materials selected for these COPVs were based on the measured mechanical properties of candidate resin systems and fibers that were also tested at cryogenic conditions before and after exposure to irradiation. The correlation of COPV burst pressures with the constituent material properties has proven to be a valuable screening method for selection of suitable candidate materials with resistance to material degradation due to exposure to temperature and radiation.

Author

Pressure Vessels; Composite Wrapping; Cryogenic Rocket Propellants; High Pressure; Cryogenic Temperature; Impact Damage; Mechanical Properties; Damage

20080031604 Townsend and Townsend and Crew, LLP, San Francisco, CA, USA; Aspen Aerogels, Inc., Northborough, MA, USA

Ormosil Aerogels Containing Silicon Bonded Polymethacrylate

Ou, D. L., Inventor; Gould, G. L., Inventor; John, C., Inventor; 5 Jan 05; 24 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAS9-03022

Patent Info.: Filed 5 Jan 05; US-Patent-Appl-SN-11-030014; US 2005/0192366

Report No.(s): PB2007-111926; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031604>

The invention provides reinforced aerogel monoliths as well as fiber reinforced composites thereof for a variety of uses. Compositions and methods of preparing the monoliths and composites are also provided.

Author

Aerogels; Silicon; Polymers; Organic Compounds; Reinforcing Fibers; Fiber Composites; Gels

20080032215 Nanomat, Inc., North Huntingdon, PA, USA

Nano-Talc Polymer Composites

Zhong, Q., Inventor; Li, M., Inventor; Srinivasa, R., Inventor; He, J., Inventor; 11 Apr 05; 18 pp.; In English

Contract(s)/Grant(s): USARMY-W911NF-04-2-0025

Patent Info.: Filed 11 Apr 05; US-Patent-Appl-SN-11-105 341

Report No.(s): PB2008-100408; No Copyright; Avail.: CASI: A03, Hardcopy

The invention describes a novel polymer composite comprising nano-talc characterized by an isoelectric point of about 2.5 to about 3.5, a specific surface area greater than about 70 m²/g, and surface hydroxy groups with corresponding hydroxy equivalent weight of about 210 to about 560; and a polymer phase. Specific composites include polyurethane composites prepared from aqueous nano-talc slurries and aqueous dispersible isocyanate terminated polyurethane prepolymers. The invention further embodies a polyurethane composite composition that is a primer coat, base coat or clear top coat for automobiles and metal articles.

NTIS

Patent Applications; Talc; Composite Materials; Prepolymers; Paints

20080032556 NASA Langley Research Center, Hampton, VA, USA

A Finite Element Analysis for Predicting the Residual Compressive Strength of Impact-Damaged Sandwich Panels
Ratcliffe, James G.; Jackson, Wade C.; August 2008; 31 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 877868.02.07.07.05.02

Report No.(s): NASA/TM-2008-215341; L-19486; No Copyright; Avail.: CASI: **A03**, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080032556>

A simple analysis method has been developed for predicting the residual compressive strength of impact-damaged sandwich panels. The method is tailored for honeycomb core-based sandwich specimens that exhibit an indentation growth failure mode under axial compressive loading, which is driven largely by the crushing behavior of the core material. The analysis method is in the form of a finite element model, where the impact-damaged facesheet is represented using shell elements and the core material is represented using spring elements, aligned in the thickness direction of the core. The nonlinear crush response of the core material used in the analysis is based on data from flatwise compression tests. A comparison with a previous analysis method and some experimental data shows good agreement with results from this new approach.

Author

Finite Element Method; Mathematical Models; Sandwich Structures; Panels; Compressive Strength; Residual Strength; Impact Damage

20080032593 Coburn (Thompson) LLP, Saint Louis, MO, USA

Automated Drill Process for Two-Diameter Holes in Multi-Layer Variable Thickness Composite Materials

Salour, A., Inventor; Grzina, D., Inventor; Barclay, R. M., Inventor; McCoy, D., Inventor; Feldman, M. A., Inventor; 14 Jul 04; 13 pp.; In English

Patent Info.: Filed Filed 14 Jul 04; US-Patent-Appl-SN-10-890 619

Report No.(s): PB2008-100105; No Copyright; Avail.: CASI: **A03**, Hardcopy

A method of manufacturing a mobile platform. The platform includes a structure and a member assembled to the structure. Further, the member has a first and a second surface with a thickness defined there between that is varied. The method includes leaving the member on the structure. Also, the method includes advancing a tool through the member while on the structure. The tool is stopped before the tool advances into the structure by more than about a first pre-selected tolerance. Also, a mobile platform assembly is provided that includes a structure, a member, and a fastener fastening the structure and member via a hole through the structure and assembly. The hole has a first diameter through the structure and a second diameter through the member, wherein the diameter changes within an acceptable depth range. In another preferred embodiment, a boroscope, adapted for inspecting holes having two diameters, is also provided.

NTIS

Composite Materials; Patent Applications; Thickness; Drilling

25

INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

Includes the analysis, synthesis, and use of inorganic and organic compounds; combustion theory; electrochemistry; and photochemistry. For related information see category *34 Fluid Dynamics and Thermodynamics*. For astrochemistry see category *90 Astrophysics*.

20080031192 Fermi National Accelerator Lab., Batavia, IL, USA

Remote Operations for LHC and CMS

Gottschalk, E.; January 2007; 6 pp.; In English

Report No.(s): DE2007-909897; FERMILAB-CONF-07-124-E; No Copyright; Avail.: Department of Energy Information Bridge

Commissioning the Large Hadron Collider (LHC) and its experiments will be a vital part of the worldwide high energy physics program beginning in 2007. A remote operations center has been built at Fermilab to contribute to commissioning and operations of the LHC and the Compact Muon Solenoid (CMS) experiment, and to develop new capabilities for real-time data analysis and monitoring for LHC, CMS, and grid computing. Remote operations will also be essential to a future International Linear Collider with its multiple, internationally distributed control rooms. In this paper we present an overview of Fermilab's

LHC/FNAL remote operations center for LHC and CMS, describe what led up to the development of the center, and describe noteworthy features of the center.

NTIS

Hadrons; Muons; Solenoids

20080031542 Savannah River National Lab., Aiken, SC, USA

Modular Caustic Side Solvent Extraction Unit (MCU) Gamma Monitors System Final Report. Revision 1

Casella, V. R.; Riley, T. N.; Hogue, M. G.; Reyes-Jimenez, J.; Filpus-Luyckx, P. E.; Jun. 2007; 131 pp.; In English

Report No.(s): DE2007-910462; WSRC-RP-2005-01902-R1; No Copyright; Avail.: National Technical Information Service (NTIS)

No abstract available

Alkalies; Cesium; Detection; Monitors; Solvent Extraction

20080031612 NASA Kennedy Space Center, Cocoa Beach, FL, USA

Concentration of Hydrogen Peroxide

Parrish, Clyde F., Inventor; 11 May 04; 7 pp.; In English; Original contains black and white illustrations

Patent Info.: Filed Filed 11 May 04; US-Patent-Appl-SN-10-845607; US 2005/0252856

Report No.(s): PB2007-109090; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031612>

Methods for concentrating hydrogen peroxide solutions have been described. The methods utilize a polymeric membrane separating a hydrogen peroxide solution from a sweep gas or permeate. The membrane is selective to the permeability of water over the permeability of hydrogen peroxide, thereby facilitating the concentration of the hydrogen peroxide solution through the transport of water through the membrane to the permeate. By utilizing methods in accordance with the invention, hydrogen peroxide solutions of up to 85% by volume or higher may be generated at a point of use without storing substantial quantities of the highly-concentrated solutions and without requiring temperatures that would produce explosive mixtures of hydrogen peroxide vapors.

Author

Hydrogen Peroxide; Aqueous Solutions; Concentration (Composition); Methodology

20080031636 Idaho National Engineering Lab., Idaho Falls, ID, USA

Electrochemical Corrosion Testing of Borated Stainless Steel Alloys

Lister, T.; Mizia, R.; Erickson, A.; Birk, S.; May 01, 2007; 25 pp.; In English

Contract(s)/Grant(s): DE-AC07-99ID-13727

Report No.(s): DE2007-912469; INL/EXT-07-12633; No Copyright; Avail.: National Technical Information Service (NTIS)

The Department of Energy Office of Civilian Radioactive Waste Management has specified borated stainless steel manufactured to the requirements of ASTM A 887-89, Grade A, UNS S30464, to be the material used for the fabrication of the fuel basket internals of the preliminary transportation, aging, and disposal canister system preliminary design. The long-term corrosion resistance performance of this class of borated materials must be verified when exposed to expected YMP repository conditions after a waste package breach. Electrochemical corrosion tests were performed on crevice corrosion coupons of Type 304 B4 and Type 304 B5 borated stainless steels exposed to single postulated in-package chemistry at 60DGC.

NTIS

Corrosion Tests; Electrochemical Corrosion; Stainless Steels

20080031729 Idaho National Engineering Lab., Idaho Falls, ID, USA

Detection of Microbial Sulfate-Reduction Associated with Buried Stainless Steel Coupons

Delwiche, M.; Olson, A.; Flitton, K. A.; Mar. 01, 2007; 12 pp.; In English

Contract(s)/Grant(s): DE-AC07-99ID-13727

Report No.(s): DE2007-911935; INL/CON-06-11127; No Copyright; Avail.: Department of Energy Information Bridge

The objective of this study was to demonstrate applicability of an innovative radioactive isotope method for imaging microbial activity in geological materials to a comprehensive study of metal corrosion. The method was tested on a sample of stainless steel coupons that had been buried as part of a corrosion study initiated by the National Institute of Standards and Testing or NIST (known as National Bureau of Standards prior to 1988) in 1970. The images showed evidence of microbial

activity that could be mapped on a millimeter scale to coupon surfaces. A second more conventional isotope tracer method was also used to provide a quantitative measure of the same type of microbial activity in soil proximal to the buried coupons. Together the techniques offer a method for evaluating low metabolic levels of activity that have the potential for significant cumulative corrosion effects. The methods are powerful tools for evaluation of potential for microbial induced corrosion to buried steel components used on pipelines, in the power and communications infrastructure, and in nuclear waste repository containers.

NTIS

Corrosion; Imaging Techniques; Microorganisms; Radioactive Isotopes; Stainless Steels; Sulfates

20080031731 Idaho National Engineering Lab., Idaho Falls, ID, USA

Advances in Acid Concentration Membrane Technology for the Sulfur-Iodine Thermochemical Cycle. Annual Meeting of the American Institute of Chemical Engineers

Stewart, F. F.; Orme, C. J.; Nov. 2006; 8 pp.; In English

Report No.(s): DE2007-911869; INL/CON-06-11182; No Copyright; Avail.: Department of Energy Information Bridge

One of the most promising cycles for the thermochemical generation of hydrogen is the Sulfur-Iodine (S-I) process, where aqueous HI is thermochemically decomposed into H₂ and I₂ at approximately 350 degrees Celsius. Regeneration of HI is accomplished by the Bunsen reaction (reaction of SO₂, water, and iodine to generate H₂SO₄ and HI). Furthermore, SO₂ is regenerated from the decomposition of H₂SO₄ at 850 degrees Celsius yielding the SO₂ as well as O₂. Thus, the cycle actually consists of two concurrent oxidation-reduction loops. As HI is regenerated, co-produced H₂SO₄ must be separated so that each may be decomposed. Current flowsheets employ a large amount (approx. 83 mol% of the entire mixture) of elemental I₂ to cause the HI and the H₂SO₄ to separate into two phases. To aid in the isolation of HI, which is directly decomposed into hydrogen, water and iodine must be removed. Separation of iodine is facilitated by removal of water. Sulfuric acid concentration is also required to facilitate feed recycling to the sulfuric acid decomposer. Decomposition of the sulfuric acid is an equilibrium limited process that leaves a substantial portion of the acid requiring recycle. Distillation of water from sulfuric acid involves significant corrosion issues at the liquid-vapor interface. Thus, it is desirable to concentrate the acid without boiling. Recent efforts at the INL have concentrated on applying pervaporation through Nafion-117, Nafion-112, and sulfonated poly(etheretherketone) (S-PEEK) membranes for the removal of water from HI/water and HI/Iodine/water feedstreams. In pervaporation, a feed is circulated at low pressure across the upstream side of the membrane, while a vacuum is applied downstream. Selected permeants sorb into the membrane, transport through it, and are vaporized from the backside. Thus, a concentration gradient is established, which provides the driving force for transport. In this work, membrane separations have been performed at temperatures as high as 134 degrees Celsius. Transmembrane fluxes of water are commercially competitive (approx. 5000 g/m²h) and separation factors have been measured as high as 8000, depending on the membrane and the water content. For the Nafion-117 experiments, the common trade off in membrane performance is observed in that as flux is increased, separation factor decreases. Nafion-112, a thinner membrane, exhibited much higher fluxes than the Nafion-117; however without the expected loss in separation factor indicating that the permeability of iodine and HI through Nafion materials is low. Preliminary data for the sulfuric acid concentration suggests performance similar to the HI experiments. All membranes studied for the HI, HI/iodine and sulfuric acid feeds exhibited no degradation in membrane performance during use.

NTIS

Hydrogen; Hydrogen Production; Iodine; Membranes; Sulfur; Thermochemistry

20080031733 Idaho National Engineering Lab., Idaho Falls, ID, USA; General Atomics Co., San Diego, CA USA

Modular Helium Reactor for Hydrogen Production

Richards, M.; Shenoy, A.; Schultz, K.; Brown, L.; Fukuie, M.; Oct. 2006; 7 pp.; In English

Report No.(s): DE2007-911857; INL/CON-06-11320; No Copyright; Avail.: National Technical Information Service (NTIS)

For electricity and hydrogen production, an advanced reactor technology receiving considerable international interest is a modular, passively-safe version of the high-temperature, gas-cooled reactor (HTGR), known in the U.S. as the Modular Helium Reactor (MHR), which operates at a power level of 600 MW(t). For hydrogen production, the concept is referred to as the H₂-MHR. Two concepts that make direct use of the MHR high-temperature process heat are being investigated in order to improve the efficiency and economics of hydrogen production. The first concept involves coupling the MHR to the

Sulfur-Iodine (SI) thermochemical water splitting process and is referred to as the SI-Based H2-MHR. The second concept involves coupling the MHR to high-temperature electrolysis (HTE) and is referred to as the HTE-Based H2-MHR.

NTIS

Helium; Hydrogen Production; High Temperature Gas Cooled Reactors

20080032254 Iowa State Univ., Ames, IA, USA

Structural and Magnetothermal Properties of Compounds: Yb(5)Si(x)Ge(4-x), Sm(5)Si(x)Ge(4-x), EuO, and Eu(3)O(4)

Ahn, K.; January 2007; 117 pp.; In English

Report No.(s): DE2007-909489; No Copyright; Avail.: Department of Energy Information Bridge

The family of R(5)Si(x)Ge(4-x), alloys demonstrates a variety of unique physical phenomena related to magneto-structural transitions associated with reversible breaking and reforming of specific bonds that can be controlled by numerous external parameters such as chemical composition, magnetic field, temperature, and pressure. Therefore, R(5)Si(x)Ge(4-x), systems have been extensively studied to uncover the mechanism of the extraordinary magneto-responsive properties including the giant magnetoresistance (GMR) and colossal magnetostriction, as well as giant magnetocaloric effect (GMCE). Until now, more than a half of possible R(5)Si(x)Ge(4-x), pseudobinary systems have been completely or partially investigated with respect to their crystallography and phase relationships (R = La, Pr, Nd, Gd, Tb, Dy, Er, Lu, Y). Still, there are other R(5)Si(x)Ge(4-x), systems (R = Ce, Sm, Ho, Tm, and Yb) that are not studied yet. Here, we report on phase relationships and structural, magnetic, and thermodynamic properties in the Yb(5)Si(x)Ge(4-x), and Sm(5)Si(x)Ge(4-x), pseudobinary systems, which may exhibit mixed valence states.

NTIS

Magnetic Properties; Thermodynamic Properties; Physical Properties; Rare Earth Compounds; Ytterbium Compounds; Samarium Compounds; Europium Compounds

20080032325 Chem-Space Associates, Pittsburgh, PA, USA

Ion Enrichment Aperture Arrays

Sheehan, E. W., Inventor; Willoughby, R. C., Inventor; 2 Jul 05; 20 pp.; In English

Contract(s)/Grant(s): DHHS-1 R43 RR143396-1

Patent Info.: Filed Filed 2 Jul 05; US-Patent-Appl-SN-11-173-377

Report No.(s): PB2007-110530; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Improvements have been made for selective collecting, focusing, and directing of ions and/or charged particles generated at atmospheric or near atmospheric pressure sources, such as but not limited to, electrospray; atmospheric pressure discharge ionization, chemical ionization, photoionization, and matrix assisted laser desorption ionization; and inductively coupled plasma ionization. A multiple-aperture laminated structure is placed at the interface of two pressure regions. Electric field geometries and strengths across the laminated structure and diameters of the apertures; all of which act to optimize the transfer of the ions from the higher pressure region into the lower pressure region while reducing the gas-load on the lower pressure region. Embodiments of this invention are methods and devices for improving sensitivity of mass spectrometry when coupled to atmospheric, near atmospheric, or higher pressure ionization sources by reducing the gas-load on the vacuum system.

NTIS

Apertures; Atmospheric Pressure; Enrichment; Ions

20080032327 Hoag (Foley), LLP, Boston, MA, USA

Permanently Linked, Rigid, Magnetic Chains

Singh, H., Inventor; Hatton, T. A., Inventor; 25 Jun 04; 19 pp.; In English

Contract(s)/Grant(s): DAAD-19-02-D0002

Patent Info.: Filed Filed 25 Jun 04; US-Patent-Appl-SN-10-877-051

Report No.(s): PB2007-113300; No Copyright; Avail.: CASI: [A03](#), Hardcopy

One aspect of the present invention relates to a permanently linked, rigid, magnetic chain of particles prepared by sol-gel methods. A second aspect of the present invention relates to a method of preparing a permanently linked, rigid, magnetic chain of particles comprising: coating a core material with one or more polyelectrolyte layers resulting in a coated particle; further coating the coated particle with a layer of magnetic nanoparticles resulting in a magnetic particle; coating the magnetic particle

with a layer of a polycationic polyelectrolyte resulting in a coated magnetic particle; and applying a magnetic field to the coated magnetic particle in the presence of a metal oxide or metal oxide precursor capable of undergoing hydrolysis.

NTIS

Sol-Gel Processes; Particles; Chains

20080032336 Barnes and Thornburg, Indianapolis, IN, USA

Electron Transfer Dissociation for Biopolymer Sequence Analysis

Hunt, D. F., Inventor; Coon, J. J., Inventor; Syka, J. E. P., Inventor; Marto, J. A., Inventor; 14 Mar 05; 75 pp.; In English
Contract(s)/Grant(s): NIH-GM-37537; NIH-1-F-32RR018688-01

Patent Info.: Filed Filed 14 Mar 05; US-Patent-Appl-SN-11-079-147

Report No.(s): PB2007-113320; No Copyright; Avail.: CASI: [A04](#), Hardcopy

The present invention relates to a new method for fragmenting ions in a mass spectrometer through the use of electron transfer dissociation, and for performing sequence analysis of peptides and proteins by mass spectrometry. In the case of peptides, the invention promotes fragmentation along the peptide backbone and makes it possible to deduce the amino acid sequence of the sample, including modified amino acid residues, through the use of an RF field device.

NTIS

Biopolymers; Dissociation; Electron Transfer; Fragmentation; Mass Spectrometers; Ions

20080032613 Idaho National Engineering Lab., Idaho Falls, ID, USA

Dissolution Testing of a Metallic Waste Form in Chloride Brine. Scientific Basis for Nuclear Waste Management

Janney, D. E.; Nov. 2006; 7 pp.; In English

Report No.(s): DE2007-911915; INL/CON-06-11484; No Copyright; Avail.: Department of Energy Information Bridge

This paper is intended for publication in the peer-reviewed proceedings from the Scientific Basis for Nuclear Waste Management (at the Fall 2006 meeting of the Materials Research Society). The same material was presented in a 15-minute talk. Argonne National Laboratory has developed an electrometallurgical process for conditioning spent sodium-bonded metallic reactor fuel from the Experimental Breeder Reactor II (EBR-II). One waste stream from this process consists of a metal waste form (MWF) whose baseline composition is stainless steel alloyed with 15 wt% Zr (SS-15Zr) and whose microstructure is a eutectic intergrowth of iron solid solutions and Fe-Zr-Cr-Ni intermetallics. This paper reports scanning electron microscope (SEM) observations of corrosion products formed during static immersion tests in which coupons of surrogate MWF containing 10 wt% U (SS-15Zr-10U) were immersed in solutions with nominal pH values of 3 and 4 and 1000 ppm added chloride for 70 days at 50 DGC. Although the majority of the surface areas of the coupons appear unchanged, linear areas with localized corrosion products apparently consisting of porous materials overlying corrosion-product-filled channels formed on both coupons, cross-cutting phase boundaries in the original eutectic microstructures. Many of the linear areas intersected the sample edge at notches present before the tests or followed linear flaws visible in pre-test images. Compositions of corrosion products differed significantly from the bulk composition, and the maximum observed concentration of U in corrosion products (approx. 25 at%) slightly exceeded the highest reported values in actinide-bearing phases in uncorroded surrogate MWF samples with comparable concentrations of U (approx. 17-19 at%).

NTIS

Brines; Chlorides; Corrosion; Dissolving; Radioactive Wastes; Scanning Electron Microscopy; Waste Management

20080032619 Idaho National Engineering Lab., Idaho Falls, ID, USA

Gamma Ray Radiolysis fo the FPEX Solvent

Mincher, B. J.; Peterman, D. R.; Riddle, C. L.; Law, J. D.; Todd, T. A.; Sep. 2006; 9 pp.; In English

Report No.(s): DE2007-911676; INL/CON-06-11724; No Copyright; Avail.: Department of Energy Information Bridge

Slide presentation. FPEX contains a calixarene for Cs extraction, a crown ether for Sr extraction, Cs7SB modifier, and TOA to aid in stripping, in Isopar L diluent. The radiation stability FPEX must be evaluated prior to process use. Radiolytic degradation of species in solution are due to reaction with the direct radiolysis products of the diluent. In Isopar L, the reactive species produced include e-, H and alkane radicals, resulting in a reducing environment. However, in nitric acid, oxidizing hydroxyl (OH) and nitro (NO2) radicals dominate system chemistry. Thus, the nature of diluent and the presence of radical scavengers affect the results of irradiation. We report the preliminary results of a new program to investigate the radiolysis of FPEX using the 60Co irradiation of FPEX neat solvent, acid pre-equilibrated solvent and mixed aerated phases. The Cs and Sr distribution ratios were used as metrics.

NTIS

Extraction; Fission Products; Gamma Rays; Radiolysis; Solvent Extraction; Solvents

METALS AND METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.

20080031096 NASA Langley Research Center, Hampton, VA, USA

Fatigue Crack Growth Threshold Testing of Metallic Rotorcraft Materials

Newman, John A.; James, Mark A.; Johnson, William M.; Le, Dy D.; July 2008; 27 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 698259.02.07.07.03.02

Report No.(s): NASA/TM-2008-215331; ARL-TR-4472; L-19489; Copyright; Avail.: CASI: [A03](#), Hardcopy

Results are presented for a program to determine the near-threshold fatigue crack growth behavior appropriate for metallic rotorcraft alloys. Four alloys, all commonly used in the manufacture of rotorcraft, were selected for study: Aluminum alloy 7050, 4340 steel, AZ91E Magnesium, and Titanium alloy Ti-6Al-4V (beta-STOA). The Federal Aviation Administration (FAA) sponsored this research to advance efforts to incorporate damage tolerance design and analysis as requirements for rotorcraft certification. Rotorcraft components are subjected to high cycle fatigue and are typically subjected to higher stresses and more stress cycles per flight hour than fixed-wing aircraft components. Fatigue lives of rotorcraft components are generally spent initiating small fatigue cracks that propagate slowly under near-threshold cracktip loading conditions. For these components, the fatigue life is very sensitive to the near-threshold characteristics of the material.

Author

Crack Propagation; Fatigue (Materials); Rotary Wing Aircraft; Tolerances (Mechanics); Fatigue Life; Metal Fatigue

20080031203 National Energy Technology Lab., Morgantown, WV, USA

Alloy Films Deposited by Electroplating as Precursors for Protective Oxide Coatings on Solid Oxide Fuel Cells Metallic Interconnect Materials

Johnson, C.; January 2006; 7 pp.; In English

Report No.(s): DE2007-910544; DOE/NETL-IR-2007/001; No Copyright; Avail.: Department of Energy Information Bridge

The successful development of stainless steel interconnects for intermediate temperature solid oxide fuel cells (SOFC) may be the materials breakthrough that makes SOFC technology truly commercial. Many of the ferritic stainless steels, however, suffer from a relatively high area specific resistance (ASR) after long exposure times at temperature and the Cr in the native oxide can evaporate and contaminate other cell components. Conductive coatings that resist oxide scale growth and chromium evaporation may prevent both of these problems. In the present study electrochemical deposition of binary alloys followed by oxidation of the alloy to form protective and conductive oxide layers is examined. Results are presented for the deposition of Mn/Co and Fe/Ni alloys via electroplating to form a precursor for spinel oxide coating formation. Analysis of the alloy coatings is done by SEM, EDS and XRD.

NTIS

Electroplating; Metal Films; Oxides; Protective Coatings; Solid Oxide Fuel Cells

20080031275 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Surface Modification Study of Tool and High Speed Steel with Functional and Adherent TiN and AlN Films Obtained by PVD Reactive Deposition

deAlmeidaVieira, Rogerio; [2007]; 212 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14203-TDI/1104; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A10](#), Hardcopy

The current technological applications of materials, mainly metals covered with nitride films are vast. In the last years, a lot of investigations have been made with the objective to optimize the adherence of these films in steels substrate seeking to enlarge its application fields. The nitride films based on metallic cations, as titanium, zirconium, chrome and aluminum, have demonstrated to be interesting for applications where are necessary higher surface hardness, corrosion and fracture resistance. However, the adherence of these films has been the main limitation for the tribological applications that demand high mechanic resistance. In this research it was proposed the study of techniques of interface dilution of film/substrate: i) diffusion or interdiffusion provoked by temperature and ii) gradual variation of the chemical composition of the interface film-substrate (functional films). It was studied the films and interfaces formed between the TiN and AlN films and AISI M2 and AISI D6 (VC131) steel substrates. In the first stage, two types of films were produced: titanium nitride and aluminum

nitride. The titanium nitride films were obtained by arc cathodic. The aluminum nitride films were obtained by magnetron sputtering. These films were characterized by X-rays diffraction (XRD), scanning electron microscope by secondary and backscattering electrons (SEM), energy dispersive spectrometry (EDS), atomic force microscopy (AFM) Rutherford backscattering (RBS), and bending test accomplished in 4 points. The results showed a excellent adherence of the titanium nitride film and poor adherence of the aluminum nitride film on M2 and D6 steel substrates. In the second stage, the functional films depositions of titanium nitride and aluminum nitride were accomplished. These functional films were obtained through magnetron sputtering. The main objective of this project was creating of diluted interfaces which are areas where the properties of the film and substrate vary in a gradual way. These interfaces formed areas of mechanical tensions absorption generated by the deposited functional film. All the films were characterized by X-rays diffraction (XRD), scanning electron microscope (SEM), energy dispersive spectrometry (EDS), X-rays photoelectron spectroscopy (XPS), atomic force microscopy (AFM), Rutherford backscattering (RBS), and bending test accomplished in 4 points. These results showed a great adherence of the nitride titanium functional film and little adherence of the nitride aluminum functional film deposited in M2 and D6 steel substrates. The M2 speed steel substrate presented a better growth and adherence.

Author

Steels; Titanium Nitrides; Aluminum Nitrides; Metal Films; Vapor Deposition; Adhesion

20080031642 Idaho National Engineering Lab., Idaho Falls, ID, USA

Highly Enriched Uranium Metal Annuli and Cylinders with Polyethylene Reflectors and/or Internal Polyethylene Moderator

Sumner, T.; Briggs, J. B.; Montierth, L. M.; May 01, 2007; 10 pp.; In English

Contract(s)/Grant(s): DE-AC07-99ID-13727

Report No.(s): DE2007-912458; INL/CON-06-11658; No Copyright; Avail.: Department of Energy Information Bridge

A variety of critical experiments were constructed of enriched uranium metal during the 1960s and 1970s at the Oak Ridge Critical Experiments Facility in support of criticality safety operations at the Y-12 Plant. The purposes of these experiments included the evaluation of storage, casting, and handling limits for the Y-12 Plant and providing data for verification of calculation methods and cross-sections for nuclear criticality safety applications. These included solid cylinders of various diameters, annuli of various inner and outer diameters, two and three interacting cylinders of various diameters, and graphite and polyethylene reflected cylinders and annuli. Of the hundreds of delayed critical experiments, experiments of uranium metal annuli with and without polyethylene reflectors and with the central void region either empty or filled with polyethylene were evaluated under ICSBEP Identifier HEU-MET-FAST-076. The outer diameter of the uranium annuli varied from 9 to 15 inches in two-inch increments. In addition, there were uranium metal cylinders with diameters varying from 7 to 15 inches with complete reflection and reflection on one flat surface to simulate floor reflection. Most of the experiments were performed between February 1964 and April 1964. Five partially reflected (reflected on the top only) experiments were assembled in November 1967, but are judged by the evaluators not to be of benchmark quality. Twenty-four of the twenty-five experiments have been determined to have fast spectra. The only exception has a mixed spectrum. Analyses were performed in which uncertainty associated with five different parameters associated with the uranium parts and three associated with the polyethylene parts was evaluated. Included were uranium mass, height, diameter, isotopic content, and impurity content and polyethylene mass, diameter, and impurity content. There were additional uncertainties associated with assembly alignment, support structure, and the value for eff. In addition to the idealizations made by the experimenters (removal of a diaphragm), a few simplifications were also made to the benchmark models that resulted in a small bias and additional uncertainty. Simplifications included omission of the support structure, possible surrounding equipment, and the walls, floor, and ceiling of the experimental cell.

NTIS

Annuli; Cylindrical Shells; Metal Shells; Moderators; Polyethylenes; Reflectors; Safety; Uranium

20080031732 Idaho National Engineering Lab., Idaho Falls, ID, USA

Fatigue Testing of Metallurgically Bonded EBR-II Superheater Tubes

Totemeier, T. C.; Dec. 2006; 23 pp.; In English

Report No.(s): DE2007-911861; INL/EXT-06-12011; No Copyright; Avail.: Department of Energy Information Bridge

Fatigue crack growth tests were performed on 214Cr-1Mo steel specimens machined from ex-service Experimental Breeder Reactor II (EBR-II) superheater duplex tubes. The tubes had been metallurgically bonded with a 100 mm thick Ni interlayer; the specimens incorporated this bond layer. Tests were performed at room temperature in air and at 400DGC in air and humid Ar; cracks were grown at varied levels of constant K. Crack growth tests at a range of K were also performed on specimens machined from the shell of the superheater. In all conditions the presence of the Ni interlayer was found to result

in a net retardation of growth as the crack passed through the interlayer. The mechanism of retardation was identified as a disruption of crack planarity and uniformity after passing through the porous interlayer. Full crack arrest was only observed in a single test performed at near-threshold K level (12 MPa-m) at 400DGC. In this case the crack tip was blunted by oxidation of the base steel at the steel-interlayer interface.

NTIS

Crack Propagation; Fatigue Tests; Fatigue (Materials); Fracture Strength; Crack Arrest

20080032484 Pacific Northwest National Lab., Richland, WA, USA

Summary Report for Contract 330088-A-T9. Procurement of Zircaloy-4 Products from Superior Tube Company

Graves, R. E.; Jun. 2007; 44 pp.; In English

Contract(s)/Grant(s): DE-AC05-76RLO01830

Report No.(s): DE2007-912731; PNNL-16656; No Copyright; Avail.: National Technical Information Service (NTIS)

This report documents the initial procurement activities from the Superior Tube Company (STC) associated with production quantities of Zircaloy-4 components (Contract 330088-A-T9) and the demonstration of their capability to produce full-length getter (FLG) components (Contract 406957-A-T5). Advanced planning for this contract began in spring 1999. STC was awarded a firm, fixed-price contract with the potential for added incentive payments based on their ability to control their manufacturing processes. Incentives were included in this contract based on the potential benefit to reduce Pacific Northwest National Laboratory's (PNNL's) quality costs and schedule risk. The contract was negotiated to a firm fixed price plus incentives with a not-to-exceed price. The manufacturing activities for the contract included two phases. The first phase consisted of demonstrating production capability for the production of getter-tube stock and inner-liner tubes. The second phase originally consisted of procuring Zr-4 feedstock and producing Zr-4 components, but 13 modifications were made to the contract. There were delays, but STC was able to produce the required amount of components as specified by their contract. There were concerns regarding product quality, including the inside diameter, the outside diameter, and straightness characteristics. Non-contact methods of inspection were implemented to minimize flexing of the tubes during inspection, and the design specification was revised to allow averaging of measurements. Along with the inspection and specification changes, STC continued to pursue process improvements that would yield a better product. Even though the product quality improved significantly, some lots still failed the initial inspection, resulting in a 100% inspection for those lots.

NTIS

Manufacturing; Procurement; Zircalloys (Trademark)

27

NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see *24 Composite Materials*.

20080030991 NASA Marshall Space Flight Center, Huntsville, AL, USA

Effects of Core-Shell Rubber (CSR) Nanoparticles on the Fracture Toughness of an Epoxy Resin at Cryogenic Temperatures

Wang, J.; Cannon, S. A.; Schneider, J. A.; May 18, 2008; 1 pp.; In English; Society for the Advancement of Material and Process Engineering (SAMPE) Conference, 18-22 May 2008, Long Beach, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

This study investigates the effects of core-shell rubber (CSR) nanoparticles on the fracture toughness of an epoxy resin at liquid nitrogen (LN₂) temperatures. Varying amounts of Kane Ace (Registered TradeMark) MX130 toughening agent were added to a commercially available EPON 862/W epoxy resin. Resulting fracture toughness was evaluated by the use of Charpy impact tests conducted on an instrumented drop tower. The size and distribution of the CSR nanoparticles were characterized using Transmission Electric Microscopy (TEM) and Small Angle X-ray Scattering (SAXS). Up to nominal 4.6% addition of the CSR nanoparticles, resulted in a nearly 5 times increase in the measured breaking energy. However, further increases in the amount of CSR nanoparticles had no appreciable effect on the breaking energy.

Author

Rubber; Nanoparticles; Fracture Strength; Epoxy Resins; Cryogenic Temperature; Mechanical Engineering

20080031001 National Renewable Energy Lab., Golden, CO USA

Carbon Nanotube Materials for Substrate Enhanced Control of Catalytic

May 2007; 4 pp.; In English

Report No.(s): DE2007-912963; NREL/CP-590-41789; No Copyright; Avail.: Department of Energy Information Bridge

Carbon SWNTs are attractive materials for supporting electrocatalysts. The properties of SWNTs are highly tunable and controlled by the nanotubes circumferential periodicity 1 and their surface chemistry 2. These unique characteristics suggest that architectures constructed from these types of carbon support materials would exhibit interesting and useful properties 3-5. Here, we expect that the structure of the carbon nanotube support will play a major role in stabilizing metal electrocatalysts under extreme operating conditions and suppress both catalyst and support degradation. Furthermore, the chemical modification of the carbon nanotube surfaces can be expected to alter the interface between the catalyst and support, thus, enhancing the activity and utilization of the electrocatalysts. We plan to incorporate discrete reaction sites into the carbon nanotube lattice to create intimate electrical contacts with the catalyst particles to increase the metal catalyst activity and utilization. The work involves materials synthesis, design of electrode architectures on the nanoscale, control of the electronic, ionic, and mass fluxes, and use of advanced optical spectroscopy techniques.

NTIS

Carbon Nanotubes; Substrates; Catalysts; Chemical Reactions

20080031069 Army Research Lab., Aberdeen Proving Ground, MD USA

Replacement Packing for 37MM Antitank Gun Recoil

Little, Donald J; Apr 2008; 18 pp.; In English

Report No.(s): AD-A479876; ARL-TN-0306; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA479876>

A method to reproduce the packing in a 1940 era gun recoil was needed to keep it in service. The recoil is used throughout the U.S. Army Research Laboratory (ARL) in numerous test facilities.

DTIC

Replacing; Seals (Stoppers)

20080031543 Savannah River National Lab., Aiken, SC, USA

Testing of TMR Sand Mantis Final Report

Krementz, D.; Daughtery, W. L.; May 2007; 32 pp.; In English

Report No.(s): DE2007-910461; WSRC-STI-2007-00189; No Copyright; Avail.: National Technical Information Service (NTIS)

Screening tests of Sand Mantis candidate materials selected for erosion resistance have been completed. The results of this testing identified that over a relatively short period of operation (<1 hour), measurable erosion will occur in each of the candidate zoom tube materials given equal operating exposure. Additionally, this testing has shown that erosion of the rubber discharge hose directly downstream of the vehicle could be expected to limit the service life of the discharge hose.

NTIS

Corrosion Resistance; Erosion; Hoses; Rubber; Sands

20080031608 NASA Langley Research Center, Hampton, VA USA

Liquid Crystalline Thermosets From Ester, Ester-Imide, and Ester-Amide Oligomers

Dingemans, Theodorus J., Inventor; Weiser, Erik S., Inventor; SaintClair, Terry L., Inventor; 29 Apr 05; 19 pp.; In English; Original contains black and white illustrations

Patent Info.: Filed Filed 29 Apr 05; US-Patent-Appl-SN-11-124508; US 2005/0209429

Report No.(s): PB2007-110905; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031608>

Main chain thermotropic liquid crystal esters, ester-imides, and ester-amides were prepared from AA, BB, and AB type monomeric materials and end-capped with phenylacetylene, phenylmaleimide, or nadimide reactive end-groups. The end-capped liquid crystal oligomers are thermotropic and have, preferably, molecular weights in the range of approximately 1000-15,000 grams per mole. The end-capped liquid crystal oligomers have broad liquid crystalline melting ranges and exhibit high melt stability and very low melt viscosities at accessible temperatures. The end-capped liquid crystal oligomers are stable for up to an hour in the melt phase. They are highly processable by a variety of melt process shape forming and blending

techniques. Once processed and shaped, the end-capped liquid crystal oligomers were heated to further polymerize and form liquid crystalline thermosets (LCT). The fully cured products are rubbers above their glass transition temperatures.

Author

Amides; Crystallinity; Esters; Imides; Liquid Crystals; Oligomers

20080032245 General Electric Co., Houston, TX, USA

Direct CSI Scintillator Coating for Improved Digital X-Ray Detector Assembly Longevity

Baumgartner, C. E., Inventor; Fobare, D. F., Inventor; DeJule, M. C., Inventor; Wei, C. Y., Inventor; Hennessy, W. A., Inventor; 21 Nov 03; 25 pp.; In English

Contract(s)/Grant(s): 70NANB5H1148

Patent Info.: Filed Filed 21 Nov 03; US-Patent-Appl-SN-10-719-117

Report No.(s): PB2007-113298; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The present invention provides an X-ray detector assembly and a fabrication method, where the X-ray detector assembly comprises a scintillator material disposed on a detector matrix array disposed on a detector substrate; an encapsulating coating disposed on the scintillator material; a moisture resistant cover disposed over the detector substrate and the encapsulating coating, and an adhesive material disposed between the detector substrate and the moisture resistant cover so as to form a moisture vapor barrier. The adhesive material is disposed so that it is not in contact with the encapsulating coating. The fabrication method of the X-ray detector assembly includes the steps of disposing the encapsulating coating on the scintillator material and a portion of the detector substrate and removing the encapsulating coating from the portion of the detector substrate.

NTIS

Coating; Imaging Techniques; Medical Equipment; Patent Applications; Scintillation Counters; X Ray Detectors

20080032337 Brinks, Hofer, Gilson, Lione, Chicago, IL, Chicago, IL, USA

Decal Transfer Microfabrication

Nuzzo, R. G., Inventor; Childs, W. R., Inventor; 4 Aug 04; 22 pp.; In English

Contract(s)/Grant(s): NSF-CHE-0097096; N66001-98-1-8915; DEFG02-91ER454439

Patent Info.: Filed Filed 4 Aug 04; US-Patent-Appl-SN-10-911-049

Report No.(s): PB2007-113318; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A method of making a microstructure includes forming a pattern in a surface of a silicon-containing elastomer, oxidizing the pattern, contacting the pattern with a substrate; and bonding the oxidized pattern and the substrate such that the pattern and the substrate are irreversibly attached. The silicon-containing elastomer may be removably attached to a transfer pad.

NTIS

Microstructure; Fabrication; Silicon; Elastomers

20080032581 Argonne National Lab., Idaho Falls, ID, USA

AGC-1 Experiment and Final Preliminary Design Report

Bratton, R.; Burchell, T.; Aug. 2006; 275 pp.; In English

Report No.(s): DE2007-911565; INL/EXT-05-00622; No Copyright; Avail.: National Technical Information Service (NTIS)

This report details the experimental plan and design as of the preliminary design review for the Advanced Test Reactor Graphite Creep-1 graphite compressive creep capsule. The capsule will contain five graphite grades that will be irradiated in the Advanced Test Reactor at the Idaho National Laboratory to determine the irradiation induced creep constants. Seven other grades of graphite will be irradiated to determine irradiated physical properties. The capsule will have an irradiation temperature of 900 degrees C and a peak irradiation dose of 5.8×10^{21} n/cm² (E > 0.1 MeV), or 4.2 displacements per atom.

NTIS

Experiment Design; Graphite; Radiation Effects

20080032700 Lawrence Livermore National Lab., Livermore, CA USA; California Univ., Los Angeles, CA, USA

Shape Memory Polymer Medical Device

Maitland, D., Inventor; Bennett, W. J., Inventor; Bearinger, J. P., Inventor; Wilson, T. S., Inventor; Small, W., Inventor; 30 Jun 05; 50 pp.; In English

Contract(s)/Grant(s): DE-W-7405-ENG-48

Patent Info.: Filed 30 Jun 05; US-Patent-Appl-SN-11-172 668

Report No.(s): PB2008-100094; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A system for removing matter from a conduit. The system includes the steps of passing a transport vehicle and a shape memory polymer material through the conduit, transmitting energy to the shape memory polymer material for moving the shape memory polymer material from a first shape to a second and different shape, and withdrawing the transport vehicle and the shape memory polymer material through the conduit carrying the matter.

NTIS

Computer Storage Devices; Medical Equipment; Patent Applications; Shapes

28

PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; their storage and handling procedures; and aircraft fuels. For nuclear fuels see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power*; *20 Spacecraft Propulsion and Power*, and *44 Energy Production and Conversion*.

20080031046 Gila River Indian Community, Coolidge, AZ, USA

Health Consultation: Lone Butte Industrial Park - Perchlorate, District 4 Memorial Area, Gila River Indian Community, Maricopa County, Arizona

Mar. 08, 2007; 24 pp.; In English

Report No.(s): PB2007-114264; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The Gila River Indian Community (GRIC), Office of Occupational Safety and Health (OSH), through a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), has prepared this health consultation which serves to address health concerns at the GRIC Lone Butte Industrial Park (LBIP) in Memorial Area in District 4. Concern was raised by the GRIC Department of Environmental Quality hydrologist, due to the perchlorate migration from a solid fuel rocket manufacturing facility, and the additional use of perchlorate at the LBIP, which has yet to be determined whether it contributes to an existing plume. This health consultation evaluates data and information regarding perchlorate contaminated monitoring wells potential public health impact on the drinking water wells situated on-site, and northeast of the LBIP site which is west of Interstate 10. Data available to the OSH office is presented in the background section, followed by a discussion of the health implications, conclusions, and recommendations.

NTIS

Arizona; Health; Industrial Plants; Migration; Perchlorates; Rivers

20080031122 NASA Johnson Space Center, Houston, TX, USA

Combustion Performance and Emissions Characteristics for a Well-Stirred Reactor for Low Volatility Hydrocarbon Fuels

Stouffer, Scott D.; Pawlik, Robert; Justinger, Garth; Heyne, Joshua; Zelina, Joe; Ballal, Dilip; July 08, 2007; 12 pp.; In English; 43rd AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 8-11 Ju. 2007, Cincinnati, OH, USA; See also [20080026086](#); See also NASA/CR-2008-215237; Original contains color illustrations

Contract(s)/Grant(s): NAS3-01135; 200-18-14U38773

Report No.(s): AIAA Paper 2007-5663; Copyright; Avail.: CASI: [A03](#), Hardcopy

The performance and gaseous emissions were measured for a well-stirred reactor operating under lean conditions for two fuels: JP8 and a synthetic Fisher-Tropsch fuel over a range of equivalence ratios from 0.6 down to lean blowout. The lean blowout characteristics were determined in LBO experiments at loading parameter values from 0.7 to 1.4. The lean blowout characteristics were then explored under higher loading conditions by simulating higher altitude operation with the use of nitrogen to dilute the air. The results show that the two fuels have very similar combustion performance and lean blowout characteristics. Most of the differences observed in the emissions characteristics can be directly attributed to the difference in the C/H ratio of the two fuels.

Author

Hydrocarbon Fuels; JP-8 Jet Fuel; Synthetic Fuels; Combustion Efficiency; Combustion Stability; Combustion Products; Exhaust Gases; Exhaust Emission; Combustion Chambers

20080031136 NASA White Sands Test Facility, NM, USA

Hydrogen Handler/Safety Course

Starritt, Larry; Farrah, Kevin; January 2006; 119 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: [A06](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031136>

This viewgraph presentation describes the process of handling hydrogen safely. It also gives a general description of hydrogen, its uses, hazards, and material incompatibility.

CASI

Hazards; Hydrogen; Industrial Safety; Gases

20080032699 Temmerman (Matthew J.), Davis, CA, USA

Electrically Controlled Solid Propellant

Grix, C., Inventor; Katzahian, A., Inventor; McGehee, D. C., Inventor; 24 Apr 03; 18 pp.; In English

Contract(s)/Grant(s): AFL-F04611-00-C-0010

Patent Info.: Filed Filed 24 Apr 03; US-Patent-Appl-SN-10-423 072

Report No.(s): PB2008-100069; No Copyright; Avail.: CASI: [A03](#), Hardcopy

An electrically controlled propellant comprising an ionomer oxidizer polymer binder, an oxidizer mix including at least one oxidizer salt and at least one eutectic material, and a mobile phase comprising at least one ionic liquid is disclosed. The PVAN polymer in the present invention may be of medium (>100,000) to high molecular weight (<1,000,000). The present invention also may include the controlled cross-linking of the polymer using epoxy resins, the use of moisture barrier coating, the addition of an energetic combustion additives such as Chromium III and polyethylene glycol polymer.

NTIS

Patent Applications; Propellants; Solid Propellants

32

COMMUNICATIONS AND RADAR

Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also 04 Aircraft Communications and Navigation; and 17 *Space Communications, Spacecraft Communications, Command and Tracking*; for search and rescue, see 03 *Air Transportation and Safety*; and 16 *Space Transportation and Safety*.

20080031047 Harral, Winner, Thompson, Sharp, Lawrence, Inc., Granbury, TX, USA

Uzbekistan Railways Telecommunications Systems Modernization Project (Final and Interim Reports)

Sep. 25, 2005; 167 pp.; In English

Report No.(s): PB2007-113679; No Copyright; Avail.: CASI: [A08](#), Hardcopy

This Final Report signifies the conclusion of services under the contract signed on July 29, 2003 (nearly 12 months after proposals were submitted) between Uzbek Railways and Harral Winner Thompson Shxarp and Lawrence, Inc. (HWTSL) to prepare a feasibility study and provide procurement technical advisory services for the Railways Telecommunication System Modernization Project in Uzbekistan. The report provides a compendium of the main documents produced under the project reporting the key findings and developments made by the HWTSL consulting team, and also describes preferences and achievements made by UTY after and owing to HWTSL's involvement in the project. This summary plus the Appendices attached hereto (including Appendix 5, comprising the Final Report for Part II of the project), constitute the full Final Report provided under the contract. The HWTSL role was comprised of two distinct, but overlapping parts: Part I supported Uzbekistan Railways (UTY) as necessary in the process of tendering for the fiber optics and transmission system for the 650-km Keles-Tashkent-Samarkand-Bukhara (KTSB) line funded under the Asian Development Bank's (second) loan for Railway Modernization, to ensure that preparation and implementation of the tender were in line with ADB guidelines and encouraged widespread, fair, and open international competition on a level playing field. Part II assessed the strategic development options for the new fiber optic communications system, including potential extensions beyond the segments so far financed by ADB, and also included a pre-feasibility study for extending the telecom network to the section Navoi-Uchkuduk-Miskent- Nukus-Karakalpakiya (NUMNK), an extension of the project beyond the Terms of Reference covered by the US grant.

NTIS

International Trade; Rail Transportation; Telecommunication; Uzbekistan

20080031049 Yankee Energy Corp., Boston, MA, USA

Telekom Srbija Technical Assistance for Business Service Development

Feb. 2006; 92 pp.; In English

Report No.(s): PB2007-113677; No Copyright; Avail.: National Technical Information Service (NTIS)

This is the final report for the technical assistance project conducted by Yankee Group and Delphos International for Telekom Srbija, the incumbent telecom provider in Serbia. This technical assistance project was funded with a grant from the U.S. Trade and Development Agency (USTDA). Yankee Group has assisted Telekom Srbija to improve its current service offerings to business customers. By understanding its market better and choosing the right investments in technology for telecommunications service to business customers, Telekom Srbija will be able to better service its customers.

NTIS

Commerce; International Trade; Telecommunication; Yugoslavia

20080031050 Associates in Rural Development, Inc., Burlington, VT, USA

Technical Assistance for Tender Preparation and Implementation for an IT System for the Municipality of Bucharest. (Final Report, Public Version)

Nov. 2003; 358 pp.; In Mixed; In English

Report No.(s): PB2007-113674; No Copyright; Avail.: National Technical Information Service (NTIS)

In 2001, the Municipality prepared technical specifications and a request for proposals (RFP) for the procurement, installation, and integration of a Municipal Information Technology (IT) system. The purpose of the IT system was to assure both the 'informatization' of the Municipality's current activities and the structuring of information for better decision making at the level of the General Mayor. The integrated IT system would allow management to directly obtain information, in real time, from databases throughout the Municipality. Specifically, it would allow access to the information systems for: administration of finances (including accounting and budgeting), materials, and human resources; the urban database, including a housing cadastre; the electronic archive, allowing access to information from 10 different departments (including public administration; public utilities; and transport, roads, and traffic safety); and client relations management.

NTIS

Information Systems; International Trade; Management Planning; Romania

20080031051 Little (Arthur D.), Inc., Cambridge, MA USA

Technical Assistance on the Montenegro Telecom Development Policy Project. Final Report to the Government of the Republic of Montenegro

May 2006; 136 pp.; In English

Report No.(s): PB2007-113669; No Copyright; Avail.: National Technical Information Service (NTIS)

Since 2000, the Republic of Montenegro has made significant progress in regard to its Telecommunications, or more broadly Electronic Communications Sector (ECS). Among these achievements are: (1) Substantial investments to build modern network infrastructures, notably a local digital circuit switched telephone network, a national fiber optic transmission network, and a high capacity, packet-switched MPLS2-based network; (2) High penetration of mobile telephone services, and a high (in light of the income levels in the Republic) household penetration of fixed telephone services; (3) Successful auction-based privatization (consummated in April, 2005) of the incumbent full-service formerly state-owned network operator Telekom Montenegro ('Telekom CG') and the elimination of Telekom CG's legal monopoly as of the beginning of 2004, although no competitive fixed operator has yet entered the market; (4) Establishment of a functioning regulator for the Telecommunications Sector (the Agency for Telecommunications) that has supervised initial steps in areas as important as telephone tariff rebalancing and a Reference Interconnection Offer (RIO) from Telekom CG, in addition to other activities such as issuing licenses and rule books, resolving disputes, ensuring consumer protection, and monitoring and controlling radio frequency systems; and (5) Establishment of a regulator for broadcasting (the Broadcasting Agency (BA or ARD)) which has developed a Broadcasting Development Strategy that addresses major anticipated developments such as the introduction of digital broadcasting and the potential role of new (to Montenegro) distribution systems such as cable TV - this strategy included adoption of a new broadcast frequencies allocation plan and frequency assignments, and a plan for digital broadcast frequencies.

NTIS

International Trade; Policies; Telecommunication; Yugoslavia

20080031681 NASA Ames Research Center, Moffett Field, CA, USA

Reconfigurable Auditory-Visual Display

Begault, Durand R., Inventor; Anderson, Mark R., Inventor; McClain, Bryan, Inventor; Miller, Joel D., Inventor; May 27, 2008; 17 pp.; In English; Original contains black and white illustrations

Patent Info.: Filed 20 Sep. 2005; US-Patent 7,378,963; NASA-Case-ARC-15315-1; US-Patent-Appl-SN-11/239449; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031681>

System and method for visual and audible communication between a central operator and N mobile communicators (N greater than or equal to 2), including an operator transceiver and interface, configured to receive and display, for the operator, visually perceptible and audibly perceptible signals from each of the mobile communicators. The interface (1) presents an audible signal from each communicator as if the audible signal is received from a different location relative to the operator and (2) allows the operator to select, to assign priority to, and to display, the visual signals and the audible signals received from a specified communicator. Each communicator has an associated signal transmitter that is configured to transmit at least one of the visual signals and the audio signal associated with the communicator, where at least one of the signal transmitters includes at least one sensor that senses and transmits a sensor value representing a selected environmental or physiological parameter associated with the communicator.

Author

Signal Detection; Visual Signals; Auditory Signals; Wireless Communication; Situational Awareness; Display Devices

20080032220 Maine and Asmus, Nashua, NH, USA

Self-Booting Software Defined Radio Module

Murotake, D. K., Inventor; 14 Jul 03; 22 pp.; In English

Contract(s)/Grant(s): AF-F30602-03-C-0183

Patent Info.: Filed 14 Jul 03; US-Patent-Appl-SN-10-618-950

Report No.(s): PB2008-100421; No Copyright; Avail.: CASI: A03, Hardcopy

The invention in the simplest form is a self-booting software defined radio (SDR) module which may be embodied as a PCMCIA, Compact Flash, or other plug in form factor module. The performance characteristics of the module, may include the radio frequency (RF) carrier frequency, instantaneous RF bandwidth, carrier modulation and demodulation, symbol coding and decoding, security, and network protocol that can be altered and saved by means of computer software transferred to the module from a host device such as a cellular telephone, personal digital assistant, lap top computer or other programming device.

NTIS

Patent Applications; Computer Programs; Radio Frequencies; Carrier Frequencies; Bandwidth

20080032240 Naval Postgraduate School, Monterey, CA USA

Technical and Operational Analysis of the Fortress Secure Wireless Access Bridge (ES-520) in Support of Tactical Military Coalition Operations

Geathers, III, Sandy; Mar 2008; 120 pp.; In English

Report No.(s): AD-A480069; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Most networks, including those deployed in the Cooperative Operations and Applied Science & Technology Studies (COASTS) field experimentation program, utilize an access point, wireless bridge, switch, and security gateway. Reducing equipment requirements in the field is most desirable to minimize the equipment footprint, cost, and power required. The COASTS research group, involved in developing a scalable, multi-mission, system of systems for coalition environments, relies heavily on Commercial-Off-The-Shelf (COTS) network technology. Evaluating the performance of COTS technology such as the Fortress Secure Wireless Access Bridge (ES-520) directly supports the programs objectives. This thesis will analyze the performance of the Fortress Secure Wireless Access Bridge (ES-520) vs. traditional 802.11a/b/g wireless access points. Additionally, radio frequency (RF) propagation performance will be analyzed for distance, mobility, sustainability, and technical advantages/disadvantages with respect to varying antenna configurations and physical parameters such as climate and terrain. Testing and evaluation will be accomplished under the COASTS field experimentation program.

DTIC

Military Operations; Wireless Communication; Technology Assessment; Commercial Off-the-Shelf Products; Networks

20080032251 Army Research Inst., Alexandria, VA USA

Collaborative Planning in Network-Enabled Co-Located and Distributed Environments

Sanders, William R; Fultz, Christopher V; Mar 2008; 38 pp.; In English

Report No.(s): AD-A479998; ARI-RR-1886; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A defining feature of Army transformation will be the development of digital communications capabilities to support distributed battle command. To support new equipment development a realistic planning task is required which can yield an objective planning performance benchmark score. The Reactive Planning Strategies Simulation (REPSS) presents a group planning and resource allocation task that can be used to generate a benchmark performance score. The present research investigated whether a benchmark REPSS performance score could be established that demonstrates sensitivity to manipulations in planning task conditions, and planning group skills. Twenty-two groups of seven Soldiers (commander and three two-person teams) performed the REPSS planning task after being assigned to either a co-located or distributed team planning condition. Results indicated that the planning performance success score for groups in the distributed condition fell below the benchmark score for groups in the co-located condition. Participant group member characteristics (rank, planning experience, and previous deployments) were significantly related to successful performance for groups in the distributed planning condition. These results provide evidence that the REPSS simulation can be applied to develop a benchmark estimate of performance against which manipulations in task conditions and planning group expertise can be compared.

DTIC

Pulse Communication; Technology Assessment; Communication Networks

20080032257 Hall (David R.), Provo, UT, USA

Assessing Down-Hole Drilling Conditions

Hall, D. R., Inventor; Pixton, D. S., Inventor; Johnson, M. L., Inventor; Bartholomew, D. B., Inventor; Fox, J., Inventor; 28 Jun 04; 24 pp.; In English

Contract(s)/Grant(s): DE-FC26-01NT41229

Patent Info.: Filed Filed 28 Jun 04; US-Patent-Appl-SN-10-878-243

Report No.(s): PB2007-113284; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A method and apparatus for use in assessing down-hole drilling conditions are disclosed. The apparatus includes a drill string, a plurality of sensors, a computing device, and a down-hole network. The sensors are distributed along the length of the drill string and are capable of sensing localized down-hole conditions while drilling. The computing device is coupled to at least one sensor of the plurality of sensors. The data is transmitted from the sensors to the computing device over the down-hole network. The computing device analyzes data output by the sensors and representative of the sensed localized conditions to assess the down-hole drilling conditions. The method includes sensing localized drilling conditions at a plurality of points distributed along the length of a drill string during drilling operations; transmitting data representative of the sensed localized conditions to a predetermined location; and analyzing the transmitted data to assess the down-hole drilling conditions.

NTIS

Communication Networks; Drilling; Patent Applications; Strings

20080032313 Hall (David R.), Provo, UT, USA

Communication Adapter for Use with a Drilling Component

Hall, D. R., Inventor; Pixton, D. S., Inventor; Hall, H. T., Inventor; Bradford, K., Inventor; Rawle, M., Inventor; 28 Jun 04; 14 pp.; In English

Contract(s)/Grant(s): DE-FC26-01NT41229

Patent Info.: Filed Filed 28 Jun 04; US-Patent-Appl-SN-10-878-192

Report No.(s): PB2007-113283; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A communication adapter is disclosed that provides for removable attachment to a drilling component when the drilling component is not actively drilling and for communication with an integrated transmission system in the drilling component. The communication adapter comprises a data transmission coupler that facilitates communication between the drilling component and the adapter, a mechanical coupler that facilitates removable attachment of the adapter to the drilling component, and a data interface.

NTIS

Adapters; Drilling; Patent Applications

20080032314 Hall [David R.], Provo, UT, USA

Closed-Loop Drilling System Using a High-Speed Communications Network

Hall, D. R., Inventor; 28 Jun 04; 20 pp.; In English

Contract(s)/Grant(s): DE-FC26-01NT41229

Patent Info.: Filed Filed 28 Jun 04; US-Patent-Appl-SN-10-878-775

Report No.(s): PB2007-113282; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A closed-loop downhole drilling system is disclosed that includes a high-speed communications network, comprising multiple nodes, integrated into a downhole drilling string. The high-speed communications network supports data transmission rates far exceeding data rates of mud pulse telemetry systems. Sensors, located at a selected points along the downhole drilling string, are operably connected to the nodes and transmit data through the communications network corresponding to conditions sensed downhole. A control module receives the sensor data through the communications network and automatically adjusts uphole or downhole-drilling parameters in response thereto.

NTIS

Communication Networks; Drilling; Feedback Control; High Speed; Patent Applications

20080032542 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Aerosol Vertical Distributions from GOCART Model and Comparisons with CALIPSO and In-situ Airborne Lidar Data

Chin, Mian; Yu, Hongbin; Diehl, Thomas; March 09, 2008; 1 pp.; In English; Calipso Science Team Meeting, 9-14 Mar. 2008, Paris, France; No Copyright; Avail.: Other Sources; Abstract Only

We will show the GOCART model simulated vertical profiles of aerosol extinction, composition, and the extinction-to-backscatter ratios (lidar ratio) at different geographical regions during 2006. These results will be compared with the air-borne HSRL lidar and CALIPSO data.

Author

Aerosols; In Situ Measurement; Airborne Equipment; Optical Radar

20080032668 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Kashima 34-m Radio Telescope

Tagiguchi, Hiroshi; Kawai, Eiji; Kawai, Eiji; Kondo, Tetsuro; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 51-54; In English; See also [20080032620](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

The Kashima 34-m radio telescope is continuously operated and maintained by the National Institute of Information and Communications Technology (NICT) as a facility of the Kashima Space Reserch Center (KSRC) in Japan. This brief report summarizes the status of this telescope, the staff and activities during 2007.

Author

Information Systems; Radio Telescopes; Antenna Design; Communication

33

ELECTRONICS AND ELECTRICAL ENGINEERING

Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment; and microelectronics and integrated circuitry. for related information see also *60 Computer Operations and Hardware*; and *76 Solid-State Physics*. For communications equipment and devices see *32 Communications and Radar*.

20080031195 Oak Ridge National Lab., TN USA

Five-Level Cascade Multilevel Inverter Three-Phase Motor Drive Using a Single DC Source

Chiasson, J. N.; Sep. 01, 2006; 25 pp.; In English

Contract(s)/Grant(s): DE-AC05-00OR22725

Report No.(s): DE2007-901193; ORNL/TM-2005/572; No Copyright; Avail.: National Technical Information Service (NTIS)

A method is presented showing that a 5-level cascade multilevel inverter for a three-phase permanent magnet synchronous motor drive can be implemented using only a single DC link to supply a standard 3-leg inverter along with three full H-bridges supplied by capacitors. It is shown that the capacitor voltages can be regulated while achieving an output voltage waveform

that is 20% greater than that obtained using the standard 3-leg inverter alone. Finally conditions are given in terms of the power factor and modulation index that determine when the capacitor voltage can be regulated.

NTIS

Inverters; Permanent Magnets; Electric Potential

20080031354 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Reliability Effects of Surge Current Testing of Solid Tantalum Capacitors

Teverovsky, Alexander; December 2007; 52 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: A04, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031354>

Solid tantalum capacitors are widely used in space applications to filter low-frequency ripple currents in power supply circuits and stabilize DC voltages in the system. Tantalum capacitors manufactured per military specifications (MIL-PRF-55365) are established reliability components and have less than 0.001% of failures per 1000 hours (the failure rate is less than 10 FIT) for grades D or S, thus positioning these parts among electronic components with the highest reliability characteristics. Still, failures of tantalum capacitors do happen and when it occurs it might have catastrophic consequences for the system. This is due to a short-circuit failure mode, which might be damaging to a power supply, and also to the capability of tantalum capacitors with manganese cathodes to self-ignite when a failure occurs in low-impedance applications. During such a failure, a substantial amount of energy is released by exothermic reaction of the tantalum pellet with oxygen generated by the overheated manganese oxide cathode, resulting not only in destruction of the part, but also in damage of the board and surrounding components. A specific feature of tantalum capacitors, compared to ceramic parts, is a relatively large value of capacitance, which in contemporary low-size chip capacitors reaches dozens and hundreds of microfarads. This might result in so-called surge current or turn-on failures in the parts when the board is first powered up. Such a failure, which is considered as the most prevalent type of failures in tantalum capacitors [1], is due to fast changes of the voltage in the circuit, dV/dt , producing high surge current spikes, $I(\text{sub sp}) = Cx(dV/dt)$, when current in the circuit is unrestricted. These spikes can reach hundreds of amperes and cause catastrophic failures in the system. The mechanism of surge current failures has not been understood completely yet, and different hypotheses were discussed in relevant literature. These include a sustained scintillation breakdown model [1-3]; electrical oscillations in circuits with a relatively high inductance [4-6]; local overheating of the cathode [5,7, 8]; mechanical damage to tantalum pentoxide dielectric caused by the impact of MnO₂ crystals [2,9, 10]; or stress-induced-generation of electron traps caused by electromagnetic forces developed during current spikes [11]. A commonly accepted explanation of the surge current failures is that at unlimited current supply during surge current conditions, the self-healing mechanism in tantalum capacitors does not work, and what would be a minor scintillation spike if the current were limited, becomes a catastrophic failure of the part [1, 12]. However, our data show that the scintillation breakdown voltages are significantly greater than the surge current breakdown voltages, so it is still not clear why the part, which has no scintillations, would fail at the same voltage during surge current testing (SCT).

Author

Capacitors; Tantalum; Low Frequencies; Manganese Oxides; Impedance; Power Supply Circuits; Short Circuits; Ripples; Scintillation; Failure Modes; Electric Potential; Dielectrics; Surges

20080031551 Michigan State Univ., East Lansing, MI, USA

Fiber Optical Micro-Detectors for Oxygen Sensing in Power Plants. Final Technical Report October 1, 2002 to September 30, 2006

Baker, G. L.; Ghosh, R. N.; Osborn, D. J.; Zhang, P.; Dec. 2006; 94 pp.; In English

Report No.(s): DE2007-910438; No Copyright; Avail.: National Technical Information Service (NTIS)

A reflection mode fiber optic oxygen sensor that can operate at high temperatures for power plant applications has been developed. The sensor is based on the O₂ quenching of the red emission from hexanuclear molybdenum chloride clusters. We report on a fiber optic technique for detection of gas phase oxygen up to 100 degrees C based on the O₂ quenching of the luminescence from molybdenum chloride clusters, K₂Mo₆Cl₁₄. The inorganic sensing film is a composite of sol-gel particles embedded in a thin, oxygen permeable sol-gel binder. The particles are comprised of thermally stable, luminescent K₂Mo₆Cl₁₄ clusters dispersed in a fully equilibrated sol-gel matrix. From 40 to 100 °C, the fiber sensor switches 60% in intensity in response to alternating pulses of <0.001% O₂ and 21% O₂ between two well defined levels with a response time of 10 s.

NTIS

Detection; Fiber Optics; Gas Detectors; Optical Measuring Instruments; Oxygen; Electric Power Plants

20080031611 Alston and Bird, LLP, Charlotte, NC, USA

Structurally Integrated Circuit and Associated Method

Marshall, Joseph A., Inventor; Weems, Douglas B., Inventor; Bussom, Richard C., Inventor; Anderson, David M., Inventor; 19 May 04; 15 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NCC2-9019

Patent Info.: Filed 19 May 04; US-Patent-Appl-SN-10-848703; US 2005/0257956

Report No.(s): PB2007-109181; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031611>

A composite structural member with an integrated electrical circuit and an associated method of manufacture are provided. The structural member includes a plurality of layers of structural reinforcement material, and two or more electrical devices are disposed at least partially between the layers with an intermediate layer of the structural reinforcement material disposed between the electrical devices. At least one electrical bus is disposed in the structural member, and each electrical device is connected to the bus by a conductive electrode. Thus, the electrodes can extend through the intermediate layer of the structural reinforcement material to connect each of the electrical devices to one or more of the buses.

Author

Integrated Circuits; Structural Members; Electromechanical Devices; Manufacturing

20080031675 NASA Glenn Research Center, Cleveland, OH, USA

Apparatus and Method for Packaging and Integrating Microphotonic Devices

Nguyen, Hung, Inventor; July 08, 2008; 19 pp.; In English; Original contains black and white illustrations

Patent Info.: Filed 13 Jul. 2005; US-Patent-7,397,978; US-Patent-Appl-SN-11/180990; NASA-Case-LEW-17694-1; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031675>

An apparatus is disclosed that includes a carrier structure and an optical coupling arrangement. The carrier structure is made of a silicon material and allows for the packaging and integrating of microphotonic devices onto a single chip. The optical coupling mechanism enables laser light to be coupled into and out of a microphotonic resonant disk integrated on the carrier. The carrier provides first, second and third cavities that are dimensioned so as to accommodate the insertion and snug fitting of the microphotonic resonant disk and first and second prisms that are implemented by the optical coupling arrangement to accommodate the laser coupling.

Author

Photonics; Optoelectronic Devices; Microelectronics; Electronic Packaging; Optical Coupling

20080031679 NASA Glenn Research Center, Cleveland, OH, USA

Miniaturized Metal (Metal Alloy)/PdO(x)/SiC Hydrogen and Hydrocarbon Gas Sensors

Hunter, Gary W., Inventor; Xu, Jennifer C., Inventor; Lukco, Dorothy, Inventor; June 24, 2008; 18 pp.; In English; Original contains black and white illustrations

Patent Info.: Filed 12 May 2006; US-Patent-7,389,675; US-Patent-Appl-SN/11/434578; NASA-Case-LEW-17859-1; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031679>

A miniaturized Schottky diode hydrogen and hydrocarbon sensor and the method of making same is disclosed and claimed. The sensor comprises a catalytic metal layer, such as palladium, a silicon carbide substrate layer and a thin barrier layer in between the catalytic and substrate layers made of palladium oxide (PdO(x)). This highly stable device provides sensitive gas detection at temperatures ranging from at least 450 to 600 C. The barrier layer prevents reactions between the catalytic metal layer and the substrate layer. Conventional semiconductor fabrication techniques are used to fabricate the small-sided sensors. The use of a thicker palladium oxide barrier layer for other semiconductor structures such as a capacitor and transistor structures is also disclosed.

Author

Schottky Diodes; Miniaturization; Gas Detectors; Hydrogen; Hydrocarbons; Sensors

20080032223 Blakely Sokoloff Taylor and Zafman, Los Angeles, CA, USA

Methods and Apparatuses Relating To Block Configuration and Fluidic Self-Assembly Processes

Craig, G. W., Inventor; Snyder, E. J., Inventor; Tu, J. K. J., Inventor; 14 Jun 05; 28 pp.; In English

Contract(s)/Grant(s): DARPA-N0014-99-C0395; DARPA-N66001-02-C8005

Patent Info.: Filed Filed 14 Jun 05; US-Patent-Appl-SN-11-153 037

Report No.(s): PB2008-100429; No Copyright; Avail.: CASI: [A03](#), Hardcopy

An apparatus and methods of making an electronic assembly. The electronic assembly comprises a functional block having at least one asymmetric feature. The functional block comprises an integrated circuitry to perform a function pertaining to the electronic assembly. The electronic assembly further comprises a substrate having a receptor site to mate with the functional block using a fluidic self-assembly process.

NTIS

Fluidics; Integrated Circuits; Patent Applications; Self Assembly

20080032259 Quarles and Brady, LLP., Milwaukee, WI, USA

Metallization of Bacterial Cellulose for Electrical and Electronic Device Manufacture

Evans, B. R., Inventor; O'Neill, H. M., Inventor; Jansen, V. M., Inventor; Woodward, J., Inventor; 19 Aug 05; 15 pp.; In English

Contract(s)/Grant(s): DE-AC05-00OR22725

Patent Info.: Filed Filed 19 Aug 05; US-Patent-Appl-SN-11-207-431

Report No.(s): PB2007-113288; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A method for the deposition of metals in bacterial cellulose and for the employment of the metallized bacterial cellulose in the construction of fuel cells and other electronic devices is disclosed. The method for impregnating bacterial cellulose with a metal comprises placing a bacterial cellulose matrix in a solution of a metal salt such that the metal salt is reduced to metallic form and the metal precipitates in or on the matrix. The method for the construction of a fuel cell comprises placing a hydrated bacterial cellulose support structure in a solution of a metal salt such that the metal precipitates in or on the support structure, inserting contact wires into two pieces of the metal impregnated support structure, placing the two pieces of metal impregnated support structure on opposite sides of a layer of hydrated bacterial cellulose, and dehydrating the three layer structure to create a fuel cell.

NTIS

Bacteria; Cellulose; Fuel Cells; Metallizing; Patent Applications

20080032319 Molecular Imprints, Inc., Austin, TX, USA

System for Magnification and Distortion Correction During Nano-Scale Manufacturing

Cherala, A., Inventor; Choi, B. J., Inventor; Nimmakayala, P. K., Inventor; Meissi, M. J., Inventor; Sreenivasan, S. V., Inventor; 30 Nov 04; 22 pp.; In English

Contract(s)/Grant(s): DARPA-N66001-01-1-8964; DARPA-N66001-02-C-8011

Patent Info.: Filed Filed 30 Nov 04; US-Patent-Appl-SN-10-999-898

Report No.(s): PB2007-110539; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The present invention is directed toward a system to vary dimensions of a substrate, such as a template having a patterned mold. To that end, the system includes a substrate chuck adapted to position the substrate in a region; a pliant member; and an actuator sub-assembly elastically coupled to the substrate chuck through the pliant member. The actuator assembly includes a plurality of lever sub-assemblies, one of which includes a body lying in the region and spaced-apart from an opposing body associated with one of the remaining lever sub-assemblies of the plurality of lever sub-assemblies. One of the plurality of lever assemblies is adapted to vary a distance between the body and the opposing body. In this manner, compressive forces may be applied to the template to remove unwanted magnification or other distortions in the pattern on the mold. The pliant member is configured to attenuate a magnitude of resulting forces sensed by the substrate chuck generated in response to the compressive forces.

NTIS

Magnification; Distortion; Nanofabrication; Nanotechnology; Manufacturing

20080032321 Lucent Technologies, Murray Hill, NJ, USA

Transistors and Methods for Making the Same

Chen, Y. K., Inventor; Houtsma, V. E., Inventor; Weimann, G., Inventor; 3 Jun 04; 16 pp.; In English

Contract(s)/Grant(s): DARPA-MDA972-03-C-0027

Patent Info.: Filed Filed 3 Jun 04; US-Patent-Appl-SN-10-859-894

Report No.(s): PB2007-110535; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Apparatus comprising: a first compound semiconductor composition layer doped to have a first charge carrier polarity;

a second compound semiconductor composition layer doped to have a second charge carrier polarity and located on the first layer; a third compound semiconductor composition layer doped to have the first charge carrier polarity and located on the second layer; a base electrode on the second layer; and a spacer ring interposed between and defining a charge carrier access path distance between the base electrode and the third layer, the path distance being within a range of between about 200 ANG and about 1000 ANG. Techniques for making apparatus. Apparatus is useful as a heterobipolar transistor, particularly for high frequency applications.

NTIS

Transistors; Semiconductors (Materials); Fabrication

20080032322 Molecular Imprints, Inc., Austin, TX, USA

Method of Varying Dimensions of a Substrate During Nano-Scale Manufacturing

Cherala, A., Inventor; Choi, B. J., Inventor; Nimmakayala, P. K., Inventor; Meissl, M. J., Inventor; Sreenivasan, S. V., Inventor; 1 Jun 05; 28 pp.; In English

Contract(s)/Grant(s): DARPA-N66001-01-1-8964; DARPA-N66001-02-C-8011

Patent Info.: Filed Filed 1 Jun 05; US-Patent-Appl-SN-11-142-834

Report No.(s): PB2007-110534; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The present invention is directed toward a method to vary dimensions of a substrate supported by a chuck. The method includes applying compressive forces to the substrate with the actuator assembly while facilitating movement of the actuator assembly with respect to the substrate to minimize reactive forces generated in response to the compressive forces being sensed by the chuck.

NTIS

Nanofabrication; Nanotechnology; Substrates; Semiconductor Devices

20080032332 Urban (M. J.), Bethlehem, PA, USA

Broadband Cascade Light Emitters

Capasso, F., Inventor; Cho, A. Y., Inventor; Gmachi, C. F., Inventor; Peabody, M. L., Inventor; Sergent, A. M., Inventor; 19 Jun 03; 13 pp.; In English

Contract(s)/Grant(s): DAAD19-00-C-0096

Patent Info.: Filed Filed 19 Jun 03; US-Patent-Appl-SN-10-465-253

Report No.(s): PB2007-113328; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A broadband Cascade Light Emitters (CLE) capable of operation simultaneously at multiple wavelengths comprises: a core region including a multiplicity or cascade of stages, each stage including a radiative transition region. A first group of stages emits radiation at a first wavelength and at a first aggregate intensity per group, and a second group of stages emits radiation at a second wavelength and at a second aggregate intensity per group lower than the first intensity. The invention is characterized in that the second group has more stages than said first group, and the per-stage intensity of the first group is greater than that of the second group. This design reduces the difference between said first and second aggregate intensities. In one embodiment, groups that are located at or near to the ends of the cascade have more stages than groups that are centrally located within the cascade regardless of their wavelength. Our invention significantly reduces variations in modal gain across the desired broadband spectrum and produces sufficiently flat gain without requiring elaborate redesign of the stages. These features enable cw operation of a broadband intersubband laser.

NTIS

Broadband; Emitters; Light Emitting Diodes

20080032338 Intellectual Property/Technology Law, Research Triangle Park, NC, USA

Apparatus and Process for Sensing Fluoro Species in Semiconductor Processing Systems

Dimeo, F., Inventor; Chen, P. S. H., Inventor; Neuner, J. W., Inventor; Welch, J., Inventor; 14 Feb 05; 33 pp.; In English

Contract(s)/Grant(s): 70NANB9H3018

Patent Info.: Filed Filed 14 Feb 05; US-Patent-Appl-SN-11-057-594

Report No.(s): PB2007-113315; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A gas detector and process for detecting a fluorine-containing species in a gas containing same, e.g., an effluent of a semiconductor processing tool undergoing etch cleaning with HF, NF₃, etc. The detector in a preferred structural arrangement employs a microelectromechanical system (MEMS)-based device structure and/or a free-standing metal element that functions as a sensing component and optionally as a heat source when elevated temperature sensing is required. The

free-standing metal element can be fabricated directly onto a standard chip carrier/device package so that the package becomes a platform of the detector.

NTIS

Gas Detectors; Fluorine; Semiconductor Devices

20080032341 Park, Vaughan and Fleming, LLP, Davis, CA, USA

Integrated Circuit Chip that Supports through Chip Electromagnetic Communication

Krishnamoorthy, A. V., Inventor; Zingherann, A. R., Inventor; Drost, R. J., Inventor; 24 Jun 05; 12 pp.; In English

Contract(s)/Grant(s): NBC-H-020055

Patent Info.: Filed Filed 24 Jun 05; US-Patent-Appl-SN-11-165-809

Report No.(s): PB2007-113304; No Copyright; Avail.: CASI: [A03](#), Hardcopy

One embodiment of the present invention provides an integrated circuit chip, including an active face upon which active circuitry and signal pads reside, and a back face opposite the active face. The integrated circuit chip additionally comprises an electromagnetic via that facilitates communication between signal pads on the integrated circuit chip and signal pads on a second integrated circuit chip. The electromagnetic via couples a signal pad on the active face of the integrated circuit chip to the back face of the integrated circuit chip so that the integrated circuit chip can communicate with the second integrated circuit chip while the back face of the integrated circuit chip is adjacent to the active face of the second integrated circuit chip. Moreover, the electromagnetic via operates by facilitating non-conductive signaling through the integrated circuit chip.

NTIS

Chips (Electronics); Integrated Circuits; Electromagnetic Wave Transmission

20080032342 Ryan, Mason, and Lewis, LLP, Fairfield, CT, USA

Techniques for Reducing Neel Coupling in Toggle Switching Semiconductor Devices

Worledge, D. C., Inventor; Klostermann, U., Inventor; 28 Jun 04; 9 pp.; In English

Contract(s)/Grant(s): MDA972-99-C-0009

Patent Info.: Filed Filed 28 Jun 04; US-Patent-Appl-SN-10-878-156

Report No.(s): PB2007-113303; No Copyright; Avail.: CASI: [A02](#), Hardcopy

The present invention provides techniques for data storage. In one aspect of the invention, a semiconductor device is provided. The semiconductor device comprises at least one free layer and at least one fixed layer, with at least one barrier layer there between. At least one pinned magnetic layer is separated from the at least one free layer by at least one non-magnetic layer, the at least one pinned magnetic layer and non-magnetic layer being configured to cancel out at least a portion of a Neel coupling between the at least one free layer and the at least one fixed layer.

NTIS

Data Storage; Semiconductor Devices; Switching

20080032343 Townsend and Townsend and Crew, LLP, San Francisco, CA, USA; California Inst. of Tech., Pasadena, CA USA

Surface Plamon Light Emitter Structure and Method of Manufacture

Scherer, A., Inventor; Okamoto, K., Inventor; 9 Feb 05; 35 pp.; In English

Contract(s)/Grant(s): F496200-03-1-0418

Patent Info.: Filed Filed 9 Feb 05; US-Patent-Appl-SN-11-055-005

Report No.(s): PB2007-113302; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A method (and resulting structures) for manufacturing light emitting semiconductor devices. The method includes providing a substrate comprising a surface region and forming a metal layer overlying the surface region of the substrate. In a specific embodiment, the metal layer and the surface region are characterized by a spatial spacing between the metal layer and the substrate to cause a coupling between electron-hole pairs generated in the substrate and a surface plasmon mode at an interface region between the metal layer and the surface region. Additionally, the interface region has a textured characteristic between the surface region and the metal layer. The textured characteristics causes emission of electromagnetic radiation through the surface plasmon mode or like mechanism according to a specific embodiment.

NTIS

Plasmons; Light Emitting Diodes; Semiconductor Devices; Electromagnetic Radiation

20080032344 Lucent Technologies, Richardson, TX, USA

OFET Structures with Both N- and P-Type Channels

Bao, Z., Inventor; Borkentn, E. J., Inventor; Li, D., Inventor; 24 Jun 04; 20 pp.; In English

Contract(s)/Grant(s): 70NANB-2-H13032

Patent Info.: Filed Filed 24 Jun 04; US-Patent-Appl-SN-10-875-478

Report No.(s): PB2007-113301; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention provides a dual organic field-effect transistor (OFET) structure and a method of fabricating the structure. The dual OFET structure includes an n-type organic semiconductor layer and a p-type organic semiconductor layer in contact with each other along an interface and forming a stack. The dual OFET structure also includes a source electrode and a drain electrode, the source and drain electrodes being in contact with one of the organic semiconductor layers. The dual OFET structure further includes first and second gate structures located on opposite sides of the stack. The first gate structure is configured to control a channel region of the n-type organic semiconductor layer, and the second gate structure is configured to control a channel region of the p-type organic semiconductor layer.

NTIS

Field Effect Transistors; N-Type Semiconductors; P-Type Semiconductors; Semiconductors (Materials)

20080032497 Universal Display Corp., Ewing, NJ, USA

Novel Smart Windows Based on Transparent Phosphorescent OLEDs. Report for January 1, 2005 to December 31, 2005

January 2005; 18 pp.; In English

Report No.(s): DE2007-912695; No Copyright; Avail.: Department of Energy Information Bridge

In this program, Universal Display Corporation (UDC) and Princeton University developed the use of white transparent phosphorescent organic light emitting devices (PHOLEDs) to make low-cost 'transparent OLED (TOLED) smart windows,' that switch rapidly from being a highly efficient solid-state light source to being a transparent window PHOLEDs are ideal for large area devices, and the UDC-Princeton team has demonstrated white PHOLEDs with efficiencies of >24 IdW at a luminance of 1,000 cd/m²., TOLEDs have transparencies >70% over the visible wavelengths of light, but their transparency drops to less than 5% for wavelengths shorter than 350 nm, so they can also be used as ultraviolet (UV) light filters, In addition to controlling the flow of W radiation, TOLEDs coupled with an electromechanical or electrically activated reflecting shutter on a glass window can be employed to control the flow of heat from infrared (IR) radiation by varying the reflectance/transparency of the glass for wavelengths greater than 800nm., One particularly attractive shutter technology is reversible electrochromic mirrors (REM) Our goal was therefore to integrate two innovative concepts to meet the U ,S , Department of Energy goals: high power efficiency TOLEDs, plus electrically controlled reflectors to produce a 'smart window,,'

NTIS

Light Sources; Phosphorescence; Transparency

20080032580 Argonne National Lab., Idaho Falls, ID, USA

Quantitative Determination of Lateral Mode Dispersion in Film Bulk Acoustic Resonators Through Laser Acoustic Imaging. 2006 IEEE International Ultrasonics Symposium

Telschow, K. L.; Larson, J. D.; Oct. 2006; 5 pp.; In English

Report No.(s): DE2007-911645; INL/CON-06-11118; No Copyright; Avail.: National Technical Information Service (NTIS)

Film Bulk Acoustic Resonators are useful for many signal processing applications. Detailed knowledge of their operation properties are needed to optimize their design for specific applications. The finite size of these resonators precludes their use in single acoustic modes; rather, multiple wave modes, such as, lateral wave modes are always excited concurrently. In order to determine the contributions of these modes, we have been using a newly developed full-field laser acoustic imaging approach to directly measure their amplitude and phase throughout the resonator. This paper describes new results comparing modeling of both elastic and piezoelectric effects in the active material with imaging measurement of all excited modes. Fourier transformation of the acoustic amplitude and phase displacement images provides a quantitative determination of excited mode amplitude and wavenumber at any frequency. Images combined at several frequencies form a direct visualization of lateral mode excitation and dispersion for the device under test allowing mode identification and comparison with predicted operational properties. Discussion and analysis are presented for modes near the first longitudinal thickness resonance (approximately 900 MHz) in an AlN thin film resonator.

NTIS

Acoustic Imaging; Conferences; Lasers; Resonators; Sound Generators; Ultrasonics

20080032582 Argonne National Lab., Idaho Falls, ID, USA

U.S. Department of Energy FreedomCAR & Vehicle Technologies Program--Hydrogen and Hydrogen/Natural Gas Station and Vehicle Operations--2006 Summary Report

Brayer, R.; Karner, D.; Francfort, J.; Sep. 2006; 44 pp.; In English

Report No.(s): DE2007-911564; INL/EXT-06-11689; No Copyright; Avail.: Department of Energy Information Bridge

This report is a summary of the operations and testing of internal combustion engine vehicles that were fueled with 100% hydrogen and various blends of hydrogen and compressed natural gas (HCNG). It summarizes the operations of the Arizona Public Service Alternative Fuel Pilot Plant, which produces, compresses, and dispenses hydrogen fuel. Other testing activities, such as the destructive testing of a CNG storage cylinder that was used for HCNG storage, are also discussed. This report highlights some of the latest technology developments in the use of 100% hydrogen fuels in internal combustion engine vehicles. Reports are referenced and WWW locations noted as a guide for the reader that desires more detailed information. These activities are conducted by Arizona Public Service, Electric Transportation Applications, the Idaho National Laboratory, and the U.S. Department of Energy's Advanced Vehicle Testing Activity.

NTIS

Energy Technology; Hydrogen; Hydrogen Fuels; Natural Gas

20080032605 International Business Machines Corp., Armonk, NY, USA

Circuit for Controlling Leakage

Ngo, H. C., Inventor; Kuang, J. B., Inventor; Nowka, K. J., Inventor; 12 Aug 04; 21 pp.; In English

Contract(s)/Grant(s): NBCH30390004

Patent Info.: Filed Filed 12 Aug 04; US-Patent-Appl-SN-10-916 980

Report No.(s): PB2008-100651; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Leakage current in logic circuitry is managed by coupling and decoupling the voltage potentials of the power supply from circuitry with large high leakage devices. Driver circuits comprise a low leakage logic path for holding logic states of the output. A high leakage logic path in parallel with the low leakage logic path is used to assert each logic state in the forward direction from input to output. The large output device in each high leakage path that enhances the current drive of a logic state on the output are leakage stress relieved by allowing their drive inputs to collapse after the output logic state has been asserted. The high leakage logic paths employ multiple stages with collapsing logic states that are generated in response to asserted logic states on the output and logic states of the low leakage logic path thus reducing the device sizes needed to control leakage.

NTIS

Circuits; Leakage; Patent Applications

34

FLUID MECHANICS AND THERMODYNAMICS

Includes fluid dynamics and kinematics and all forms of heat transfer; boundary layer flow; hydrodynamics; hydraulics; fluidics; mass transfer and ablation cooling. For related information see also *02 Aerodynamics*.

20080031007 Idaho National Engineering Lab., Idaho Falls, ID, USA

Particle Methods for Simulation of Subsurface Multiphase Fluid Flow and Biogeological Processes

Meakin, P.; Tartakovsky, A.; Scheibe, T.; Tartakovsky, D.; Redden, G.; Jun. 2007; 12 pp.; In English

Report No.(s): DE2007-912911; INL/CON-07-12848; No Copyright; Avail.: National Technical Information Service (NTIS)

A number of particle models that are suitable for simulating multiphase fluid flow and biogeological processes have been developed during the last few decades. Here we discuss three of them: a microscopic model - molecular dynamics; a mesoscopic model - dissipative particle dynamics; and a macroscopic model - smoothed particle hydrodynamics. Particle methods are robust and versatile, and it is relatively easy to add additional physical, chemical and biological processes into particle codes. However, the computational efficiency of particle methods is low relative to continuum methods. Multiscale particle methods and hybrid (particleparticle and particlecontinuum) methods are needed to improve computational efficiency and make effective use of emerging computational capabilities. These new methods are under development.

NTIS

Biogeochemistry; Biomass; Computerized Simulation; Fluid Flow; Fuels; Multiphase Flow; Particle Motion

20080031037 Boeing Co., Renton, WA, USA; NASA Marshall Space Flight Center, Huntsville, AL, USA

MISSE Thermal Control Materials with Comparison to Previous Flight Experiments

Finckenor, Miria; Pippin, H. Gary; Frey, George; May 20, 2008; 8 pp.; In English; The Ninth International Space Conference-Protection of Materials and Structures from the Space Environment, 20-23 May 2008, Toronto, Canada; Original contains black and white illustrations; Copyright; Avail.: CASI: [A02](#), Hardcopy

Many different passive thermal control materials were flown as part of the Materials on International Space Station Experiment (MISSE), including inorganic coatings, anodized aluminum, and multi-layer insulation materials. These and other material samples were exposed to the low Earth orbital environment of atomic oxygen, ultraviolet radiation, thermal cycling, and hard vacuum, though atomic oxygen exposure was limited for some samples. Materials flown on MISSE-1 and MISSE-2 were exposed to the space environment for nearly four years. Materials flown on MISSE-3, MISSE-4, and MISSE-5 were exposed to the space environment for one year. Solar absorptance, infrared emittance, and mass measurements indicate the durability of these materials to withstand the space environment. Effects of short duration versus long duration exposure on ISS are explored, as well as comparable data from previous flight experiments, such as the Passive Optical Sample Assembly (POSA), Optical Properties Monitor (OPM), and Long Duration Exposure Facility (LDEF).

Author

International Space Station; Thermal Control Coatings; Extraterrestrial Environments; Durability; Physical Properties; Spaceborne Experiments; Temperature Control

20080031111 NASA Glenn Research Center, Cleveland, OH, USA

Heat Transfer in Conical Corner and Short Superelliptical Transition Ducts

Poinsatte, Philip; Thurman, Douglas; Hippensteele, Steven; June 2008; 21 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 561581.02.08.03.02.02

Report No.(s): NASA/TP-2008-214944; ARL-TR-4199; E-16176; Copyright; Avail.: CASI: [A03](#), Hardcopy

Local surface heat transfer measurements were experimentally mapped using a transient liquid-crystal heat-transfer technique on the surface of two circular-to-rectangular transition ducts. One has a transition cross section defined by conical corners (Duct 1) and the other by an elliptical equation with changing coefficients (Duct 2). Duct 1 has a length-to-diameter ratio of 0.75 and an exit plane aspect ratio of 1.5. Duct 2 has a length-to-diameter ratio of 1.0 and an exit plane aspect ratio of 2.9. Test results are reported for various inlet-diameter-based Reynolds numbers ranging from 0.45 10^6 to 2.39 10^6 and two freestream turbulence intensities of about 1 percent, which is typical of wind tunnels, and up to 16 percent, which may be more typical of real engine conditions.

Author

Heat Transfer; Ducted Flow; Liquid Crystals; Coefficients; Reynolds Number; Aspect Ratio; Ducts

20080031178 NASA Langley Research Center, Hampton, VA, USA

Unified Application Vapor Screen Flow Visualization and Pressure Sensitive Paint Measurement Techniques to Vortex- and Shock Wave-Dominated Flow Fields

Erickson, Gary E.; July 2008; 31 pp.; In English; ISFV13 - 13th International Symposium on Flow Visualization, 1-4 Jul. 2008, Nice, France; Original contains color and black and white illustrations

Report No.(s): ISFV13 Paper No. 122; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031178>

Laser vapor screen (LVS) flow visualization and pressure sensitive paint (PSP) techniques were applied in a unified approach to wind tunnel testing of slender wing and missile configurations dominated by vortex flows and shock waves at subsonic, transonic, and supersonic speeds. The off-surface cross-flow patterns using the LVS technique were combined with global PSP surface static pressure mappings to characterize the leading-edge vortices and shock waves that coexist and interact at high angles of attack (α). The synthesis of LVS and PSP techniques was also effective in identifying the significant effects of passive surface porosity and the presence of vertical tail surfaces on the flow topologies. An overview is given of LVS and PSP applications in selected experiments on small-scale models of generic slender wing and missile configurations in the NASA Langley Research Center (NASA LaRC) Unitary Plan Wind Tunnel (UPWT) and 8-Foot Transonic Pressure Tunnel (8-Foot TPT).

Author

Scale Models; Shock Waves; Transonic Wind Tunnels; Vapors; Vortices; Wind Tunnel Tests; Pressure Sensitive Paints; Flow Visualization

20080031179 George Washington Univ., Newport News, VA, USA; NASA Langley Research Center, Hampton, VA, USA
An Experimental and Numerical Study of a Supersonic Burner for CFD Model Development
Magnotti, G.; Cutler, A. D.; July 20, 2008; 14 pp.; In English; 44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference & Exhibit, 20-23 Jul. 2008, Hartford, CT, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 732759.07.06; Copyright; Avail.: CASI: [A03](#), Hardcopy

A laboratory scale supersonic burner has been developed for validation of computational fluid dynamics models. Detailed numerical simulations were performed for the flow inside the combustor, and coupled with finite element thermal analysis to obtain more accurate outflow conditions. A database of nozzle exit profiles for a wide range of conditions of interest was generated to be used as boundary conditions for simulation of the external jet, or for validation of non-intrusive measurement techniques. A set of experiments was performed to validate the numerical results. In particular, temperature measurements obtained by using an infrared camera show that the computed heat transfer was larger than the measured value. Relaminarization in the convergent part of the nozzle was found to be responsible for this discrepancy, and further numerical simulations sustained this conclusion.

Author

Computational Fluid Dynamics; Burners; Supersonic Flow; Wind Tunnel Tests; Mathematical Models; Numerical Analysis

20080031346 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Thermal Vacuum Testing of a Multi-Evaporator Miniature Loop Heat Pipe
Ku, Jentung; Ottenstein, Laura; Nagano, Hosei; May 13, 2008; 26 pp.; In English; 2008 International Two-Phase Thermal Control Technology Workshop, 13-15 May 2008, Noordwijk, Netherlands; Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

Under NASA's New Millennium Program Space Technology 8 Project, four experiments are being developed for future small system applications requiring low mass, low power, and compactness. GSFC is responsible for developing the Thermal Loop experiment, which is an advanced thermal control system consisting of a miniature loop heat pipe (MLHP) with multiple evaporators and condensers. The objective is to validate the operation of an MLHP, including reliable start-ups, steady operation, heat load sharing, and tight temperature control over the range of 273K to 308K. An MLHP Breadboard has been built and tested for 1200 hours under the laboratory environment and 500 hours in a thermal vacuum chamber. Results of the TV tests are presented here.

Derived from text

Heat Pipes; Evaporators; Aerospace Engineering; Temperature Control; Technological Forecasting; Miniaturization

20080031705 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil
Simulation and Analysis of the Granular Fluids Dynamics
Soterroni, Aline Cristina; [2007]; 133 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format
Report No.(s): INPE-14808-TDI/1251; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A07](#), Hardcopy

Granular materials are ubiquitous in nature and in our daily lives, and used in many industrial processes. Depending on the physical conditions that they are subjected, granular materials may present unusual behavior, combining properties of solids, liquids or gases, and displaying interesting and diversified phenomena. In this work we numerically simulated two granular systems in order to investigate the phenomenon of size segregation (System 1) and pattern formation in vertically vibrated thin granular layers (System 2). Results for the System 1 suggest that the phenomenon of segregation is the effect of the combination of two distinct mechanisms: buoyancy and convection. For System 2, we found disordered patterns but with some isolated squares, pentagons and hexagons. The dynamics observed in System 2 is essentially diffusive, Brownian motion-type, in contrast with the convective dynamics displayed by System 1, characterized by the presence of a convection cell within the simulation box.

Author

Granular Materials; Computational Fluid Dynamics; Size Separation; Patterns

20080031724 Idaho National Engineering Lab., Idaho Falls, ID, USA
Recent Heat Transfer Improvements to the RELAP5-3D Code
Riemke, R. A.; Davis, C. B.; Oh, C. H.; May 01, 2007; 6 pp.; In English
Contract(s)/Grant(s): DE-AC07-99ID-13727

Report No.(s): DE2007-911964; INL/CON-07-12083; No Copyright; Avail.: Department of Energy Information Bridge

The heat transfer section of the RELAP5-3D computer program has been recently improved. The improvements are as

follows: (1) the general cladding rupture model was modified (more than one heat structure segment connected to the hydrodynamic volume and heat structure geometrys internal gap pressure), (2) the cladding rupture model was modified for reflood, and (3) the heat transfer minor edits/plots were extended to include radiation/enclosure heat flux and generation (internal heat source).

NTIS

Computer Programs; Heat Transfer

20080031739 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Thermal Interface Comparisons Under Flight Like Conditions

Rodriguez-Ruiz, Juan; March 11, 2008; 42 pp.; In English; Spacecraft Thermal Control Workshop, 11-13 Mar. 2008, El Segundo, CA, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: [A03](#), Hardcopy
ONLINE: <http://hdl.handle.net/2060/20080031739>

Thermal interface materials are used in bolted interfaces to promote good thermal conduction between the two. The mounting surface can include panels, heat pipes, electronics boxes, etc. . On Lunar Reconnaissance Orbiter (LRO) project the results are directly applicable: a) Several high power avionics boxes b) Several interfaces from RWA to radiator through heat pipe network

Derived from text

Conductive Heat Transfer; Avionics; Reconnaissance; Heat Pipes; Flight Conditions

20080032260 Pratt and Whitney Aircraft Group, East Hartford, CT, USA

High Admittance Acoustic Liner

Proscia, W., Inventor; Jones, C. D., Inventor; Patrick, W. P., Inventor; 28 Jun 04; 10 pp.; In English
Contract(s)/Grant(s): F33657-99-D-2051-008
Patent Info.: Filed Filed 28 Jun 04; US-Patent-Appl-SN-10-878-806
Report No.(s): PB2007-113285; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A cooled acoustic liner useful in a fluid handling duct includes a resonator chamber with a neck, a face sheet, and a coolant plenum residing between the face sheet and the chamber. Coolant bypasses the resonator chamber, rather than flowing through it, resulting in better acoustic admittance than in liners in which coolant flows through the resonator chamber and neck. In one embodiment, the liner also includes a graze shield. Openings, penetrate both the face sheet and the shield to establish a relatively low face sheet porosity and a relatively high shield porosity. The shielded embodiment of the invention helps prevent a loss of acoustic admittance due to fluid grazing past the liner. Another embodiment that is not necessarily cooled, includes the resonator chamber, low porosity face sheet and high porosity shield, but no coolant plenum for bypassing coolant around the resonator chamber. An associated method of retrofitting an acoustic treatment into a fluid handling module includes installing openings in the module and mounting a resonator box on the module so that the inlets to the resonator necks register with the installed openings.

NTIS

Acoustic Ducts; Ducts; Electrical Impedance; Linings; Patent Applications

20080032315 Moore and Van Allen, PLLC, Mooresville, NC, USA

Recoilless Impact Device

Sabates, F., Inventor; Wilson, D., Inventor; Mossey, C., Inventor; Johnson, M., Inventor; VanCampen, C., Inventor; 10 May 06; 22 pp.; In English
Patent Info.: Filed Filed 10 May 06; US-Patent-Appl-SN-11-125-706
Report No.(s): PB2007-113281; No Copyright; Avail.: CASI: [A03](#), Hardcopy

An apparatus for generating an impact against a target object comprises a driver reciprocally disposed in a housing. The driver includes a hollow tube having a closed end and a nozzle sealing the other end. A piston is slidably positioned in the tube. Propellant is disposed between the piston and the closed end of the tube and fluid is disposed between the nozzle and the piston. A rupture disc is provided for sealing the nozzle which is adapted to rupture when the pressure in the tube exceeds a predetermined pressure. A striker is also mounted in the housing so that in a retracted position of the striker a head portion is proximate the driver and a portion of a shaft extends outwardly from the housing. The striker member is movable between the retracted position and an extended position. The propellant is ignited so that combustion gases build pressure in the tube between the piston and the closed end of the tube causing the pressure in the tube to exceed the predetermined pressure for rupturing the disc. This causes the piston to move toward the nozzle and fluid to be expelled through the nozzle for moving

the driver against the head portion of the striker. The driver transfers energy to the striker for moving the striker to the extended position at high velocity for driving the end of the striker with great force against the target object. Recoil action is cushioned by the fluid exiting the nozzle.

NTIS

Patent Applications; Propellants; Targets

20080032372 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Numerical Analysis of the Turbulent Coaxial Jets

EduardoMeloLima, Luiz; [2007]; 145 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14799-TDI/1242; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A07](#), Hardcopy

The understanding of the jets behavior is of extreme importance in several practical applications in combustion and propulsion. Therefore, it becomes more and more important the detailed analysis of the parameters that affect the characteristics of this type of flow. This work presents a numerical study of the incompressible turbulent coaxial jets characteristics, based in the analysis of the variation in the velocities ratio of the internal and external jets, and of the variation in the nozzles internal to external diameter relation. The turbulent jets characteristics analyzed in this work are the decay of the centerline speed, the spreading rate, the length of the potential cores, the mean velocity profiles, the Reynolds stress distribution, the variation of turbulent viscosity, the turbulent kinetic energy and the dissipation rate of turbulent kinetic energy. The Reynolds decomposition process, generally applied to incompressible and compressible flows, were used as mathematical tool in the formulation of the turbulent flow. This decomposition process supply the Reynolds Averaged Navier-Stokes equation. For the closing of the mean equations becomes necessary the modeling of the unknown terms (Reynolds stress) that arise due the non linearity of the instantaneous equations in the mean flow. Therefore, it is necessary to use turbulence models to model the Reynolds stress. The numerical solution of the equations were carried through the use of a developed application to solve specific problems in continuous mechanics. This application, called OpenFOAM, are a C++ library, of open source code for Computational Fluid Dynamics, that uses a finite volume method in the equation discretization. Besides the analysis of turbulent coaxial jets, the numerical analysis of a coaxial jets configuration identical of the axisymmetrical simple jet has also been carried. And also of coaxial jets configuration with a nozzles areas ratio similar of a Delft piloted jet diffusion flame burner, considering simple coaxial nozzles without edge between the two jets and also the influence of the edge between the burner nozzles. As results, it was possible to get results that had been compared with others authors in similar configurations and other results not available in the literature, observing the main differences between them.

Author

Numerical Analysis; Turbulent Jets; Incompressible Flow; Computational Fluid Dynamics

20080032485 National Energy Technology Lab., Morgantown, WV, USA

CAPE-OPEN Integration for Advanced Process Engineering Co-Simulation

Zitney, S. E.; January 2007; 32 pp.; In English

Report No.(s): DE2007-912708; DOE/NETL-IR-2007-037; No Copyright; Avail.: National Technical Information Service (NTIS)

This paper highlights the use of the CAPE-OPEN (CO) standard interfaces in the Advanced Process Engineering Co-Simulator (APECS) developed at the National Energy Technology Laboratory (NETL). The APECS system uses the CO unit operation, thermodynamic, and reaction interfaces to provide its plug-and-play co-simulation capabilities, including the integration of process simulation with computational fluid dynamics (CFD) simulation. APECS also relies heavily on the use of a CO COM/CORBA bridge for running process/CFD co-simulations on multiple operating systems. For process optimization in the face of multiple and some time conflicting objectives, APECS offers stochastic modeling and multi-objective optimization capabilities developed to comply with the CO software standard. At NETL, system analysts are applying APECS to a wide variety of advanced power generation systems, ranging from small fuel cell systems to commercial-scale power plants including the coal-fired, gasification-based FutureGen power and hydrogen production plant.

NTIS

Computational Fluid Dynamics; Product Development; Simulation; Simulators

20080032507 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Computational Model 2D for Gaseous Flow with Heat Transfer for a Reactor Type CVD

CavalhoBarbosa, Divani; January 2008; 108 pp.; In Portuguese; Original contains color and black and white illustrations

Report No.(s): INPE-15095-TDI/1274; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A06](#), Hardcopy

In this work a prototype for the computational numerical simulation of gaseous flow, with heat transfer, is elaborated upon

and applied to the reactor type CVD, existing in the Laboratorio Asociado de Sensores e Materiais (LAS) of the Instituto Nacional de Pesquisas Espaciais (INPE). Initially, the intention was to define which the best type of mesh to be used in this work, for diffusion due to heat transference. The reactor type CVD was simulated using three different types of meshes: structuralized, not structuralized and mixing (constructed for multi-blocks). With the mesh defined, and with the goal of implementing the correct solution method for the system of equations, a study was made of its initial character, regarding the behavior of the fluid between two plain plates, half-infinite parallel bars. The decision to use this implementation was based upon analytical results found in literature, which revealed that this method had been used for validation. During the implementation of this simulation, the most laborious task was the coupling of physical largeness (pressure and speed); to this end, two different types of methods were tested using Gresho e Sani (1987) and the Semi Implicit Linked Equations (SIMPLE). With the type of mesh and method defined, implemented, and validated, the next step was the simulation of reactor draining. In an effort to better understand the function of the three studied processes of transport in this work (forced convection, natural and diffusion heat transfer), the behavior of the gas was simulated in four different configurations. These four configurations had been projected so that the transport of the gas, gift in the region of the hot lament to the substrate, either helped or confused for the free and forced convection, thus indicating the paper of the convective and diffusion transport during the process of growth of the film in the reactor type CVD.

Author (revised)

Computational Fluid Dynamics; Two Dimensional Models; Gas Flow; Heat Transfer; Vapor Deposition

20080032590 NASA Glenn Research Center, Cleveland, OH, USA

An Idealized, Single Radial Swirler, Lean-Direct-Injection (LDI) Concept Meshing Script

Iannetti, Anthony C.; Thompson, Daniel; July 2008; 42 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): WBS 984754.02.07.19.02

Report No.(s): NASA/TM--2008-215048; E-16261; Copyright; Avail.: CASI: [A03](#), Hardcopy

To easily study combustor design parameters using computational fluid dynamics codes (CFD), a Gridgen Glyph-based macro (based on the Tcl scripting language) dubbed BladeMaker has been developed for the meshing of an idealized, single radial swirler, lean-direct-injection (LDI) combustor. BladeMaker is capable of taking in a number of parameters, such as blade width, blade tilt with respect to the perpendicular, swirler cup radius, and grid densities, and producing a three-dimensional meshed radial swirler with a can-annular (canned) combustor. This complex script produces a data format suitable for but not specific to the National Combustion Code (NCC), a state-of-the-art CFD code developed for reacting flow processes.

Author

Computational Fluid Dynamics; Combustion Chambers; Injection; Gas Turbine Engines; Grid Generation (Mathematics)

20080032594 Hartman and Hartman, P.C., Vaiparaiso, IN, USA

Device and Method for Sensing Rheological Properties of a Fluid

Sparks, D. R., Inventor; Najafi, N., Inventor; 19 Jul 05; 14 pp.; In English

Contract(s)/Grant(s): DOD-W56HZV-05-C-0126

Patent Info.: Filed Filed 19 Jul 05; US-Patent-Appl-SN-11-184 620

Report No.(s): PB2008-100107; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A method and device for assessing rheological properties of a fluid, including lubricity and viscosity. The invention utilizes a tube into which the fluid is introduced, and relies on tracking the movement of particles intentionally introduced into the fluid to assess the rheological properties of the fluid. The method and device generally entail introducing at least one solid particle into the fluid to cause the particle to flow through the portion of the tube, and assessing a rheological property of the fluid within the tube by tracking the movement of the particle through the portion relative to the flow of the fluid through the portion.

NTIS

Detection; Patent Applications; Rheology

20080032602 Bureau of Reclamation, Denver, CO USA

Theory and Problems of Water Percolation. Engineering Monographs No. 8

Zangar, C. N.; Apr. 1953; 87 pp.; In English

Report No.(s): PB2008-100594; No Copyright; Avail.: CASI: [A05](#), Hardcopy

The flow of water through dams and their foundations, and the accompanying pressures and gradients that exist, have long

been recognized by engineers as important factors in dam design. This monograph is concerned with the effects of this 'percolating' water and the methods for correcting these effects when they are thought to be detrimental. Also given are several methods for determining the permeability of soils by field tests. These problems resolve themselves into a study of the slow flow of water through porous media. Slow flow as used here is defined as laminar flow in which the Reynolds number is 1 or less. If the Reynolds number becomes larger than 1, it is possible for turbulence to develop. In this case, Darcy's law governing the slow flow of water through porous media, no longer applies. Darcy's law will be treated in detail under the section on general theory, which follows; but briefly, it states that the rate of flow, Q , of water through a porous medium is directly proportional to the cross-sectional area, A , and to the pressure gradient acting. There are many engineering problems to which the laws of slow flow of water apply and which, consequently, affect the design of the structures involved. Some of these problems are: 1. Percolation through concrete dams and their foundations. 2. Percolation through earth dams and their foundations. 3. Flow into drains embedded in concrete and soil. 4. Flow around cut-off walls. 5. Foundation settlement (consolidation). Most of these problems involve a knowledge of the permeability of the materials involved.

NTIS

Dams; Documents; Percolation; Water; Water Flow

20080032617 NASA Langley Research Center, Hampton, VA, USA

CFD Support of NASP Design

McClinton, Charles R.; Bittner, Robert D.; Kamath, Pradeep S.; October 29, 1990; 23 pp.; In English; AIAA Second International Aerospace Planes Conference, 29-31 Oct. 1990, Orlando, FL, USA; Original contains black and white illustrations

Report No.(s): AIAA Paper-90-5249; Copyright; Avail.: CASI: [A03](#), Hardcopy

This paper presents a summary of design studies from the 'open' literature which illustrate the level of effort and the use of computational fluid dynamics (CFD) to support the National Aerospace Plane (NASP) X-30 design. CFD plays a major role in the NASP program, particularly for the very high speed regions (Mach greater than 10) where wind tunnels cannot fully simulate the flow and/or flow field measurements are difficult to obtain. Full simulation (nose-to-tail analysis) of the NASP flow field, both internal and external, is discussed.

Author

Computational Fluid Dynamics; National Aerospace Plane Program; X-30 Vehicle; Spacecraft Design; Air Breathing Engines

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INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography. For aerial photography see *43 Earth Resources and Remote Sensing*. For related information see also *06 Avionics and Aircraft Instrumentation*; and *19 Spacecraft Instrumentation and Astrionics*.

20080031000 National Security Technologies, LLC, Las Vegas, NV, USA

Flash X-Ray Diffraction System for Fast, Single-Pulse Temperature and Phase Transition Measurements

Morgan, D. V.; Macy, D. R.; Madlener, M. J.; Morgan, J. G.; January 2007; 4 pp.; In English

Report No.(s): DE2007-913067; No Copyright; Avail.: Department of Energy Information Bridge

A new, fast, single-pulse diagnostic for determining phase transitions and measuring the bulk temperature of polycrystalline metal objects has been developed. The diagnostic consists of a 37-stage Marx bank with a cable-coupled X-ray diode that produces a 35-ns pulse of mostly 0.71-A monochromatic X rays and a P-43 fluor coupled to a cooled, charge-coupled device camera by a coherent fiber-optic bundle for detection of scattered X rays. The X-ray beam is collimated to a 1DG divergence in the scattering plane with the combination of a 1.5-mm tungsten pinhole and a 1.5-mm-diameter molybdenum anode. X rays are produced by a high-energy electron beam transiting inward from the cathode to the anode in a needle-and-washer configuration. The anodes characteristic K- α X-ray emission lines are utilized for this diffraction system. The X-ray anode is heavily shielded in all directions other than the collimated beam. The X-ray diode has a sealed reentrant system, allowing X rays to be produced inside a vacuum containment vessel, close to the sample under study.

NTIS

Phase Transformations; Temperature Measurement; X Ray Diffraction; Polycrystals

20080031150 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Contrast Measurements of the Microshutter Arrays for the NIRSpec

Kutyrev, Alexander; Chambers, J.; Moseley, S. H.; Rapchun, D.; January 07, 2008; 1 pp.; In English; American Astronomical Society, 7-10 Jan. 2008, Austin, TX, USA

Contract(s)/Grant(s): NNG06EO90A; No Copyright; Avail.: Other Sources; Abstract Only

We have been developing programmable microshutter arrays for the Near Infrared Spectrometer (NIRSpec) on the James Webb Space telescope (JWST). These arrays are an enabling technology that allows to turn NIRSpec into a powerful multi-object spectrometer and tremendously increase its efficiency. The arrays are essentially 2D programmable masks that are designed to operate at cryogenic temperatures of JWST. The primary optical characteristic of the microshutter array is a contrast, that is defined as a ratio of the transmitted light intensity through open shutters to the intensity of the transmitted light through the closed shutters. To eliminate the noise and confusion from other sources in the field of view and therefore to improve the detection limit, the contrast provided by the microshutter array should be very high, with the goal of 10,000. The test system that we have developed specifically for the purpose of the high contrast characterization of the microshutter array devices has been used to test several microshutter arrays. It is capable of measuring contrast values of up to 10^5 and therefore can reliably measure contrast values of the arrays that satisfy the requirements. The arrays have been characterized for the contrast ratio and its behavior with temperature and other array operating parameters. The arrays that we have tested meet or exceed the NIRSpec requirements.

Author

Near Infrared Radiation; Spectrometers; Arrays; James Webb Space Telescope

20080031151 NASA Goddard Space Flight Center, Greenbelt, MD, USA

High Resolution Near Infrared Spectrometer to Study the Zodiacal Light Spectrum

Kutyrev, Alexander; Arendt, Richard G.; Dwek, Eli; Moseley, Samuel H.; Silverberg, Robert F.; Rapchun, David; January 07, 2008; 1 pp.; In English; American Astronomical Society, 7-10 Jan. 2008, Austin, TX, USA

Contract(s)/Grant(s): NNG06EO90A; No Copyright; Avail.: Other Sources; Abstract Only

We are developing a near infrared spectrometer for measuring solar absorption lines in the zodiacal light in the near infrared region. R. Reynolds et al. (2004, ApJ 612, 1206) demonstrated that observing single Fraunhofer line can be a powerful tool for extracting zodiacal light parameters based on their measurements of the profile of the Mg I line at 5184 Å. We are extending this technique to the near infrared with the primary goal of measuring the absolute intensity of the zodiacal light. This measurement will provide the crucial information needed to accurately subtract zodiacal emission from the DIRBE measurements to get a much higher quality measurement of the extragalactic IR background. The instrument design is based on a dual Fabry-Perot interferometer with a narrow band filter. Its double etalon design allows to achieve high spectral contrast to reject the bright out of band telluric OH emission. High spectral contrast is absolutely necessary to achieve detection limits needed to accurately measure the intensity of the absorption line. We present the design, estimated performance of the instrument with the expected results of the observing program.

Author

High Resolution; Infrared Spectrometers; Near Infrared Radiation; Zodiacal Light; Light Emission; Absorption Spectra

20080031154 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The 'Best Worst' Field Optimization and Focusing

Vaughann, David; Moore, Ken; Bock, Noah; Zhou, Wei; Ming, Liang; Wilson, Mark; June 23, 2008; 1 pp.; In English; SPIE Astronomical Telescopes and Instrumentation 2008 Conference, 23-28 Jun. 2008, Marseille, France; Copyright; Avail.:

Other Sources; Abstract Only

A simple algorithm for optimizing and focusing lens designs is presented. The goal of the algorithm is to simultaneously create the best and most uniform image quality over the field of view. Rather than relatively weighting multiple field points, only the image quality from the worst field point is considered. When optimizing a lens design, iterations are made to make this worst field point better until such a time as a different field point becomes worse. The same technique is used to determine focus position. The algorithm works with all the various image quality metrics. It works with both symmetrical and asymmetrical systems. It works with theoretical models and real hardware.

Author

Algorithms; Iteration; Lens Design; Focusing; Optimization

20080031456 Department of the Army, Washington, DC USA

Simultaneous 4-Stokes Parameter Determination Using a Single Digital Image

Gerhart, Grant R., Inventor; Matchko, Roy M., Inventor; Jun 12, 2007; 11 pp.; In English; PATENT-7 230 700 B2 Report No.(s): AD-D020361; TARDEC-17153; No Copyright; Avail.: US Patent and Trademark Office

A method for determining and displaying polarization profiles of points in a scene from a single imaging detector array, which utilizes a filter system comprised of a retarder, four linear polarizers, four lenses, a color filter, camera lens and CCD video camera. Light from points in a scene are transmitted through the system and exits with attenuated intensities unique for each wavelength of the light. A narrowband color filter selects the wavelength of interest. The four lenses in the system produce four images of the scene, which are recorded as a single CCD-image. The attenuated intensities in each of the four scene-images are used to calculate the Stokes parameters for selected points in the scene for the selected wavelength. A computer program separates the four scene-images in the CCD-image, crops, registers them and calculates the Stokes parameters for each point in the cropped scene.

DTIC

Image Processing; Patents

20080031487 Missouri Univ., Rolla, MO, USA

A Novel 24 GHz One-Shot, Rapid and Portable Microwave Imaging System

Ghasr, M. T.; Abou-Khousa, M. A.; Kharkovsky, S.; Zoughi, R.; Pommerenke, D.; May 12, 2008; 5 pp.; In English; 12MTC 2008 - IEEE International Instrumentation and Measurement Technology Conference, 12-15 May 2008, Victoria, BC, Canada; Original contains black and white illustrations

Contract(s)/Grant(s): NNM06AA06G; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031487>

Development of microwave and millimeter wave imaging systems has received significant attention in the past decade. Signals at these frequencies penetrate inside of dielectric materials and have relatively small wavelengths. Thus, imaging systems at these frequencies can produce images of the dielectric and geometrical distributions of objects. Although there are many different approaches for imaging at these frequencies, they each have their respective advantageous and limiting features (hardware, reconstruction algorithms). One method involves electronically scanning a given spatial domain while recording the coherent scattered field distribution from an object. Consequently, different reconstruction or imaging techniques may be used to produce an image (dielectric distribution and geometrical features) of the object. The ability to perform this accurately and fast can lead to the development of a rapid imaging system that can be used in the same manner as a video camera. This paper describes the design of such a system, operating at 24 GHz, using modulated scatterer technique applied to 30 resonant slots in a prescribed measurement domain.

Author

Microwave Imagery; Dielectrics; Millimeter Waves; Cameras

20080031613 NASA Langley Research Center, Hampton, VA, USA

Stereoscopic Imaging in Hypersonics Boundary Layers using Planar Laser-Induced Fluorescence

Danehy, Paul M.; Bathel, Brett; Inman, Jennifer A.; Alderfer, David W.; Jones, Stephen B.; June 23, 2008; 14 pp.; In English; 38th AIAA Fluid Dynamics Conference and Exhibit, 23-26 Jun. 2008, Seattle, WA, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 599489

Report No.(s): AIAA 2008-4267; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031613>

Stereoscopic time-resolved visualization of three-dimensional structures in a hypersonic flow has been performed for the first time. Nitric Oxide (NO) was seeded into hypersonic boundary layer flows that were designed to transition from laminar to turbulent. A thick laser sheet illuminated and excited the NO, causing spatially-varying fluorescence. Two cameras in a stereoscopic configuration were used to image the fluorescence. The images were processed in a computer visualization environment to provide stereoscopic image pairs. Two methods were used to display these image pairs: a cross-eyed viewing method which can be viewed by naked eyes, and red/blue anaglyphs, which require viewing through red/blue glasses. The images visualized three-dimensional information that would be lost if conventional planar laser-induced fluorescence imaging had been used. Two model configurations were studied in NASA Langley Research Center's 31-Inch Mach 10 Air Wind tunnel. One model was a 10 degree half-angle wedge containing a small protuberance to force the flow to transition. The other model was a 1/3-scale, truncated Hyper-X forebody model with blowing through a series of holes to force the boundary layer flow to transition to turbulence. In the former case, low flowrates of pure NO seeded and marked the boundary layer fluid.

In the latter, a trace concentration of NO was seeded into the injected N₂ gas. The three-dimensional visualizations have an effective time resolution of about 500 ns, which is fast enough to freeze this hypersonic flow. The 512x512 resolution of the resulting images is much higher than high-speed laser-sheet scanning systems with similar time response, which typically measure 10-20 planes.

Author

Boundary Layer Flow; Hypersonic Boundary Layer; Hypersonic Flow; Imaging Techniques; Laser Induced Fluorescence; Boundary Layers; Turbulence

20080031674 NASA Kennedy Space Center, Cocoa Beach, FL, USA

Image Edge Extraction via Fuzzy Reasoning

Dominquez, Jesus A., Inventor; Klinko, Steve, Inventor; July 15, 2008; 14 pp.; In English; Original contains black and white illustrations

Patent Info.: Filed 19 Feb. 2004; US-Patent-7,400,766; US-Patent-Appl-SN-10/783295; NASA-Case-KSC-12278; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031674>

A computer-based technique for detecting edges in gray level digital images employs fuzzy reasoning to analyze whether each pixel in an image is likely on an edge. The image is analyzed on a pixel-by-pixel basis by analyzing gradient levels of pixels in a square window surrounding the pixel being analyzed. An edge path passing through the pixel having the greatest intensity gradient is used as input to a fuzzy membership function, which employs fuzzy singletons and inference rules to assign a new gray level value to the pixel that is related to the pixel's edginess degree.

Author

Edge Detection; Image Analysis; Fuzzy Systems

20080031676 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Upgrades to Electronic Speckle Interferometer (ESPI) Operation and Data Analysis at NASA's Goddard Space Flight Center

Connelly, Joseph; Blake, Peter; Jones, Joycelyn; September 2008; 1 pp.; In English; SPIE Europe Optical Systems Design, 1-5 Sep. 2008, Glasgow, Scotland, UK; No Copyright; Avail.: Other Sources; Abstract Only

The authors report operational upgrades and streamlined data analysis of a commissioned electronic speckle interferometer (ESPI) in a permanent in-house facility at NASA's Goddard Space Flight Center. Our ESPI was commercially purchased for use by the James Webb Space Telescope (JWST) development team. We have quantified and reduced systematic error sources, improved the software operability with a user-friendly graphic interface, developed an instrument simulator, streamlined data analysis for long-duration testing, and implemented a turn-key approach to speckle interferometry. We also summarize results from a test of the JWST support structure (previously published), and present new results from several pieces of test hardware at various environmental conditions.

Author

Speckle Interferometry; James Webb Space Telescope; Data Processing; Image Analysis

20080031700 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Wavefront Sensing with the Fine Guidance Sensor for James Webb Space Telescope

Smith, J. Scott; Aronstein, David; Dean, Bruce H.; Howard, Joe; Shiri, Ron; June 23, 2008; 1 pp.; In English; SPIE Astronomical Instrumentation Conference, 23-28 Jun. 2008, Marseilles, France; No Copyright; Avail.: Other Sources; Abstract Only

An analysis is presented that utilizes the Fine Guidance Sensor (FGS) for focal-plane wavefront sensing (WFS) for the James Webb Space Telescope (JWST). WFS with FGS increases the number of wavefront measurements taken in field of the telescope, but has many challenges over the other JWST instruments that make it unique, such as; less sampling of the Point Spread Function (PSF), a smaller diversity-defocus range, a smaller image detector size, and a polychromatic object or source. Additionally, presented is an analysis of sampling for wavefront sensing. Results are shown based on simulations of flight and the cryogenic optical testing at NASA Johnson Space Center.

Author

Wave Fronts; James Webb Space Telescope; Guidance Sensors; Focusing; Detection; Cryogenics

20080031703 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Image Mosaicking Based on Multiresolution Analysis

Bagli, Vantier Veronezi; [2007]; 114 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14807-TDI/1250; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A06](#), Hardcopy

The mosaicking process is of interest in many applications such as remote sensing and cartography applications. It is, in general, performed in two stages. In the first stage, the corresponding points in the two to-be-combined images are identified and matched. In the second stage, the intensities of the overlapped images are blended. The task of image blending in the registration process is referred to as blending or compositing. The aim of blending is to provide a smooth transition between images and to eliminate visible seams (due to exposure differences), blurring (due to mis-registration), or ghosting (due to moving objects). The compositing of registered images must address the problem of determining how the pixels belonging to overlapping areas should be represented. This task involves selecting those pixels that contribute to the final composite and how to optimally blend them to minimize the visible seams, blur, and ghosting. The composition of two or more images may generate geometric and radiometric discontinuities along the line where two individual images abut. This line is called a seam or cut line. Visible seams between the images ruin the illusion that the mosaic is a continuous image. Therefore, an ideal blending process should automatically build seamless mosaics. This task can be achieved through the integration of modern techniques to construct an intelligent cut line and an efficient blending algorithm. The present work describes a blending technique that integrates methods to create a seam line in the high frequency regions and multiresolution analysis to blend the images. The results show that the method developed is more efficient when compared to traditional methods.

Author

Image Reconstruction; Image Resolution; Image Analysis; Digital Techniques; High Resolution; Mosaics

20080031712 NASA Marshall Space Flight Center, Huntsville, AL, USA

A Novel 24 Ghz One-Shot Rapid and Portable Microwave Imaging System (Camera)

Ghasr, M.T.; Abou-Khousa, M.A.; Kharkovsky, S.; Zoughi, R.; Pommerenke, D.; May 12, 2008; 21 pp.; In English; I2MTC 2008 - IEEE International Instrumentation and Measurement Technology Conference, 12-15 May 2008, British Columbia, Canada; Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

A novel 2D microwave imaging system at 24 GHz based on MST techniques. Enhanced sensitivity and SNR by utilizing PIN diode-loaded resonant slots. Specific slot and array design to increase transmission and reduce cross-coupling. Real-time imaging at a rate in excess of 30 images per second. Reflection as well transmission mode capabilities. Utility and application for electric field distribution mapping related to: Nondestructive Testing (NDT), imaging applications (SAR, Holography), and antenna pattern measurements.

Derived from text

Microwave Imagery; Real Time Operation; Imaging Techniques; Nondestructive Tests; Diodes; Cameras; Electric Fields

20080032333 McDermott, Will, and Emery, Los Angeles, CA, USA

High Dynamic Range Image Editing

Debevec, P. E., Inventor; Hawkins, T. S., Inventor; Tchou, C. D. X. N., Inventor; 1 Feb 05; 8 pp.; In English

Contract(s)/Grant(s): DMD 19-99-D-0046

Patent Info.: Filed 1 Feb 05; US-Patent-Appl-SN-11-049-834

Report No.(s): PB2007-113327; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A high dynamic range image editing system for editing an image file having pixels spanning a first range of light intensity levels in an image editing system that only displays differences in the light intensity levels of pixels within a second range of light intensity levels that is less than the first range of light intensity levels, without reducing the range of light intensity levels in the image file.

NTIS

Dynamic Range; Editing; Image Processing

20080032345 Ollila Setter, LLC, Boulder, VA, USA

Sensor System to Distinguish Frozen and Non-Frozen Liquid Particulates

Rasmussen, R. M., Inventor; Hallett, J., Inventor; 22 Dec 04; 17 pp.; In English

Contract(s)/Grant(s): NSF-MRI 63406630414; NSF-98-C-00031

Patent Info.: Filed 22 Dec 04; US-Patent-Appl-SN-11-025-214

Report No.(s): PB2007-110516; No Copyright; Avail.: CASI: A03, Hardcopy

A sensor system comprises a first sensor, a second sensor, and circuitry. The first sensor collects non-frozen liquid with a first collection efficiency, but does not collect frozen liquid. The second sensor collects non-frozen liquid with a second collection efficiency and also collects frozen liquid. The first collection efficiency and the second collection efficiency are substantially equivalent. The circuitry maintains the first sensor and the second sensor at a substantially constant temperature. The circuitry determines a measurement of the frozen liquid based on maintaining the first sensor and the second sensor at the substantially constant temperature. In some examples, multiple sensor systems can be used in combination to improve the accuracy of the measurement.

NTIS

Sensors; Circuits; Liquids; Ice; Particulates; Detection

20080032367 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Windy Mars: A Dynamic Planet as Seen by the HiRISE Camera

Bridges, N. T.; Geissler, P. E.; McEwen, A. S.; Thomson, B. J.; Chuang, F. C.; Herkenhoff, K. E.; Keszthelyi, L. P.; Martinez-Alonso, S.; *Geophysical Research Letters*; December 15, 2007; Volume 34; 7 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40888>; <http://dx.doi.org/10.1029/2007GL031445>

With a dynamic atmosphere and a large supply of particulate material, the surface of Mars is heavily influenced by wind-driven, or aeolian, processes. The High Resolution Imaging Science Experiment (HiRISE) camera on the Mars Reconnaissance Orbiter (MRO) provides a new view of Martian geology, with the ability to see decimeter-size features. Current sand movement, and evidence for recent bedform development, is observed. Dunes and ripples generally exhibit complex surfaces down to the limits of resolution. Yardangs have diverse textures, with some being massive at HiRISE scale, others having horizontal and cross-cutting layers of variable character, and some exhibiting blocky and polygonal morphologies. 'Reticulate' (fine polygonal texture) bedforms are ubiquitous in the thick mantle at the highest elevations.

Author

Mars Reconnaissance Orbiter; Imaging Techniques; High Resolution; Planetary Geology; Mars Surface; Cameras

20080032370 NASA Marshall Space Flight Center, Huntsville, AL, USA

Potential Application of Airborne Passive Microwave Observations for Monitoring Inland Flooding Caused by Tropical Cyclones

Hood, Robbie E.; Radley, C.D.; LaFontaine, F.J.; April 28, 2008; 1 pp.; In English; AMS 28th Conference on Hurricanes and Tropical Meteorology, 28 Apr. - 2 May 2008, Florida, USA; No Copyright; Avail.: Other Sources; Abstract Only

Inland flooding from tropical cyclones can be a significant factor in storm-related deaths in the USA and other countries. Information collected during NASA tropical cyclone field studies suggest surface water and flooding induced by tropical cyclone precipitation can be detected and therefore monitored using passive microwave airborne radiometers. In particular, the 10.7 GHz frequency of the NASA Advanced Microwave Precipitation Radiometer (AMPR) flown on the NASA ER-2 has demonstrated high resolution detection of anomalous surface water and flooding in numerous situations. This presentation will highlight the analysis of three cases utilizing primarily satellite and airborne radiometer data. Radiometer data from the 1998 Third Convection and Moisture Experiment (CAMEX-3) are utilized to detect surface water during landfalling Hurricane Georges in both the Dominican Republic and Louisiana. A third case is landfalling Tropical Storm Gert in Eastern Mexico during the Tropical Cloud Systems and Processes (TCSP) experiment in 2005. AMPR data are compared to topographic data and vegetation indices to evaluate the significance of the surface water signature visible in the 10.7 GHz information. The results of this study suggest the benefit of an aircraft 10 GHz radiometer to provide real-time observations of surface water conditions as part of a multi-sensor flood monitoring network.

Author

Cyclones; Floods; Tropical Regions; Tropical Storms; Microwave Radiometers; Airborne Equipment

20080032415 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Instrument Performance of GISMO, a 2 Millimeter TES Bolometer Camera used at the IRAM 30 m Telescope

Staguhn, Johannes; June 23, 2008; 1 pp.; In English; SPIE 2008: Astronomical Instrumentation, 23-28 Jun. 2008, Marseille, France

Contract(s)/Grant(s): NNG06O90A; No Copyright; Avail.: Other Sources; Abstract Only

In November of 2007 we demonstrated a monolithic Backshort-Under-Grid (BUG) 8x16 array in the field using our 2 mm

wavelength imager GISMO (Goddard IRAM Superconducting 2 Millimeter Observer) at the IRAM 30 m telescope in Spain for astronomical observations. The 2 mm spectral range provides a unique terrestrial window enabling ground-based observations of the earliest active dusty galaxies in the universe and thereby allowing a better constraint on the star formation rate in these objects. The optical design incorporates a 100 mm diameter silicon lens cooled to 4 K, which provides the required fast beam yielding 0.9 λ/D pixels. With this spatial sampling, GISMO will be very efficient at detecting sources serendipitously in large sky surveys, while the capability for diffraction limited imaging is preserved. The camera provides significantly greater detection sensitivity and mapping speed at this wavelength than has previously been possible. The instrument will fill in the spectral energy distribution of high redshift galaxies at the Rayleigh-Jeans part of the dust emission spectrum, even at the highest redshifts. Here I will we present early results from our observing run with the first fielded BUG bolometer array. We have developed key technologies to enable highly versatile, kilopixel, infrared through millimeter wavelength bolometer arrays. The Backshort-Under-Grid (BUG) array consists of three components: 1) a transition-edge-sensor (TES) based bolometer array with background-limited sensitivity and high filling factor, 2) a quarter-wave reflective backshort grid providing high optical efficiency, and 3) a superconducting bump-bonded large format Superconducting Quantum Interference Device (SQUID) multiplexer readout. The array is described in more detail elsewhere (Allen et al., this conference). In November of 2007 we demonstrated a monolithic 8x 16 array with 2 mm-pitch detectors in the field using our 2 mm wavelength imager GISMO (Goddard IRAM Superconducting 2 Millimeter Observer) at the IRAM 30 m telescope in Spain for astronomical observations. The 2 mm spectral range provides a unique terrestrial window enabling ground-based observations of the earliest active dusty galaxies in the universe and thereby allowing a better constraint on the star formation rate in these objects. The optical design incorporates a 100 mm diameter silicon lens cooled to 4 K, which provides the required fast beam yielding 0.9 λ/D pixels. With this spatial sampling, GISMO will be very efficient at detecting sources serendipitously in large sky surveys, while the capability for diffraction limited imaging is preserved. The camera provides significantly greater detection sensitivity and mapping speed at this wavelength than has previously been possible. The instrument will fill in the spectral energy distribution of high redshift galaxies at the Rayleigh-Jeans part of the dust emission spectrum, even at the highest redshifts. Here I will we present early results from our observing run with the first fielded BUG bolometer array.

Author

Superconductivity; Telescopes; Astronomy; Bolometers; Sensors; Interference; Cameras

20080032416 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Testing Microshutter Arrays Using Commercial FPGA Hardware

Rapchun, David; June 23, 2008; 1 pp.; In English; SPIE 2008: Astronomical Instrumentation, 23-28 Jun. 2008, Marseille, France

Contract(s)/Grant(s): NAS5-01090; No Copyright; Avail.: Other Sources; Abstract Only

NASA is developing micro-shutter arrays for the Near Infrared Spectrometer (NIRSpec) instrument on the James Webb Space Telescope (JWST). These micro-shutter arrays allow NIRSpec to do Multi Object Spectroscopy, a key part of the mission. Each array consists of 62414 individual 100 x 200 micron shutters. These shutters are magnetically opened and held electrostatically. Individual shutters are then programmatically closed using a simple row/column addressing technique. A common approach to provide these data/clock patterns is to use a Field Programmable Gate Array (FPGA). Such devices require complex VHSIC Hardware Description Language (VHDL) programming and custom electronic hardware. Due to JWST's rapid schedule on the development of the micro-shutters, rapid changes were required to the FPGA code to facilitate new approaches being discovered to optimize the array performance. Such rapid changes simply could not be made using conventional VHDL programming. Subsequently, National Instruments introduced an FPGA product that could be programmed through a Labview interface. Because Labview programming is considerably easier than VHDL programming, this method was adopted and brought success. The software/hardware allowed the rapid change the FPGA code and timely results of new micro-shutter array performance data. As a result, numerous labor hours and money to the project were conserved.

Author

Near Infrared Radiation; Infrared Spectrometers; Arrays; Field-Programmable Gate Arrays; Electromechanical Devices; James Webb Space Telescope

20080032421 NASA Goddard Space Flight Center, Greenbelt, MD, USA

A Compact, Modular Superconducting Bolometer Array Package

Benford, Dominic J., et al.; June 23, 2008; 1 pp.; In English; SPIE 2008: Millimeter and Submillimeter Detectors, 23-28 Jun. 2008, Marseille, France; No Copyright; Avail.: Other Sources; Abstract Only

We have designed a detector package to house a superconducting bolometer array, SQUID multiplexers, bias and

integration circuitry, optical filtering, electrical connectors, and thermal/mechanical interfaces. This package has been used successfully in the GISMO 2mm camera, a 128-pixel camera operating at a base temperature of 270mK. Operation at lower temperatures is allowed by providing direct heat sinking to the SQUIDS and bias resistors, which generate the bulk of the dissipation in the package. Standard electrical connectors provide reliable contact while enabling quick installation and removal of the package. Careful design has gone into the compensation for differing thermal expansions, the need for heat sinking of the bolometer array, and the placement of magnetic shielding in critical areas. In this presentation, we detail the design and performance of this detector package and describe its scalability to 1280- pixel arrays in the near future.

Author

Bolometers; Superconductivity; Radiation Detectors

20080032457 NASA Goddard Space Flight Center, Greenbelt, MD, USA

FIR/THz Space Interferometry: Science Opportunities, Mission Concepts, and Technical Challenges

Leisawitz, David; September 02, 2007; 1 pp.; In English; Infrared-Millimeter-Terahertz Conference, 2-7 Sep. 2007, Wales, UK; No Copyright; Avail.: Other Sources; Abstract Only

Sensitive far-IR imaging and spectroscopic measurements of astronomical objects on sub-arcsecond angular scales are essential to our understanding of star and planet formation, the formation and evolution of galaxies, and to the detection and characterization of extrasolar planets. Cold single-aperture telescopes in space, such as the Spitzer Space Telescope and the Herschel Space Observatory, are very sensitive, but they lack the necessary angular resolution by two or more orders of magnitude. Far-IR space interferometers will address this need in the coming decades. Several mission concepts have already been studied, including in the US the Space Infrared Interferometric Telescope (SPIRIT) and the more ambitious Submillimeter Probe of the Evolution of Cosmic Structure (SPECS). This talk will describe science goals and summarize alternative concepts for future FIR/THz space interferometry missions. Small arrays of sensitive, fast, direct detectors are a key enabling technology for SPIRIT and SPECS. I will describe the technology requirements for far-IR interferometry, including the detector requirements, and their derivation from the mission science goals and instrument concepts.

Author

Far Infrared Radiation; Imaging Techniques; Interferometry; Mission Planning; Spaceborne Telescopes; Extrasolar Planets

20080032494 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Terrestrial Planet Finder Interferometer Formation Control Performance Demonstration

Schwarz, Daniel P, Editor; Lawson, Peter R., Editor; January 2008; 83 pp.; In English; Original contains color illustrations Contract(s)/Grant(s): NAS7-03001; 101743.10.01.03.02.1

Report No.(s): JPL Publication 08-11; TPF-1 Technology Milestone #2 Report; No Copyright; Avail.: CASI: [A05](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080032494>

This document reports the achievement of Terrestrial Planet Finder Interferometer (TPF-I) Technology Milestone #2, a ground-based, system-level demonstration of two-spacecraft formation synchronized rotation. We review the milestone specification from the Milestone White Paper (May 25, 2007), summarize the experiments performed in the Formation Control Testbed (FCT), detail the procedures and analysis of the resulting data, and describe and present the data itself.

Author

Interferometers; Terrestrial Planets; Technology Utilization; Formation Flying

20080032513 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Hertz/VPM Polarimeter: Design and First Light Observations

Krejny, Megan; Chuss, David; d'Aubigny, Christian Drouet; Golish, Dathon; Houde, Martin; Hui, Howard; Kulesa, Craig; Loewenstein, Robert F.; Moseley, Harvey; Novak, Giles; Voellmer, George; Walker, Chris; Wollack, Ed; [2008]; 33 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NNG05GL31H; ARPA04-0077-0150; Copyright; Avail.: Other Sources

We present first results of Hertz/VPM, the first submillimeter polarimeter employing the dual Variable-delay Polarization Modulator (dual-VPM). This device differs from previously used polarization modulators in that it, operates in translation rather than mechanical rotation. We discuss the basic theory behind this device, and its potential advantages over the commonly used half wave plate (HFVP). The dual-VPM was tested both at the Submillimeter Telescope Observatory (SMTO) and in the lab. In each case we present a detailed description of the setup. We discovered nonideal behavior in the system. This is at least in part due to properties of the VPM wire grids (diameter, spacing) employed in our experiment. Despite this,

we found that the dual-VPM system is robust, operating with high efficiency and low instrumental polarization. This device is well suited for air and space-borne applications.

Author

Submillimeter Waves; Mathematical Models; Modulators; Astronomical Polarimetry

20080032522 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Detector Modeling and CMB Polarimetry Technology Development at GSFC

Chuss, David T.; Wollack, Edward J.; Moseley, S. Harvey; Withington, Stafford; Saklatvala, George; December 03, 2007; 8 pp.; In English; Ultra-low-noises Detectors Workshop, 3 Dec. 2007, Cambridge, UK; Original contains black and white illustrations; No Copyright; Avail.: CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080032522>

Pixel size limits the resolution in the focal plane. This should be accounted for in optical design. Alternatively, this reduces the effective number of independent detectors. Polarization and scattering are intrinsically related, and both are more severe at low $p\lambda$. Future work: Quantification of the pixel cross-coupling- calculate a theoretical covariance matrix to predict performance of future detector arrays.

Derived from text

Polarimetry; Pixels; Optical Equipment; Design Analysis; Performance Prediction; Cross Coupling

20080032574 Fish and Richardson, P.C., Minneapolis, MN, USA

Spectrometer System for Optical Reflectance Measurements

Soller, Babs R., Inventor; Phillips, Patrick G., Inventor; Parker, Michael S., Inventor; 25 Apr 05; 27 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): AMRC-DAMD 17-03-1-0005; NASBRI-SMS-00205; NCC9-58

Patent Info.: Filed 25 Apr 05; US-Patent-Appl-SN-11-113347; US 2005/0259254

Report No.(s): PB2007-109195; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080032574>

A spectrometer system includes a thermal light source for illuminating a sample, where the thermal light source includes a filament that emits light when heated. The system additionally includes a spectrograph for measuring a light spectrum from the sample and an electrical circuit for supplying electrical current to the filament to heat the filament and for controlling a resistance of the filament. The electrical circuit includes a power supply that supplies current to the filament, first electrical components that sense a current through the filament, second electrical components that sense a voltage drop across the filament, third electrical components that compare a ratio of the sensed voltage drop and the sensed current with a predetermined value, and fourth electrical components that control the current through the filament or the voltage drop across the filament to cause the ratio to equal substantially the predetermined value.

Author

Light Sources; Optical Measurement; Reflectance; Spectrometers

36

LASERS AND MASERS

Includes lasing theory, laser pumping techniques, maser amplifiers, laser materials, and the assessment of laser and maser outputs. For cases where the application of the laser or maser is emphasized see also the specific category where the application is treated. For related information see also *76 Solid-State Physics*.

20080032521 NASA Goddard Space Flight Center, Greenbelt, MD, USA

LISA Pathfinder

Stebbins, Robin; January 07, 2008; 1 pp.; In English; 211th Meeting of the American Astronomical Society, 7-11 Jan. 2008, Austin, TX, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: [A01](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080032521>

USA Pathfinder is a space mission dedicated to demonstrating technology for the Laser Interferometer Space Antenna (LISA). LISA is a joint ESA/NASA mission to detect low-frequency gravitational waves on the 0.0001 to 0.1 Hz frequency band. LISA is expected to observe 100's of merging massive black hole binaries out to $z=15$, tens of thousands of close compact binary systems in the Milky Way, merging intermediate-mass black hole binaries, tens of stellar-mass black holes falling into supermassive black holes in galactic centers, and possibly other exotic sources. Several critical LISA technologies have not

been demonstrated at the requisite level of performance. In spaceflight, and some flight hardware cannot be tested in a 1-g environment. Hence, the LISA Pathfinder mission is being implemented to demonstrate these critical LISA technologies in a relevant flight environment. LISA Pathfinder mimics one arm of the LISA constellation by shrinking the 5-million-kilometer armlength down to a few tens of centimeters. The experimental concept is to measure the relative separation between two test masses nominally following their own geodesics, and thereby determine the relative residual acceleration between them near 1 mHz, about a decade above the lowest frequency required by LISA. To implement such a concept, disturbances on the test masses must be kept very small by many design features, but chiefly by 'drag-free' flight. A drag-free spacecraft follows a free-falling test mass which it encloses, but has no mechanical connection to. The spacecraft senses its orientation and separation with respect to the proof mass, and its propulsion system is commanded to keep the spacecraft centered about the test mass. Thus, the spacecraft shields the test mass from most external influences, and minimizes the effect of force gradients arising from the spacecraft, and acting on the test mass. LISA Pathfinder will compare the geodesic of one test mass against that of the other. Only a metrology system based on interferometry can achieve the displacement sensitivity. Interferometers monitor the separation of both test masses with a sensitivity comparable to that required by LISA, and using the same technologies. LISA Pathfinder is scheduled to be launched in the first half of 1020 to a Lissajous orbit around the first Sun-Earth Lagrange point, L1. In addition to a complete European technology package (the LISA Technology Package, or LTP), LISA Pathfinder will also carry thrusters and software, known as ST-7, a part of NASA's New Millennium Program.

Author

LISA (Observatory); Pathfinder Nuclear Reactor; Gravitational Waves; Space Missions

37

MECHANICAL ENGINEERING

Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see *63 Cybernetics, Artificial Intelligence, and Robotics*; and *54 Man/System Technology and Life Support*.

20080031605 NASA Langley Research Center, Hampton, VA, USA

Device and Method for Connections Made between a Crimp Connector and Wire

Yost, William T., Inventor; Cramer, K. Elliott, Inventor; Perey, Daniel F., Inventor; 9 Sep 04; 21 pp.; In English; Original contains black and white illustrations

Patent Info.: Filed 9 Sep 04; US-Patent-Appl-SN-10-943649; US 2005/0193792

Report No.(s): PB2007-111938; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031605>

An ultrasonic device and method obtains desirable crimp connections between a crimp connector and a wire, or bundle of wires, by assessing the desirability of connections made in a wire-to-wire connection and in other situations where two materials with good acoustic propagation characteristics are joined together via deformation. An embodiment of the device as a crimping tool comprises a compressing means, pulse-generating circuitry, at least one ultrasonic transmitting transducer, at least one ultrasonic receiving transducer, receiving circuitry, and a display. The user may return to a previously crimped connection and assess the desirability of the connection by compressing the device about the connection, sending an acoustic signal through the crimp, and comparing the received signal to a signal obtained from known desirable connections.

Author

Folding; Tools; Signal Transmission; Sound Waves; Wire; Ultrasonics; Electric Connectors

20080032496 Michigan Technological Univ., Houghton, MI, USA

Direct Injection Compression Ignition Diesel Automotive Technology Education GATE Program. Report for September 1998 to September 30, 2005

Anderson, C. L.; Mar. 16, 2006; 13 pp.; In English

Contract(s)/Grant(s): DE-FC26-98CH10951

Report No.(s): DE2007-912696; No Copyright; Avail.: Department of Energy Information Bridge

The underlying goal of this project was to provide multi-disciplinary engineering training for graduate students in the area of internal combustion engines, specifically in direct injection compression ignition engines. The program was designed to educate highly qualified engineers and scientists that will seek to overcome technological barriers preventing the development and production of cost-effective high-efficiency vehicles for the U.S. market. Further, these highly qualified engineers and scientists will foster an educational process to train a future workforce of automotive engineering professionals who are

knowledgeable about and have experience in developing and commercializing critical advanced automotive technologies. Eight objectives were defined to accomplish this goal.

NTIS

Automobiles; Diesel Engines; Education; Ignition; Injection; Internal Combustion Engines

20080032693 Environmental Protection Agency, Washington, DC, USA

Light-Duty Automotive Technology and Fuel Economy Trends: 1975 through 2007. Appendix F: Car Data Stratified by EPA Car Class

Sep. 2007; 10 pp.; In English

Report No.(s): PB2008-101047; EPA-420-R-07-008F; No Copyright; Avail.: CASI: [A02](#), Hardcopy

This report, published in September 2007, provides data on the fuel economy and technology characteristics of new light-duty vehicles (cars, minivans, sport utility vehicles, and pickup trucks) for model years 1975 through 2007. EPA projects average real-world fuel economy for Model Year 2007 to be 20.2 miles per gallon, the same as in 2006. There is some uncertainty, however, as the 2007 estimate is based on pre-model-year sales projections provided by automakers to EPA at a time when gasoline prices were lower than today's levels.

NTIS

Automobile Fuels; Motor Vehicles

20080032694 Environmental Protection Agency, Washington, DC, USA

Light-Duty Automotive Technology and Fuel Economy Trends: 1975 through 2007. Appendix E: Data Stratified by Vehicle Type and Size

Sep. 2007; 16 pp.; In English

Report No.(s): PB2008-101046; EPA-420-R-07-008E; No Copyright; Avail.: CASI: [A03](#), Hardcopy

This report, published in September 2007, provides data on the fuel economy and technology characteristics of new light-duty vehicles (cars, minivans, sport utility vehicles, and pickup trucks) for model years 1975 through 2007. EPA projects average real-world fuel economy for Model Year 2007 to be 20.2 miles per gallon, the same as in 2006. There is some uncertainty, however, as the 2007 estimate is based on pre-model-year sales projections provided by automakers to EPA at a time when gasoline prices were lower than today's levels.

NTIS

Automobile Fuels; Motor Vehicles

20080032695 Environmental Protection Agency, Washington, DC, USA

Light-Duty Automotive Technology and Fuel Economy Trends: 1975 through 2007. Appendix D: Data Stratified by Vehicle Type

Sep. 2007; 16 pp.; In English

Report No.(s): PB2008-101045; EPA-420-R-07-008D; No Copyright; Avail.: CASI: [A03](#), Hardcopy

This report, published in September 2007, provides data on the fuel economy and technology characteristics of new light-duty vehicles (cars, minivans, sport utility vehicles, and pickup trucks) for model years 1975 through 2007. EPA projects average real-world fuel economy for Model Year 2007 to be 20.2 miles per gallon, the same as in 2006. There is some uncertainty, however, as the 2007 estimate is based on pre-model-year sales projections provided by automakers to EPA at a time when gasoline prices were lower than today's levels.

NTIS

Automobile Fuels; Motor Vehicles

20080032696 Environmental Protection Agency, Washington, DC, USA

Light-Duty Automotive Technology and Fuel Economy Trends: 1975 through 2007. Appendix C: Fuel Economy Distribution Data

Sep. 2007; 25 pp.; In English

Report No.(s): PB2008-101044; EPA-420-R-07-008C; No Copyright; Avail.: CASI: [A03](#), Hardcopy

This report, published in September 2007, provides data on the fuel economy and technology characteristics of new light-duty vehicles (cars, minivans, sport utility vehicles, and pickup trucks) for model years 1975 through 2007. EPA projects average real-world fuel economy for Model Year 2007 to be 20.2 miles per gallon, the same as in 2006. There is some

uncertainty, however, as the 2007 estimate is based on pre-model-year sales projections provided by automakers to EPA at a time when gasoline prices were lower than today's levels.

NTIS

Automobile Fuels; Motor Vehicles

20080032697 Environmental Protection Agency, Washington, DC, USA

Light-Duty Automotive Technology and Fuel Economy Trends: 1975 through 2007. Appendix A: Database Details and Calculation Methods

Sep. 2007; 16 pp.; In English

Report No.(s): PB2008-101042; EPA-420-R-07-008A; No Copyright; Avail.: CASI: [A03](#), Hardcopy

This report, published in September 2007, provides data on the fuel economy and technology characteristics of new light-duty vehicles (cars, minivans, sport utility vehicles, and pickup trucks) for model years 1975 through 2007. EPA projects average real-world fuel economy for Model Year 2007 to be 20.2 miles per gallon, the same as in 2006. There is some uncertainty, however, as the 2007 estimate is based on pre-model-year sales projections provided by automakers to EPA at a time when gasoline prices were lower than today's levels.

NTIS

Automobile Fuels; Data Bases; Motor Vehicles

20080032698 Environmental Protection Agency, Washington, DC, USA

Light-Duty Automotive Technology and Fuel Economy Trends: 1975 through 2007. Appendix B: Model Year 2007 Nameplate Fuel Economy Listings

Sep. 2007; 16 pp.; In English

Report No.(s): PB2008-101043; EPA-420-R-07-008B; No Copyright; Avail.: CASI: [A03](#), Hardcopy

This report, published in September 2007, provides data on the fuel economy and technology characteristics of new light-duty vehicles (cars, minivans, sport utility vehicles, and pickup trucks) for model years 1975 through 2007. EPA projects average real-world fuel economy for Model Year 2007 to be 20.2 miles per gallon, the same as in 2006. There is some uncertainty, however, as the 2007 estimate is based on pre-model-year sales projections provided by automakers to EPA at a time when gasoline prices were lower than today's levels.

NTIS

Automobile Fuels; Motor Vehicles

38

QUALITY ASSURANCE AND RELIABILITY

Includes approaches to, and methods for reliability analysis and control, quality control, inspection, maintainability, and standardization.

20080031321 NASA Wallops Flight Center, Wallops Island, VA, USA; NASA Johnson Space Center, Houston, TX, USA
Overview of NASA White Sands Test Facility Composite Overwrapped Pressure Vessel Testing

Greene, Nathanael; Saulsberry, Regor; Thesken, John; Phoenix, Leigh; March 06, 2006; 25 pp.; In English; 9th Joint FAA/DoD/NASA Aging Aircraft Conference, 6-9 Mar. 2006, Atlanta, GA, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

This viewgraph presentation examines the White Sands Test Facility testing of Composite overwrapped pressure vessel (COPV). A COPV is typically a metallic liner overwrapped with a fiber epoxy matrix. There is a weight advantage over the traditional all metal design. The presentation shows pictures of the facilities at White Sands, and then examines some of the testing performed. The tests include fluids compatibility, and Kevlar COPV. Data for the Kevlar tests are given, and an analysis is reviewed. There is also a comparison between Carbon COPVs and the Kevlar COPVs.

CASI

Composite Wrapping; Fiber Composites; Kevlar (Trademark); Pressure Vessels; Test Facilities

20080031329 NASA Johnson Space Center, Houston, TX, USA

Safety and Mission Assurance Knowledge Management Retention

Johnson, Teresa A.; March 02, 2006; 14 pp.; In English; Original contains color illustrations; No Copyright; Avail.:

CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031329>

This viewgraph presentation reviews the issues surrounding the management of knowledge in regards to safety and

mission assurance. The JSC workers who were hired in the 1960's are slated to retire in the next two to three years. The experiences and knowledge of these NASA workers must be identified, and disseminated. This paper reviews some of the strategies that the S&MA is developing to capture that valuable institutional knowledge.

CASI

Personnel; Safety; Knowledge

39

STRUCTURAL MECHANICS

Includes structural element design, analysis and testing; dynamic responses of structures; weight analysis; fatigue and other structural properties; and mechanical and thermal stresses in structures. For applications see *05 Aircraft Design, Testing and Performance*; and *18 Spacecraft Design, Testing and Performance*.

20080031118 NASA Langley Research Center, Hampton, VA, USA

Weld Residual Stress and Distortion Analysis of the ARES I-X Upper Stage Simulator (USS)

Raju, Ivatury; Dawicke, David; Cheston, Derrick; Phillips, Dawn; July 27, 2008; 14 pp.; In English; 2008 ASME Pressure Vessels and Piping Conference, 27-31 Jul. 2008, Chicago, IL, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 510505.03.07.01.11

Report No.(s): PVP 2008-61247; Copyright; Avail.: CASI: [A03](#), Hardcopy

An independent assessment was conducted to determine the critical initial flaw size (CIFS) for the flange-to-skin weld in the Ares I-X Upper Stage Simulator (USS). The Ares system of space launch vehicles is the US National Aeronautics and Space Administration's plan for replacement of the aging space shuttle. The new Ares space launch system is somewhat of a combination of the space shuttle system and the Saturn launch vehicles used prior to the shuttle. Here, a series of weld analyses are performed to determine the residual stresses in a critical region of the USS. Weld residual stresses both increase constraint and mean stress thereby having an important effect on fatigue and fracture life. While the main focus of this paper is a discussion of the weld modeling procedures and results for the USS, a short summary of the CIFS assessment is provided.

Author

Stress Analysis; Welding; Weld Strength; Ares 1 Upper Stage; Launch Vehicles; Fatigue (Materials); Spacecraft Launching; Residual Stress

20080031625 NASA Johnson Space Center, Houston, TX, USA

The Purpose of Generating Fatigue Crack Growth Threshold Data

Forth, Scott; November 13, 2006; 16 pp.; In English; ASTM Committee Meeting, 13-16 Nov. 2006, Atlanta, GA, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): 981155.01.05.12; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031625>

Test data shows that different width and thickness C(T), M(T) and ESE(T) specimens generate different thresholds. Structures designed for 'infinite life' are being re-evaluated: a) Threshold changes from 6 to 3 ksi in(sup 1/2); b) Computational life changes from infinite to 4 missions. Multi-million dollar test programs required to substantiate operation. Using ASTM E647 as standard guidance to generate threshold data is not practical. A threshold test approach needs to be standardized that will provide positive margin for high cycle fatigue applications.

Derived from text

Fatigue (Materials); Crack Propagation

20080032551 NASA Langley Research Center, Hampton, VA, USA

Constitutive Soil Properties for Unwashed Sand and Kennedy Space Center

Thomas, Michael A.; Chitty, Daniel E.; Gildea, Martin L.; T'Kindt, Casey M.; July 2008; 100 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNL07AA00B; WBS 644423.04.31.04.40.42

Report No.(s): NASA/CR-2008-215334; Copyright; Avail.: CASI: [A05](#), Hardcopy

Accurate soil models are required for numerical simulations of land landings for the Orion Crew Exploration Vehicle. This report provides constitutive material models for one soil, unwashed sand, from NASA Langley's gantry drop test facility and three soils from Kennedy Space Center (KSC). The four soil models are based on mechanical and compressive behavior observed during geotechnical laboratory testing of remolded soil samples. The test specimens were reconstituted to measured

in situ density and moisture content. Tests included: triaxial compression, hydrostatic compression, and uniaxial strain. A fit to the triaxial test results defines the strength envelope. Hydrostatic and uniaxial tests define the compressibility. The constitutive properties are presented in the format of LS-DYNA Material Model 5: Soil and Foam. However, the laboratory test data provided can be used to construct other material models. The four soil models are intended to be specific to the soil conditions discussed in the report. The unwashed sand model represents clayey sand at high density. The KSC models represent three distinct coastal sand conditions: low density dry sand, high density in-situ moisture sand, and high density flooded sand. It is possible to approximate other sands with these models, but the results would be unverified without geotechnical tests to confirm similar soil behavior.

Author

Mathematical Models; Mechanical Properties; Sands; Soil Science; Test Facilities

20080032607 Argonne National Lab., Idaho Falls, ID, USA

Manufactured Home Testing in Simulated and Naturally Occurring High Winds. WCTE 2006

Richins, W. D.; Larson, T. K.; Lacy, J. M.; Kobbe, R. G.; Aug. 2006; 9 pp.; In English

Report No.(s): DE2007-911197; INL/CON-06-11185; No Copyright; Avail.: National Technical Information Service (NTIS)

A typical double-wide manufactured home was tested in simulated and naturally occurring high winds to understand structural behavior and improve performance during severe windstorms. Seven lateral load tests were conducted on a double-wide manufactured home at a remote field test site in Wyoming. An extensive instrumentation package monitored the overall behavior of the home and collected data vital to validating computational software for the manufactured housing industry. The tests were designed to approach the design load of the home without causing structural damage, thus allowing the behavior of the home to be accessed when the home was later exposed to high winds (to 80-mph). The data generally show near-linear initial system response with significant non-linear behavior as the applied loads increase. Load transfer across the marriage line is primarily compression. Racking, while present, is very small. Interface slip and shear displacement along the marriage line are nearly insignificant. Horizontal global displacements reached 0.6 inch. These tests were designed primarily to collect data necessary to calibrate a desktop analysis and design software tool, MHTool, under development at the Idaho National Laboratory specifically for manufactured housing. Currently available analysis tools are, for the most part, based on methods developed for 'stick built' structures and are inappropriate for manufactured homes.

NTIS

Buildings; Loads (Forces)

42

GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology. For other specific topics in geosciences see *categories 42 through 48*.

20080031162 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Canopy Level Solar Induced Fluorescence for Vegetation in Controlled Experiments

Middleton, E. M.; Corp, L. A.; Campbell, P. K. Entcheva; July 23, 2007; 1 pp.; In English; International Geoscience and Remote Sensing Symposium, 23-27 Jul. 2007, Barcelona, Spain; Copyright; Avail.: Other Sources; Abstract Only

Solar induced chlorophyll fluorescence (SIF) was retrieved from high resolution reflectance spectra acquired one meter above saplings of three deciduous tree species during springtime (three weeks after leaf flush) and in late summer when foliage was mature. SIF was determined by application of the Fraunhofer Line Depth (FLD) Principal to above-canopy spectra acquired with an Analytical Spectral Devices (ASD) Fieldspec spectroradiometer (3.2 nm resolution with 1.2 nm sampling interval). SIF retrievals were made at the two atmospheric oxygen (O₂) absorption features that occur in the chlorophyll fluorescence (ChlF) region (660 -780 nm). These telluric features are O₂V, the broader and deeper feature centered at 760 nm, but located on the shoulder of the far-red ChlF peak at 740 nm; and O₂3, a narrow feature centered at 688 nm that is positioned near the red ChlF peak at 685 nm. Supporting, coincident leaf level fluorescence, reflectance, photochemical and other measurements were also made. At the leaf level, these measurements included in situ photosynthetic capacity (P_{max}) and light adapted total chlorophyll fluorescence (F_s') collected at steady state under high light and controlled chamber conditions (e.g., temperature, PAR, humidity, and CO₂); optical properties (reflectance, transmittance, absorptance); chlorophyll and carotenoid content; specific leaf mass; carbon (C) and nitrogen (N) content; fluorescence emission spectra at multiple excitation wavelengths; the ChlF contribution to red (R) and far-red (FR) reflectance; fluorescence imagery; and fluorescence excitation-emission matrices (EEMs). The tree species examined were tulip poplar (*Liriodendron tulipifera* L.), red maple

(*Acer rubrum* L.), and sweetgum (*Liquidambar styraciflua* L.), and each had been provided four levels of N augmentation (0, 19, 37, and 75 kg N/hectare seasonally) to simulate atmospheric deposition from air pollution. Whole-plant SIF measurements of these species were compared with SIF estimates derived using FluorMOD, a radiative transfer model that includes fluorescence properties of foliage, when provided with our supporting measurements. Simulated values for SIF were also compared with similar estimates made over three years for corn (*Zea mays* L.) crops under N treatments (20, 50, 70, and 140 kg N/hectare) and with corn and pepper (*Capsicum annuum* L.) plants provided dimethyl urea (DCMU, 0 and 5×10^{-5} M) which were grown in pots and grouped in artificial canopies for spectral measurements. For near-surface measurements of healthy and stressed vegetation, red SIF retrieved at 688 nm (O23) varied between 2-7 mW/m(exp 2)/nm/sr while far-red SIF retrieved at 760 nm (O2A) varied between 0.5 and 4.0 mW/m(exp 2)/nm/sr. Typical values for the SIF red/far-red ratio ranged between 1.75 and 4.0. Relationships of SIF to spectral reflectance indices and foliar photochemical indices were examined, such as photosynthetic light use efficiency. Initial investigations of the variability in these measurements at the same leaf temperature for sunlit and shaded foliage showed us that shaded foliage produced higher ChlF and light use efficiency. Other factors that affect SIF determinations are discussed. These results will assist in determine the expected intensity of the SIF signal from vegetation near the surface, as well as to identify enhancements needed for FluorMOD (or other such models), and will assist in determining relationships of SIF to reflectance indices and carbon dynamics.

Author

Fluorescence; Vegetation; Photochemical Reactions; Spectral Reflectance; Optical Properties; Atmospheric Attenuation; Emission Spectra; Farm Crops; Methyl Compounds; Chlorophylls

20080031669 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Atmospheric Observations from Unmanned Aircraft Systems

Newman, Paul A.; June 29, 2008; 1 pp.; In English; Quadrennial Ozone Symposium (QOS), 29 Jun. - 5 Jul. 2008, Tromso, Norway; No Copyright; Avail.: Other Sources; Abstract Only

Unmanned Aircraft Systems (UASs) provide a new and exciting avenue for atmospheric observations. NASA has a number of UASs. Amongst these are the Ikhana (24 hrs., 7000 km), the Altair (120 hrs., 6500 km), the Aerosonde (30 hrs., 3000 km), and the Global Hawk (30 hrs., 22,000 km). This presentation provides a brief history of UASs which is followed by a description of their capabilities. The presentation concludes by describing an example mission - the UAS Aura Validation Experiment (UAS-AVE). This mission will be flown on the NASA Global Hawk in the Spring/Summer of 2009. The goals for the mission are to: 1) provide Aura validation observations, 2) sample the break up of the Arctic polar vortex, 3) observed cross-Pacific transport of aerosols and pollutants such as ozone, and 4) sample intense water advective events that impact the U.S. west coast (atmospheric rivers). Because of their range and duration, UASs provide new and exciting opportunities for atmospheric science.

Author (revised)

Unmanned Aircraft Systems; Remote Sensing; Aerial Reconnaissance; Atmospheric Sounding

20080031687 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Polarimetric SAR Data Analysis for Tropical Forest Volume Estimation

Goncalves, Fabio Guimaraes; [2007]; 110 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14777-TDI/1230; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A06](#), Hardcopy

In this study it was evaluated the potential of polarimetric synthetic aperture radar (PolSAR) data for the retrieval of timber volume over tropical forests, with sights to identify areas with potential for sustainable timber production. As a secondary focus, it was made a sensitivity analysis of the PolSAR data in detecting floristic and structural variations in a selectively logged tropical forest area. The work was carried out in the Tapajos National Forest using L-band data acquired by the SAR-R99B airborne sensor. Procedures such as antenna pattern correction, polarimetric calibration and absolute calibration were initially performed in the polarimetric data treatment. Multiple regression techniques were applied to find out the predictive efficacy of the PolSAR data on timber volume estimation. In such a way, ground measurements from conventional forest inventories were used to adjust first order models for timber volume prediction. The set of explanatory variables was comprised of polarimetric attributes based on radar power returns, and on phase information. The sensitivity analysis of the PolSAR data in detecting floristic and structural variations was accomplished based on target decomposition and co-polarized responses. The results suggested the most important attributes for the timber volume modeling were the HV backscattering coefficient, the volume scattering component of the Freeman decomposition, the HH-VV phase difference, and the polarimetric coherence. A set of independent data, used for the models validation, showed the mean error in the volume estimation was below 15%. Thus, the results of this study confirm the hypothesis that L-band PolSAR data can be applied to

quantify timber stocks in the Amazon forest with the same accuracy as that presented by conventional forest inventories. Concerning the sensitivity analysis, the applied techniques were not effective enough to detect the floristic and structural variability in the study area.

Author

Polarimetry; Synthetic Aperture Radar; Rain Forests; Timber Inventory; Sensitivity Analysis

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EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis of remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photography. For related instrumentation see *35 Instrumentation and Photography*.

20080031139 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Atmospheric Radiative Transfer for Satellite Remote Sensing

Marshak, Alexander; May 31, 2008; 1 pp.; In English; 13th International Conference on Mathematical Modeling and Analysis, 31 May - 8 Jun. 2008, Tartu, Estonia; No Copyright; Avail.: Other Sources; Abstract Only

I will discuss the science of satellite remote sensing which involves the interpretation and inversion of radiometric measurements made from space. The goal of remote sensing is to retrieve some physical aspects of the medium which are sensitive to the radiation at specific wavelengths. This requires the use of fundamentals of atmospheric radiative transfer. I will talk about atmospheric radiation or, more specifically, about the interactions of solar radiation with aerosols and cloud particles. The focus will be more on cloudy atmospheres. I will also show how a standard one-dimensional approach, that is traced back at least 100 years, can fail to interpret the complexity of real clouds. In these cases, three-dimensional radiative transfer should be used. Examples of satellite retrievals will illustrate the cases.

Author

Atmospheric Radiation; Radiative Transfer; Remote Sensing; Clouds (Meteorology)

20080031172 NASA Dryden Flight Research Center, Edwards, CA, USA

Operational Experience with Long Duration Wildfire Mapping: UAS Missions Over the Western USA

Hall, Philip; Cobleigh, Brent; Buoni, Greg; Howell, Kathleen; June 12, 2008; 45 pp.; In English; AUVSI Unmanned Systems North America 2008, 10-12 Jun. 2008, San Diego, CA, USA; Original contains color illustrations; No Copyright; Avail.:

CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031172>

The National Aeronautics and Space Administration, USA Forest Service, and National Interagency Fire Center have developed a partnership to develop and demonstrate technology to improve airborne wildfire imaging and data dissemination. In the summer of 2007, a multi-spectral infrared scanner was integrated into NASA's Ikhana Unmanned Aircraft System (UAS) (a General Atomics Predator-B) and launched on four long duration wildfire mapping demonstration missions covering eight western states. Extensive safety analysis, contingency planning, and mission coordination were key to securing an FAA certificate of authorization (COA) to operate in the national airspace. Infrared images were autonomously geo-rectified, transmitted to the ground station by satellite communications, and networked to fire incident commanders within 15 minutes of acquisition. Close coordination with air traffic control ensured a safe operation, and allowed real-time redirection around inclement weather and other minor changes to the flight plan. All objectives of the mission demonstrations were achieved. In late October, wind-driven wildfires erupted in five southern California counties. State and national emergency operations agencies requested Ikhana to help assess and manage the wildfires. Four additional missions were launched over a 5-day period, with near realtime images delivered to multiple emergency operations centers and fire incident commands managing 10 fires.

Author

Fires; United States; Thematic Mapping; Unmanned Aircraft Systems

20080031173 NASA Langley Research Center, Hampton, VA, USA

1D-VAR Retrieval Using Superchannels

Liu, Xu; Zhou, Daniel; Larar, Allen; Smith, William L.; Schluessel, Peter; Mango, Stephen; SaintGermain, Karen; July 06, 2008; 2 pp.; In English; 2008 IEEE IGARSS, 6-11 Jul. 2008, Boston, MA, USA

Contract(s)/Grant(s): WBS 534173.02.07.9456.01; Copyright; Avail.: CASI: [A01](#), Hardcopy

Since modern ultra-spectral remote sensors have thousands of channels, it is difficult to include all of them in a 1D-var

retrieval system. We will describe a physical inversion algorithm, which includes all available channels for the atmospheric temperature, moisture, cloud, and surface parameter retrievals. Both the forward model and the inversion algorithm compress the channel radiances into super channels. These super channels are obtained by projecting the radiance spectra onto a set of pre-calculated eigenvectors. The forward model provides both super channel properties and jacobian in EOF space directly. For ultra-spectral sensors such as Infrared Atmospheric Sounding Interferometer (IASI) and the NPOESS Airborne Sounder Testbed Interferometer (NAST), a compression ratio of more than 80 can be achieved, leading to a significant reduction in computations involved in an inversion process. Results will be shown applying the algorithm to real IASI and NAST data. Derived from text

Algorithms; Remote Sensors; Mathematical Models; Atmospheric Sounding

20080031317 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Geotechnologies as Contribution to the Study of Coffee Crop Agroecosystem at Municipal Level in Minas Gerais State
Barros, Marco Aurelio; [2007]; 163 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14591-TDI/1177; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A08](#), Hardcopy

Coffee crops, an important economic and social activity to Brazil, is an agrobusiness segment that has not updated information about the agroecosystem and the productive profile. In this sense, a multidisciplinary and multi-institutional project was proposed in 2004, involving INPE, EMBRAPA and UFLA to characterize the coffee agroecosystem in Minas Gerais State, using geotechnology tools (remote sensing and GIS; Geographic Information System). In the context of this project, the use of these tools were relevant to generate information in a quick, precise, automatic and computerized way, in different scales and levels of details. The present work develops and/or improves upon fundamental methods in geotechnologies that may significantly contribute to the study of the coffee crop agroecosystem in Minas Gerais State, allowing the diagnosis of the geographic environment in which the coffee crop is installed and to allowing technicians and professionals to determine limited and potential areas to introduce the crop. As a pilot study area the municipalities of Aguanil, Boa Esperanca, Campo Belo and Cristais were selected. In the development of the work, images from CCD, onboard the CBERS-2 satellite; images from TM sensor, onboard of Landsat-5; and, altimetry data from SRTM integrated in a geographic data bank, were used. From orbital data, digital image processing, analogical digitalized maps and GIS techniques, in conjunction with field work, information on hydrography, gallery forest, land use, altimetry, slope and hill orientation were extracted in order to diagnose the coffee crop with regard to these variables. Coffee crop areas as well as physiographic variables were quantified and mapped. Using GIS, a diagnosis at the municipal level was performed for each calculated variable and afterwards the intersection between: coffee crop and altimetry; coffee crop and slope; coffee crop and hill slope orientation, was also performed. Eventually, with the concluding thematic maps, a geo-environmental map was elaborated, pointing to areas with more or less favorability to coffee crop as well as the conditions of the mapped fields. To achieve this objective, a weighted map and a multi-criteria analyses using the AHP technique was performed, which allowed the generation of a final favorability map from literature agronomic parameters. The results allowed the diagnosis of the municipalities and area with mapped coffee crop.

Author (revised)

Coffee; Agriculture; Ecosystems; Environmental Monitoring; Remote Sensing; Geographic Information Systems

20080031411 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Use of Geotechnology to Evaluate and to Monitor the Brazilian Coffee Crop: Phase I - Minas Gerais State

Moreira, Mauricio Aves; Rafaelli, Debora Rosa; Barros, marco Aurelio; LitsueImotoNakayaAulicino, Tania; CardosodeFaria, Vivane Gomes; ArujodeCarvalho, Magog; [2007]; 90 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14611-RPE/8080; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A05](#), Hardcopy

With the globalization of the economy, increase of world population and the food security issue several governments are concerned with the rapid, precise estimation of both crop area and crop yield of major agricultural crops. Some meteorological factors such as precipitation, drought, excessive rain, and hail, among others, exert strong influence on agricultural production. Information to quantify the adverse effects on agricultural production is highly relevant to plan agricultural activities with respect to transport, storing, processing, commercialization, etc. The knowledge about the spatial distribution of crops with regard to the amount and localization of plantations is also important to environmental planning, management practices and erosion control. The present work describes the mapping of the coffee crop in the Minas Gerais State through the use of

satellite images and Geographic Information System. The results are available in the form of both figures and maps that present the spatial distribution of coffee crop plantations in each producing municipality of Minas Gerais State.

Author

Coffee; Crop Vigor; Crop Inventories; Spatial Distribution; Geographic Information Systems; Thematic Mapping; Satellite Imagery

20080031433 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Analysis of the Turbidity in the Curuai Floodplain (Pa, Brazil) Integrating Telemetric Data and MODIS/TERRA Images

HereniodeAlcantara, Enner; [2007]; 220 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14621-TDI/1200; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A10](#), Hardcopy

The hypothesis that motivated the accomplishment of this research was: the turbidity has a variation in response of flood pulse in the Curuai floodplain and this response could be followed with the use of satellite images and in-situ data (ground data and telemetric data). Thus, the objective of the work was to evaluate the turbidity behavior in the Curuai floodplain during the hydrological cycle. The response of turbidity in the floodplain was studied in two scales: first, point-temporal (turbidity sampling by Environmental Monitoring System-SIMA); second, spatial-temporal analysis (turbidity distribution using MODIS/TERRA images). As the two scales are distinct, the treatment methods had also been distinct. For treatment of the point-temporal scale, we used a non-linear method called Wavelet Transform. For spatial-temporal scale, we used five field campaigns with turbidity sampling. This ground data was treated with Ordinary Kriging. A Spectral Linear Mixture Model was applied in MODIS image during 2003 to 2005, to verify the turbidity distribution during the hydrological cycle. The main results were: [1] the annual flood pulse is the main driving force that modulates turbidity values in the Curuai floodplain; [2] the results derived from Spectral Linear Mixture Model showed that the north region of floodplain is more turbid than the south region; [3] it is difficult to adjust a unique mathematical function for estimating the turbidity in floodplain. Thus, we conclude that the turbidity variability, in both scales, is a response to the flood pulse.

Author

Flood Plains; Floods; Hydrological Cycle; Turbidity; Satellite Imagery; Telemetry; MODIS (Radiometry)

20080031503 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Evaluation of 5-Scale Model to Simulate Reflectance Values of Landscape Units of Tapajos National Forest

SbravattiPiromal, Rodrigo Alexandre; [2007]; 154 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14645-TDI/1205; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A08](#), Hardcopy

The increased pressure over natural resources makes efficient planning of its use necessary, as well as monitoring and restraining inadequate and/or illegal practices. For this, remote sensing allied with several specialized areas is presented as an excellent tool. However one of the great challenges of remote sensing is to equate the problem that similar targets present different spectral responses and targets considered different present similar spectral responses, due to the interactions of electromagnetic radiation with these targets. Thus, reflectance models, such as 5-Scale, allow us to understand and to simulate variations of biophysical characteristics on the responses in the electromagnetic spectrum. Another commonly used model for assisting in the interpretation of remote sensor data is the Spectral Linear Mixing Model, which generates fraction images from selected endmembers, making its results dependent on these endmembers selection. Therefore, in this work, an analysis was performed to see how the choice of vegetation endmembers, using Minimum Volume Simplex Geometry technique and vegetation endmembers generated by 5-Scale reflectance model, modifies the identification of landscape units in Tapajos National Forest, in the classification of generated fraction images. Moreover, a comparative analysis was performed between 5-Scale reflectance data with TM, ETM+ and MODIS reflectance data, evaluating the temporal variations for the whole study area, and landscape units groups generated by Cluster analysis. The results show that the use of vegetation endmembers estimated by the reflectance model makes the classifier generate more classes, although apparently it did not improve the separability of landscape units. It was also observed that occurred a predominance of the produced classes in always possessing more pixels from a few landscape units. TM and ETM+ fraction images classification allowed a higher separability of non forest landscape units such as exposed soils and water than MODIS fraction images classification. Analyzing the comparison of 5-Scale model reflectance data with the images reflectance averages, it can be affirmed that the model monthly

data averages present great similarities with MODIS images monthly data averages. However in regression analysis for classes of landscape units, it was obtained higher correlations with TM and ETM+ images than with MODIS images. These results indicate that adjustments and other evaluations are still necessary, and, therefore, 5- Scale reflectance model can be used in tropical forests with some restrictions.

Author

Remote Sensing; Vegetation; Reflectance

20080031651 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Global Observations - The Key to Model Development and Improved Assessments

Douglass, Anne R.; September 23, 2007; 1 pp.; In English; Symposium for the 20th Anniversary of the Montreal Protocol/National Observatory of Athens, 23-26 Sep. 2007, Athens, Greece; No Copyright; Avail.: Other Sources; Abstract Only

One application of global models is to predict the response of stratospheric ozone to changes in composition and climate. The recent international ozone assessment included results from three-dimensional models with interactions among the dynamical, photochemical and radiative processes that all influence ozone behavior. The physical basis of such models is far more realistic than that of either the one-dimensional (single profile) models of the 1970's and early 1980's or the two-dimensional (latitude height) models of the late 1980's and 1990's. Observations have played a key role in the model development at all stages. This talk will highlight the role of observations in inspiring broad model improvements that have grown from the effort to reproduce observed relationships or processes, for example the correlations between long-lived constituents seen in aircraft data and the deep unmixed descent of mesospheric air into the winter polar vortices seen from satellite. The talk will also trace the evolution of model evaluation from contour plots showing 'good agreement' to the more rigorous process-oriented evaluation of three-dimensional models that is becoming the norm using the wealth of space-based observations obtained from the late 1970's until present.

Author

Earth Observations (From Space); Three Dimensional Models

20080031691 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Agrometeorological-Spectral Model to Monitor and Estimate Yield of Coffee Crop in Southern Minas Gerais State

CardosodaRosa, Viviane Gomes; [2007]; 145 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14791-TDI/1234; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A07](#), Hardcopy

The importance of coffee crops in the Brazilian commercial balance has motivated scientific research to contribute to crop monitoring, as well as to subsidize the adoption of politics for planning and agribusiness. In this sense, the present work has the objective of monitoring and estimating coffee crop yield in the southern region of Minas Gerais State through an agrometeorological-spectral model. In order to obtain the spectral characterization of the coffee crop the behavior of the NDVI and EVI vegetation indices from the MODIS product MOD13Q1 was evaluated for three types of coffee crop fields: coffee crop in production, in formation and trimmed. The results showed that the indices presented a relationship with crop phenology and crop management. Crop yield estimates for regional, microrregional and municipality scales were performed for crop years 2001/02, 2002/03, 2003/04 and 2004/05. The methodology consisted in the adaptation of an agrometeorological-spectral model running in a Geographic Information System (GIS), whose spectral input variable is the Leaf Area Index (LAI) estimated from the NDVI product of the sensor MODIS. Other input variables were meteorological data generated from the regional weather forecast model ETA and soil water holding capacity estimated from a soil map. The model parameters were adjusted based on crop yield data provided by IBGE, for crop years 2003/04 and 2004/05. Relative differences between crop yield of the model and of IBGE for the regional scale were: 0%, 14.36%, 0.6% and 2.4% for crop years 2001/02, 2002/03, 2003/04 and 2004/05, respectively. At the microrregional scale, best results were obtained for crop years 2003/04 and 2004/05 whose relative differences were under 11%. At municipality scale, the differences between yield estimate from the model and from IBGE were greater, although on an average basis the T-Student statistical test indicated that no significant difference was observed for $\alpha=0.05$. The satisfactory results indicate a great potential for the agrometeorological-spectral model to estimate coffee crop yield, especially at regional scale.

Author (revised)

Agrometeorology; Spectral Methods; MODIS (Radiometry); Crop Inventories; Coffee; Remote Sensing

20080031693 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Analysis of Radiometric and Geometric Characteristics of CCD/CBERS-2 Data

Souza dos Anjos, Camila; [2007]; 122 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14792-TDI/1235; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A06](#), Hardcopy

The cooperation between Brazil and China for the development of satellites has led Brazil the right to access the distinct group of countries that has the know-how of remote sensing technology. The China-Brazil Earth Resources Satellite (CBERS) 1 and 2 satellites were launched in 1999 and 2003, respectively. CBERS-2B (2007), CBERS-3 (2009) and CBERS-4 (2011) satellites are to be launched foreseen. Nowadays, there is free distribution of more than 10,000 CBERS scenes per month and the CCD sensor is the most downloaded product. Thus, the aim of this work is to analyze some radiometric and geometric characteristics that influence in the quality of the CCD/CBERS-2 images: the saturation effect, the blurring effect and the positioning error. The saturation effect in band 4 of the CCD sensor was analyzed and a methodology for its partial correction, based on the linear regression approach, was proposed. The use of restoration filters to reduce the blurring effect in CCD/CBERS-2 images was evaluated. Finally, the positional accuracy of CCD images was analyzed during the periods when the satellite control was change between China and Brazil.

Author (revised)

Earth Observations (From Space); Satellite Imagery; Radiometric Resolution; Geometric Accuracy; Technology Assessment

20080031694 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Sugar Cane Harvested Area Monitoring using MODIS Images

Alves de Aguiar, Daniel; [2007]; 103 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14803-TDI/1246; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A06](#), Hardcopy

Brazil is among the world leaders in producing and exporting several agricultural products and is the largest producer and exporter of sugar and alcohol. The State of Sao Paulo is responsible for approximately 60% of the entire national production of cane, alcohol and sugar and for 70% of the exportations. In the current globalized market there is a great demand for reliable and objective information on the amount of raw material available to sugar and alcohol production, since this affects directly the quotation of these products in stock exchange. In addition, information about the type of harvest (with burning or without burning raw cane) is relevant to the environment. Remote sensing techniques associated with Geographic Information Systems (GIS) technology have a great potential to monitor the sugar cane harvest activity and provide reliable and objective information not only on the amount of harvested area but also on the type of harvest. Considering that the sugar cane crop has several favorable characteristics to be identified, mapped and monitored through remote sensing satellite images it seems that free-of-charge MODIS images are a promising alternative to monitor the sugar cane harvest activity. This hypothesis is based on the high temporal resolution of the MODIS images which maximizes the chance of obtaining cloud free images. Therefore, the objective of this work was to develop an operational procedure using MODIS images in Sao Paulo State in order to provide objective information about the sugar cane harvest activity. To achieve this objective, different image processing techniques were tested, i.e., linear spectral mixture model, image algebra and the use of the normalized difference vegetation index (NDVI) with the intent of pointing out advantages and disadvantages of each technique to estimate sugar cane harvested area. These techniques were applied over multitemporal compositions of NDVI (MOD13Q1), compositions developed to detect the type of harvest (MODCSH) and daily reflectance images. To validate the estimates medium spatial resolution images were used (Landsat-5 and CBERS-2) and field data provided by a sugar and alcohol Plant. Best results of area estimates were obtained with the subtraction between the MODCSH compositions which estimated 95.2% of the reference area and achieved best temporal precision ($R=0.95$; for the regression between dates of reference and harvested estimates). It was possible to estimate the type of sugar cane harvest applying linear spectral mixture model over the daily reflectance MODIS images. Finally, the presented methodology, with the use of MODIS images, allowed to monitoring the harvest activity of the sugar cane crop.

Author

Sugar Cane; Crop Inventories; Crop Vigor; MODIS (Radiometry); Satellite Imagery; Image Resolution; Image Processing

20080031711 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Geomorphometric Data as Subsidy for Vegetation Mapping

da Conceicao Bispo, Polyanna; [2007]; 128 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14813-TDI/1255; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A07](#), Hardcopy

The potentials of geomorphometric variables derived from SRTM (Shuttle Radar Topographic Mission) for the mapping

of vegetation types were investigated. Four published vegetation maps for study areas inside three Brazilian biomes (Amazonian forest, Savanna and Steppe) served as reference for testing the discriminatory potential of the geomorphometric variables. The study sites differed in the feasibility of applying topographic data to vegetation mapping according to the variation of geomorphometric conditions and vegetation reference mapping scale and detail level. The analysis indicated the vegetation class groups prone to classification in contrast to groups occurring in similar topographic conditions. The variables that presented strongest relationships with the vegetation classes were elevation, horizontal and vertical curvature. Although geomorphometric data had shown potential for discriminating vegetation classes, the achieved classification could not reach the thematic detail level of the reference maps due to co-occurrence of classes with similar vegetational structures. Based on discriminant analysis, it was possible to experimentally map to the sub-phytophysognomic level. The best results were found for the RPPNSA and PNCA sites, and the sub-physiognomies of the latter. PNB site showed the worst results at the phytophysognomy level, while its tested sub-physiognomies performed satisfactorily. It was found that discriminant analysis of geomorphometric data could subsidize vegetation mapping.

Author

Geomorphology; Vegetation; Thematic Mapping; Radar Imagery

20080031741 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Using the NASA NEESPI Portal Data to Study Land, Climate, and Socio-Economic Changes in Northern Eurasia

Leptoukh, Gregory; Shen, Suhung; Csiszar, Ivan; Romanov, Peter; Loboda, Tatiana; Gerasimov, Irina; July 07, 2008; 38 pp.; In English; IGARSS 2008, 7-11 Jul. 2008, Boston, MA, USA; Original contains color illustrations; Copyright; Avail.:

CASI: [A03](#), Hardcopy

A large number of fires detected in July of 2003 - a nearly 200-time increase in fire detections compared to other years during 2001-2006. despite the summer monsoon suppression of large fire occurrence. Traditional vegetation indices (NDVI and EVI) included in operational fire danger assessment provide little information on the fuel state in this ecosystem pre- or post-fire. No considerable differences in surface temperature and soil moisture in July were observed between the catastrophic year of 2003 and the two subsequent years of low summer fire occurrence of 2004 and 2005. However, the temporal analysis indicates that dry spring conditions in 2003 (detected through low soil moisture measurements in April and May) may have led to a stressed vegetative state and created conditions conducive to catastrophic fire occurrence.

Derived from text

Normalized Difference Vegetation Index; Fires; Ecosystems; Vegetation; Hazards; Soil Moisture; Climate

20080032369 NASA Marshall Space Flight Center, Huntsville, AL, USA

Summertime Coincident Observations of Ice Water Path in the Visible/Near-IR, Radar, and Microwave Frequencies

Pittman, Jasna V.; Robertson, Franklin R.; Atkinson, Robert J.; May 27, 2008; 1 pp.; In English; The Meeting of the Americas 2008 Joint Assembly, 27-30 May 2008, Florida, USA; No Copyright; Avail.: Other Sources; Abstract Only

Accurate representation of the physical and radiative properties of clouds in climate models continues to be a challenge. At present, both remote sensing observations and modeling of microphysical properties of clouds rely heavily on parameterizations or assumptions on particle size distribution (PSD) and cloud phase. In this study, we compare Ice Water Path (IWP), an important physical and radiative property that provides the amount of ice present in a cloud column, using measurements obtained via three different retrieval strategies. The datasets we use in this study include Visible/Near-IR IWP from the Moderate Resolution Imaging Spectroradiometer (MODIS) instrument flying aboard the Aqua satellite, Radar-only IWP from the CloudSat instrument operating at 94 GHz, and NOAA/NESDIS operational IWP from the 89 and 157 GHz channels of the Microwave Humidity Sounder (MHS) instrument flying aboard the NOAA-18 satellite. In the Visible/Near-IR, IWP is derived from observations of optical thickness and effective radius. CloudSat IWP is determined from measurements of cloud backscatter and assumed PSD. MHS IWP retrievals depend on scattering measurements at two different, non-water absorbing channels, 89 and 157 GHz. In order to compare IWP obtained from these different techniques and collected at different vertical and horizontal resolutions, we examine summertime cases in the tropics (30S - 30N) when all 3 satellites are within 4 minutes of each other (approximately 1500 km). All measurements are then gridded to a common 15 km x 15 km box determined by MHS. In a grid box comparison, we find CloudSat to report the highest IWP followed by MODIS, followed by MHS. In a statistical comparison, probability density distributions show MHS with the highest frequencies at IWP of 100-1000 g/m(exp 2) and CloudSat with the longest tail reporting IWP of several thousands g/m(exp 2). For IWP greater than 30 g/m(exp 2), MODIS is consistently higher than CloudSat, and it is higher at the lower IWPs but lower at the higher IWPs that overlap with MHS. Some of these differences can be attributed to the limitations of the measuring techniques themselves,

but some can result from the assumptions made in the algorithms that generate the IWP product. We investigate this issue by creating categories based on various conditions such as cloud type, precipitation presence, underlying liquid water content, and surface type (land vs. ocean) and by comparing the performance of the IWP products under each condition.

Author

Clouds (Meteorology); Ice Clouds; Climate Models; Cloud Physics; Light (Visible Radiation); Near Infrared Radiation; Microwave Frequencies; Meteorological Radar; Summer

20080032384 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Global Survey and Statistics of Radio-Frequency Interference in AMSR-E Land Observations

Njoku, Eni G.; Ashcroft, Peter; Chan, Tsz K.; Li, Li; IEEE Transactions On Geoscience and Remote Sensing; May 5, 2005; Volume 43, No. 5, pp. 938-947; In English; Original contains color illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40892>; <http://dx.doi.org/10.1109/TGRS.2004.837507>

Radio-frequency interference (RFI) is an increasingly serious problem for passive and active microwave sensing of the Earth. To satisfy their measurement objectives, many spaceborne passive sensors must operate in unprotected bands, and future sensors may also need to operate in unprotected bands. Data from these sensors are likely to be increasingly contaminated by RFI as the spectrum becomes more crowded. In a previous paper we reported on a preliminary investigation of RFI observed over the USA in the 6.9-GHz channels of the Advanced Microwave Scanning Radiometer (AMSR-E) on the Earth Observing System Aqua satellite. Here, we extend the analysis to an investigation of RFI in the 6.9- and 10.7-GHz AMSR-E channels over the global land domain and for a one-year observation period. The spatial and temporal characteristics of the RFI are examined by the use of spectral indices. The observed RFI at 6.9 GHz is most densely concentrated in the USA, Japan, and the Middle East, and is sparser in Europe, while at 10.7 GHz the RFI is concentrated mostly in England, Italy, and Japan. Classification of RFI using means and standard deviations of the spectral indices is effective in identifying strong RFI. In many cases, however, it is difficult, using these indices, to distinguish weak RFI from natural geophysical variability. Geophysical retrievals using RFI-filtered data may therefore contain residual errors due to weak RFI. More robust radiometer designs and continued efforts to protect spectrum allocations will be needed in future to ensure the viability of spaceborne passive microwave sensing.

Author

Radio Frequency Interference; Microwave Radiometers; Earth Observing System (EOS); Geophysics; Detection

20080032389 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Three Years of Atmospheric Infrared Sounder Radiometric Calibration Validation using Sea Surface Temperatures

Aumann, H. H.; Broberg, Steve; Elliott, Denis; Gaiser, Steve; Gregorich, Dave; Journal Of Geophysical Research; August 23, 2006; Volume 111; 8 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40864>; <http://dx.doi.org/10.1029/2005JD006822>

This paper evaluates the absolute accuracy and stability of the radiometric calibration of the Atmospheric Infrared Sounder (AIRS) by analyzing the difference between the brightness temperatures measured at 2616 cm(exp -1) and those calculated at the top of the atmosphere (TOA), using the Real-Time Global Sea Surface Temperature (RTGSST) for cloud-free night tropical oceans between +/- 30 degrees latitude. The TOA correction is based on radiative transfer. The analysis of the first 3 years of AIRS radiances verifies the absolute calibration at 2616 cm(exp -1) to better than 200 mK, with better than 16 mK/yr stability. The AIRS radiometric calibration uses an internal full aperture wedge blackbody with the National Institute of Standards and Technology (NIST) traceable prelaunch calibration coefficients. The calibration coefficients have been unchanged since launch. The analysis uses very tight cloud filtering, which selects about 7000 cloud-free tropical ocean spectra per day, about 0.5% of the data. The absolute accuracy and stability of the radiometry demonstrated at 2616 cm(sup -1) are direct consequences of the implementation of AIRS as a thermally controlled, cooled grating-array spectrometer and meticulous attention to details. Comparable radiometric performance is inferred from the AIRS design for all 2378 channels. AIRS performance sets the benchmark for what can be achieved with a state-of-the-art hyperspectral radiometer from polar orbit and what is expected from future hyperspectral sounders. AIRS was launched into a 705 km altitude polar orbit on NASA's Earth Observation System (EOS) Aqua spacecraft on 4 May 2002. AIRS covers the 3.7-15.4 micron region of the thermal infrared spectrum with a spectral resolution of $\nu/\Delta\nu = 1200$ and has returned 3.7 million spectra of the upwelling radiance each day since the start of routine data gathering in September 2002.

Author

Atmospheric Sounding; Infrared Instruments; Spectrometers; Radiometers; Calibrating; Sea Surface Temperature

20080032391 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Effect of Ducting on Radio Occultation Measurements: An Assessment Based on High-Resolution Radiosonde Soundings

Ao, C. O.; Radio Science; March 28, 2007; Volume 42; 15 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40870>; <http://dx.doi.org/10.1029/2006RS003485>

Recent studies have shown that the presence of elevated ducts in the lower atmosphere has an adverse effect on the inversion of GPS radio occultation data. The problem arises because the microwave refractivity within and below an elevated duct is no longer uniquely determined by the bending angle profile. Applying Abel inversion without a priori knowledge of the duct will introduce a negative bias in the retrieved refractivity profile within and below the duct. In this work, high vertical resolution radiosonde data are used to give a quantitative assessment of the characteristics and effects of ducts, including their frequency of occurrences, heights, and thicknesses at different latitudes and seasons. The negative bias from the Abel-retrieved refractivity profiles resulting from these ducts is also computed. The results give a strong indication that ducting in the lower troposphere is a frequent phenomenon over the tropics and midlatitudes. The ducts are shown to be predominantly caused by sharp changes in the vertical structure of water vapor. The majority of the ducts are found to be below 2 km, with a median duct layer thickness of about 100 m. The negative refractivity bias is shown to be largest below 2 km, with a median value of about 0.5-1% in the tropics and 0.2-0.5% in midlatitudes. The bias is about a factor of 2-3 smaller between 2 to 3 km and is negligible above 4 km.

Author

Radio Occultation; Microwaves; Refractivity; Radiosondes; Atmospheric Sounding

20080032394 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Distribution of Aboveground Live Biomass in the Amazon Basin

Saatchi, S. S.; Houghton, R. A.; DosSantos Alvala, R. C.; Soares, J. V.; Yu, Y.; Global Change Biology; April 2007; Volume 13, No. 4, pp. 816-837; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40882>

The amount and spatial distribution of forest biomass in the Amazon basin is a major source of uncertainty in estimating the flux of carbon released from land-cover and land-use change. Direct measurements of aboveground live biomass (AGLB) are limited to small areas of forest inventory plots and site-specific allometric equations that cannot be readily generalized for the entire basin. Furthermore, there is no spaceborne remote sensing instrument that can measure tropical forest biomass directly. To determine the spatial distribution of forest biomass of the Amazon basin, we report a method based on remote sensing metrics representing various forest structural parameters and environmental variables, and more than 500 plot measurements of forest biomass distributed over the basin. A decision tree approach was used to develop the spatial distribution of AGLB for seven distinct biomass classes of lowland old-growth forests with more than 80% accuracy. AGLB for other vegetation types, such as the woody and herbaceous savanna and secondary forests, was directly estimated with a regression based on satellite data. Results show that AGLB is highest in Central Amazonia and in regions to the east and north, including the Guyanas. Biomass is generally above 300Mgha(sup 1) here except in areas of intense logging or open floodplains. In Western Amazonia, from the lowlands of Peru, Ecuador, and Colombia to the Andean mountains, biomass ranges from 150 to 300Mgha(sup 1). Most transitional and seasonal forests at the southern and northwestern edges of the basin have biomass ranging from 100 to 200Mgha(sup 1). The AGLB distribution has a significant correlation with the length of the dry season. We estimate that the total carbon in forest biomass of the Amazon basin, including the dead and below ground biomass, is 86 PgC with +/- 20% uncertainty.

Author

Biomass; Structural Basins; Flood Plains; Grasslands; Spatial Distribution; Forests; Land Use; Structural Design

20080032466 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Differential Radiometers Using Fabry-Perot Interferometric Technique for Remote Sensing of Greenhouse Gases

Georgieva, Elena M.; Heaps, William S.; Wilson, Emily L.; [2007]; 8 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080032466>

A new type of remote sensing radiometer based upon the Fabry-Perot interferometric technique has been developed at NASA's Goddard Space Flight Center and tested from both ground and aircraft platform. The sensor uses direct or reflected sunlight and has channels for measuring column concentration of carbon dioxide at 1570 nm, oxygen lines sensitive to

pressure and temperature at 762 and 768 nm, and water vapor (940 nm). A solid Fabry-Perot etalon is used as a tunable narrow bandpass filter to restrict the measurement to the gas of interest's absorption bands. By adjusting the temperature of the etalon, which changes the index of refraction of its material, the transmission fringes can be brought into nearly exact correspondence with absorption lines of the particular species. With this alignment between absorption lines and fringes, changes in the amount of a species in the atmosphere strongly affect the amount of light transmitted by the etalon and can be related to gas concentration. The technique is applicable to different chemical species. We have performed simulations and instrument design studies for CH₄, ¹³C isotope, and CO detection. Index Terms- Absorbing media, Atmospheric measurements, Fabry-Perot interferometers, Optical interferometry, Remote sensing.

Author

Fabry-Perot Interferometers; Remote Sensing; Bandpass Filters; Greenhouse Effect; Tunable Filters; Gas Composition

20080032471 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Desert Dust Air Mass Mapping in the Western Sahara, using Particle Properties Derived from Space-based Multi-angle Imaging

Kahn, Ralph; Petzold, Andreas; Wendisch, Manfred; Bierwirth, Eike; Dinter, Tilman; Fiebig, Marcus; Schladitz, Alexander; von Hoyningen-Huene, Wolfgang; Submitted to Tellus: SAMUM Special Issue; March 2008; 22 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

Coincident observations made over the Moroccan desert during the SAhara Mineral dUst experiMent (SAMUM) 2006 field campaign are used both to validate aerosol amount and type retrieved from Multi-angle Imaging SpectroRadiometer (MISR) observations, and to place the sub-orbital aerosol measurements into the satellite's larger regional context. On three moderately dusty days for which coincident observations were made, MISR mid-visible aerosol optical thickness (AOT) agrees with field measurements point-by-point to within 0.05 to 0.1. This is about as well as can be expected given spatial sampling differences; the space-based observations capture AOT trends and variability over an extended region. The field data also validate MISR's ability to distinguish and to map aerosol air masses, from the combination of retrieved constraints on particle size, shape, and single-scattering albedo. For the three study days, the satellite observations (a) highlight regional gradients in the mix of dust and background spherical particles, (b) identify a dust plume most likely part of a density flow, and (c) show an air mass containing a higher proportion of small, spherical particles than the surroundings, that appears to be aerosol pollution transported from several thousand kilometers away.

Author

Air Masses; Imaging Techniques; Minerals; Sahara Desert (Africa); Aerosols; Remote Sensing

20080032503 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Remote Sensing for Multitemporal Analysis of Crop Land Use Dynamics

deAlmeidaCrusco, Natalia; January 2007; 108 pp.; In Portuguese; Original contains color and black and white illustrations Report No.(s): INPE-14826-TDI/1266; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A06](#), Hardcopy

Agricultural statistics are important in a country like Brazil, where agriculture plays an important role over the economy. The methodologies for crop area estimates are commonly based on subjective data, and they present a non-probabilistic profile. In order to increase the quality of the results, the Geosafra Project uses remote sensing data associated to field data for estimating the area of agricultural crops for the main crop types existing in the country. However, this method presents some limitations regarding the field data validation. This work tackled this aspect and has as central hypothesis the existence of relation between the field data collected in the present and information about the land-use in the past. Thus, the main objective is to evaluate how the agricultural crop land use dynamics, evaluated here by remote sensing multitemporal analysis, can assist the early estimation process, auditing and field data validation. The analysis of multitemporal images showed that it was possible the validation of the agricultural land dynamics and the land-use patterns in the study area. In order to accomplish the study, 24 TM/Landsat-5 and ETM+/Landsat-7 images in the time-frame from 2002 to 2005 were used. The crop land use classes evaluated in this work -soybean, sugar cane, grassland and forest were well distinguished visually and spectrally. The analysis of the temporal dynamics showed that each class has a distinct pattern, which is also associated to the agricultural schedule/calendar of the region. The methodology used in this work was efficient for the land-use prediction, as well as for the indication of the plotted points to be audited in the sample panel of the Geosafra Project. Also, it was possible to identify the errors that can be committed during field sampling and corrected them by using multitemporal satellite images.

Author

Remote Sensing; Farmlands; Land Use; Crop Inventories

20080032528 NASA Dryden Flight Research Center, Edwards, CA, USA

NASA 2007 Western States Fire Missions (WSFM)

Posada, Herman A.; June 10, 2008; 35 pp.; In English; Unmanned Vehicle Systems International Conference, 10-13 Jun. 2008, Paris, France; Original contains color illustrations; No Copyright; Avail.: CASI: [A03](#), Hardcopy
ONLINE: <http://hdl.handle.net/2060/20080032528>

This presentation describes the objectives of the 2007 Western States Fire Mission (WSFM), which included demonstrating capabilities of the Ikhana unmanned aerial system (UAS) to overfly and collect sensor data on widespread fires throughout the Western USA, demonstrating long-endurance (20+ hours) mission capabilities, and delivering real-time imagery within 10 minutes of acquisition. Additionally, the operations concept, operational zones, and landing sites are highlighted. Provisions of the certificate of authorization are also addressed. Imagery obtained from the WSFM are included.

CASI

Remote Sensing; Forest Fires; Satellite Imagery; Unmanned Aircraft Systems; Aerial Reconnaissance

20080032543 NASA Goddard Space Flight Center, Greenbelt, MD, USA; Wyle Information Services, LLC, USA

Effective Interpolation of Incomplete Satellite-Derived Leaf-Area Index Time Series for the Continental USA

Jasinski, Michael F.; Borak, Jordan S.; Submitted to Agricultural and Forest Meteorology; February 29, 2008; 38 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: [A03](#), Hardcopy
ONLINE: <http://hdl.handle.net/2060/20080032543>

Many earth science modeling applications employ continuous input data fields derived from satellite data. Environmental factors, sensor limitations and algorithmic constraints lead to data products of inherently variable quality. This necessitates interpolation of one form or another in order to produce high quality input fields free of missing data. The present research tests several interpolation techniques as applied to satellite-derived leaf area index, an important quantity in many global climate and ecological models. The study evaluates and applies a variety of interpolation techniques for the Moderate Resolution Imaging Spectroradiometer (MODIS) Leaf-Area Index Product over the time period 2001-2006 for a region containing the conterminous USA. Results indicate that the accuracy of an individual interpolation technique depends upon the underlying land cover. Spatial interpolation provides better results in forested areas, while temporal interpolation performs more effectively over non-forest cover types. Combination of spatial and temporal approaches offers superior interpolative capabilities to any single method, and in fact, generation of continuous data fields requires a hybrid approach such as this.

Author

Earth Sciences; Interpolation; Leaf Area Index; Time Series Analysis; United States

20080032544 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Irrigation Requirement Estimation using MODIS Vegetation Indices and Inverse Biophysical Modeling; A Case Study for Oran, Algeria

Bounoua, L.; Imhoff, M.L.; Franks, S.; Submitted to Remote Sensing of the Environment - RSE; [2008]; 29 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

Human demand for food influences the water cycle through diversion and extraction of fresh water needed to support agriculture. Future population growth and economic development alone will substantially increase water demand and much of it for agricultural uses. For many semi-arid lands, socio-economic shifts are likely to exacerbate changes in climate as a driver of future water supply and demand. For these areas in particular, where the balance between water supply and demand is fragile, variations in regional climate can have potentially predictable effect on agricultural production. Satellite data and biophysically-based models provide a powerful method to quantify the interactions between local climate, plant growth and water resource requirements. In irrigated agricultural lands, satellite observations indicate high vegetation density while the precipitation amount indicates otherwise. This inconsistency between the observed precipitation and the observed canopy leaf density triggers the possibility that the observed high leaf density is due to an alternate source of water, irrigation. We explore an inverse process approach using observations from the Moderate Resolution Imaging Spectroradiometer (MODIS), climatological data, and the NASA's Simple Biosphere model, SiB2, to quantitatively assess water demand in a semi-arid agricultural land by constraining the carbon and water cycles modeled under both equilibrium (balance between vegetation and prevailing local climate) and nonequilibrium (water added through irrigation) conditions. We postulate that the degree to which irrigated lands vary from equilibrium conditions is related to the amount of irrigation water used. We added water using two distribution methods: The first method adds water on top of the canopy and is a proxy for the traditional spray irrigation. The second method allows water to be applied directly into the soil layer and serves as proxy for drip irrigation. Our approach indicates that over the study site, for the month of July, spray irrigation resulted in an irrigation amount of about 1.4 mm per occurrence with an average frequency of occurrence of 24.6 hours. The simulated total monthly irrigation for July was 34.85

mm. In contrast, the drip irrigation resulted in less frequent irrigation events with an average water requirement about 57% less than that simulated during the spray irrigation case. The efficiency of the drip irrigation method rests on its reduction of the canopy interception loss compared to the spray irrigation method. When compared to a country-wide average estimate of irrigation water use, our numbers are quite low. We would have to revise the reported country level estimates downward to 17% or less

Author

Irrigation; Vegetation Growth; Water Resources; MODIS (Radiometry); Biophysics; Climate; Fresh Water; Satellite Observation

20080032623 Bonn Univ., Germany

The Bonn Geodetic VLBI Operation Center

Nothnagel, A.; Muskens, A.; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 127-128; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

The IGGB Operation Center has continued to carry out similar tasks of organizing and scheduling various observing series as in 2006. The INT3 activities have been added in the second half of the year. Activities included measurement of vertical crust motion in Europe by Very Long Baseline Interferometry (VLBI) and observation of the IVS-T2 series primarily for the maintenance and stabilization of the VLBI terrestrial reference frame as well as for Earth rotation monitoring as a by-product. Additionally, the center was involved in UT1 determination with near-real-time e-VLBNI (INT3).

Author

Very Long Base Interferometry; Geodesy; Earth Observations (From Space); Remote Sensing

20080032632 NVI, Inc., Greenbelt, MD, USA

CORE Operation Center Report

Thomas, Cynthia C.; MacMillan, Daniel; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 129-131; In English; See also [20080032620](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

This report gives a synopsis of the activities of the CORE Operation Center from January 2007 to December 2007. The report forecasts activities planned for the year 2008. The International VLBI Service for Geodesy and Astrometry (IVS) program, which started in 2002, used the Mark IV recording mode for each session. The IVS program began using Mark 5 recording mode in mid-2003, and by the end of 2007 all stations were upgraded to Mark 5. Included tables provide the average in formal errors for various 2007 sessions and show the EOP differences with respect to IGS.

Author

Very Long Base Interferometry; Geodesy; Astrometry; Remote Sensing

20080032650 National Inst. of Information and Communications Technology, Tokyo, Japan

Analysis Center at National Institute of Information and Communications Technology

Hobiger, Thomas; Ichikawa, Ryuichi; Sekido, Mamoru; Takiguchi, Hiroshi; Kondo, Tetsuro; Koyama, Yasuhiro; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 220-223; In English; See also [20080032620](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

This report summarizes the activities of the Analysis Center at National Institute of Information and Communications Technology (NICT) for the year 2007. Current activities include ultra-rapid UT1 experiments which demonstrate that the estimates of UT1 can be obtained shortly after the last observed data transfer via Internet protocols and the development of a 'Compact Antenna of Radio Astronomy Adapted for Network' with a 2.4 m diameter dish (CARAVAN 2400). Additionally, a set of programs has been developed, summarized under the name MK3TOOLS, which allows the creation of Mark III databases from post-correlator output without any dependency on CALC/SOLVE libraries and a set of programs (Kashima Ray-Tracing Tools [KARAT]) has been developed which allows fast and accurate ray-tracing tasks and output of information in standard formats. Future plans include several international and domestic Very Long Baseline Interferometry (VLBI) experiments for real-time EOP determination using e-VLBI and the K5 system, improvement of processing speed and efficiency for VLBI data correlation using multi-processor and high speed networks, and the implementation of KARAT in a multi-processor/multi-core environment, along with the establishment of an online ray-tracing service.

Author

Communication Networks; Technology Assessment; Very Long Base Interferometry; Radio Astronomy

20080032722 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Evaluation of Multipolarized L-Band Images from SAR-R99B System (SIVAM-CENSIPAM) for Geological Application in the Curaca River Valley, Bahia

Rabelo, Tiago Nunes; [2007]; 194 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14820-TDI/1260; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A09](#), Hardcopy

SAR (Synthetic Aperture Radar) images have been mainly used to geological applications based on a more qualitative approach, which tends to subutilize the total content of geological information available in the data. With the advent of polarimetric SAR systems, quantitative analysis is becoming essential, particularly when focusing on the understanding of the energy/target interactions in the microwave spectrum. This investigation aimed to evaluate in both qualitative and quantitative ways the geological applicability of multipolarized L-band SAR data acquired by the SAR-R99B system (SIVAM-CENSIPAM) in the Lower Curaca River Valley, Bahia State. The study area is characterized by a semi-arid environment, with a flat topographic terrain, showing shallow residual soils well correlated to the substratum and sparse caatinga vegetation. Geologically, the region is part of the Sao Francisco Craton, and comprises Paleoproterozoic granulites, gneisses, granites and a sequence of Cu-mineralized mafic-ultramafic intrusives. Subordinately, metasedimentary rocks represented by schists, phyllites, marble of Neoproterozoic ages are also found. The methodology can be divided into two steps: (1) qualitative analysis based on photogeological interpretation of the multipolarized images and (2) quantitative analysis through statistical approaches (linear regression and separability) using as input backscattered responses (backscattering coefficient of Lhh, Lvv, Lhv, Lvv/Lhv and Lhh/Lhv) and surface roughness information (micro-topography). The investigation has allowed several findings: (1) the qualitative analysis showed that Lvv polarization presented an overall best performance in the discrimination of the main rock units and in the characterization of the main geological structures in the study area. The poorest performance was related to Lhh; (2) statistical analysis based on linear-regression indicated Lvv polarization as the most sensitive band to the micro-topographic variations, followed by Lhh, Lhv and ratio Lvv/Lhv. Furthermore, the ratio Lhh/Lhv presented the poorest correlation with surface roughness; (3) separability analysis also pointed out the Lvv polarization as the most important band in the discrimination of mafic-ultramafic responses related to Vertisols, followed by Lhv and Lhh; (4) moisture affecting the dielectric properties of soils and vertical structure of caatinga vegetation were important controls in the backscattered responses which favored the rock unit discrimination. Finally, the high spatial resolution of the SAR images was important in the detection of the geological structures in the area.

Author

Synthetic Aperture Radar; Radar Imagery; Image Analysis; Ultrahigh Frequencies; Photogeology

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ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; and solar, geothermal, windpower, and waterwave conversion systems; energy storage; and traditional power generators. For technologies related to nuclear energy production see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power*; *20 Spacecraft Propulsion and Power*, and *28 Propellants and Fuels*.

20080031196 California Inst. of Tech., Pasadena, CA, USA

Science of Electrode Materials for Lithium Batteries. Final Report for the DOE BES Program. 1999-2007

Fultz, B.; Mar. 15, 2007; 29 pp.; In English

Contract(s)/Grant(s): DE-FG02-00ER15035

Report No.(s): DE2007-900899; DOE/ER/15035-1; No Copyright; Avail.: Department of Energy Information Bridge

Rechargeable lithium batteries continue to play the central role in power systems for portable electronics, and could play a role of increasing importance for hybrid transportation systems that use either hydrogen or fossil fuels. For example, fuel cells provide a steady supply of power, whereas batteries are superior when bursts of power are needed. The National Research Council recently concluded that for dismounted soldiers 'Among all possible energy sources, hybrid systems provide the most versatile solutions for meeting the diverse needs of the Future Force Warrior. The key advantage of hybrid systems is their ability to provide power over varying levels of energy use, by combining two power sources.' The relative capacities of batteries versus fuel cells in a hybrid power system will depend on the capabilities of both. In the longer term, improvements in the cost and safety of lithium batteries should lead to a substantial role for electrochemical energy storage subsystems as components in fuel cell or hybrid vehicles. We have completed a basic research program for DOE BES on anode and cathode materials for lithium batteries, extending over 6 years with a 1 year phaseout period. The emphasis was on the thermodynamics and kinetics of the lithiation reaction, and how these pertain to basic electrochemical properties that we measure

experimentally voltage and capacity in particular. In the course of this work we also studied the kinetic processes of capacity fade after cycling, with unusual results for nanostructured Si and Ge materials, and the dynamics underlying electronic and ionic transport in LiFePO₄. This document is the final report for this work.

NTIS

Electrode Materials; Electrodes; Lithium Batteries

20080032335 Townsend, Townsend and Crew, LLP, San Francisco, CA, USA

Eulytite Solid Acid Electrolytes for Electrochemical Devices

Chisholm, C., Inventor; Haile, S. M., Inventor; 21 Jun 05; 14 pp.; In English

Contract(s)/Grant(s): N00014-02-1-0192

Patent Info.: Filed Filed 21 Jun 05; US-Patent-Appl-SN-11-165-560

Report No.(s): PB2007-113323; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Improved solid acid electrolyte materials, methods of synthesizing such materials, and electrochemical devices incorporating such materials are provided. The stable electrolyte material comprises a solid acid in a eulytine structure capable of undergoing rotational disorder of oxyanion groups and capable of extended operation at elevated temperatures, that is, solid acids having hydrogen bonded anion groups; a superprotonic disordered phase; and capable of operating at temperatures of about 100 degree C and higher.

NTIS

Electrolytes; Fuel Cells; Solid Electrolytes; Electrochemical Capacitors

20080032692 Department of Energy, Washington, DC, USA

Discussion Meeting on Plug-In Hybrid Electric Vehicles. Summary Report

Aug. 2006; 9 pp.; In English

Report No.(s): PB2008-101071; No Copyright; Avail.: CASI: [A02](#), Hardcopy

Interest is growing in hybrid vehicles that can recharge from wall-plug energy because of their high fuel economy and the potential to reduce petroleum use. Therefore, the Office of FreedomCAR and Vehicle Technologies (OFCVT) convened a 2-day discussion meeting of over 120 experts representing the automotive and electric utility industries, national labs and academia to discuss technical and economic issues related to plug-in hybrid electric vehicles, or PHEVs. The U.S. Department of Energy (DOE) must ascertain whether the national benefits of PHEVs warrant support for R&D to make the vehicles cost-effective and to ensure that the electric power grid can supply the load.

NTIS

Electric Motor Vehicles; Energy Storage

45

ENVIRONMENT POLLUTION

Includes atmospheric, water, soil, noise, and thermal pollution.

20080031030 Oregon Dept. of Human Resources, Salem, OR, USA

Health Consultation: Supreme Perlite, Portland, Multnomah County, Oregon. EPA Facility ID: ORO5102390

Sep. 22, 2005; 50 pp.; In English

Report No.(s): PB2007-114285; No Copyright; Avail.: National Technical Information Service (NTIS)

Supreme Perlite is located at 4600 N. Suttle Road in an industrial area of north Portland near the Columbia River. From 1968 through 1974, Supreme Perlite received shipments of 639.28 tons (1,278,560 lbs) of Libby vermiculite (unpublished information from the Environmental Protection Agency's (EPA) database of W.R. Grace invoices) that were processed at the site and sold as attic insulation. In response to scientific studies in the 1990s that indicated higher rates of asbestos-related health conditions in Libby, Montana, EPA investigated a number of sites throughout the country where Libby vermiculite had been reportedly processed. As part of this investigation, EPA visited Supreme Perlite in April 2000 and collected soil and dust samples in and around the plant. Although Supreme Perlite processed a relatively low tonnage of Libby vermiculite, EPA identified the site for further investigation after sampling found asbestos contamination in an area where Libby vermiculite was unloaded from rail cars. Cleanup of the contaminated soil was completed in April 2001. EPA has no further action planned or required at this time for vermiculite cleanup at the Supreme Perlite site. This health consultation evaluates the public health implications from past, present, and future exposure pathways to asbestos in Libby vermiculite exfoliated at the Supreme

Perlite site. The Oregon Department of Human Services (ODHS) Superfund Health Investigation and Education program (SHINE) has prepared this health consultation in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR).

NTIS

Health; Insulation; Oregon; Vermiculite

20080031031 Oregon Dept. of Human Resources, Salem, OR, USA

Health Consultation: (Former) Vermiculite Northwest, Inc., (a/k/a Zonolite Division of W. R. Grace and Co.; W. R. Grace and Co., Construction Products Division; and W. R. Grace and Co.-Conn.; NW Vermiculite-Portland), Portland, Multnomah County, Oregon. EPA Facility ID: ORSFN1002216

January 2007; 54 pp.; In English

Report No.(s): PB2007-114284; No Copyright; Avail.: National Technical Information Service (NTIS)

The former Vermiculite Northwest/W.R. Grace site is located at the intersections of N. Harding, N. Randolph, and N. Loring in an industrial area of northeast Portland, Oregon, near the Willamette River. Vermiculite was processed at the site from the early 1950s through 1993. From 1967 through 1991, Vermiculite Northwest/W.R. Grace received shipments of 193,112.78 tons (386,225,563 lbs) of Libby vermiculite (unpublished information from EPA's database of W.R. Grace invoices) that were exfoliated at the site.

NTIS

Construction; Health; Oregon; Vermiculite

20080031042 Arizona State Dept. of Health, Phoenix, AZ, USA

Health Consultation: North Indian Bend Wash, Area 7 Groundwater Extraction and Treatment Facility, Scottsdale, Maricopa County, Arizona. EPA Facility ID: AZD980695969

Mar. 08, 2007; 17 pp.; In English

Report No.(s): PB2007-114281; No Copyright; Avail.: National Technical Information Service (NTIS)

The North Indian Bend Wash (NIBW) Superfund site was added to the National Priorities List in 1983. Three (3) companies are identified as potentially responsible parties for contributing to the contamination of groundwater beneath this site; Motorola, Siemens, and SmithKline Beecham. The Area 7 Groundwater Extraction and Treatment System (GWETS) was placed into service to remove volatile organic compounds (VOCs) from contaminated aquifers. During the operation of this facility, community members became concerned over the possibility of health risks associated with VOC emissions being produced by the air stripper at this site. Releases of trichloroethylene (TCE), perchloroethylene (PCE), and chloroform were of particular interest to local residents and businessmen. In response to a request from the NIBW Community Involvement Group, the Arizona Department of Health Services (ADHS) reviewed existing data and performed a health consultation to evaluate the potentially adverse health effects due to VOCs created by air emissions from the Area 7 Treatment System.

NTIS

Arizona; Extraction; Ground Water; Health; Volatile Organic Compounds

20080031043 Arizona State Dept. of Health, Phoenix, AZ, USA

Health Consultation: North Indian Bend Wash Miller Road Treatment Facility, Scottsdale, Maricopa County, Arizona. EPA Facility ID: AZD980695969

Mar. 01, 2006; 14 pp.; In English

Report No.(s): PB2007-114279; No Copyright; Avail.: National Technical Information Service (NTIS)

The North Indian Bend Wash (NIBW) Superfund site was added to the National Priorities List in 1983. As part of the remediation, the Miller Road Treatment Facility (MRTF) was built by the Arizona American Water Company (AAWC) to treat groundwater in order to reduce volatile organic compounds (VOCs) that have contaminated the aquifers. The MRTF uses a process called Air Stripping to remove VOCs from water. The NIBW Community Involvement group has expressed concern regarding the release of VOCs such as trichloroethylene (TCE), perchloroethylene (PCE), and chloroform into the ambient air by this treatment facility. In response, the Arizona Department of Health Services reviewed existing data and performed a health consultation to evaluate the potentially adverse health effects due to VOCs created by air emissions from the Miller Road Treatment Facility.

NTIS

Aquifers; Arizona; Contamination; Ground Water; Health; Roads; Volatile Organic Compounds

20080031045 Oregon Dept. of Human Resources, Salem, OR, USA

Health Consultation: Final Version. J. H. Baxter and Company, Eugene, Lane County, Oregon. CERCLIS No. ORD009032400

January 2007; 39 pp.; In English

Report No.(s): PB2007-114277; No Copyright; Avail.: National Technical Information Service (NTIS)

The Superfund Health Investigation and Education (SHINE) program in the Oregon Department of Human Services developed this health consultation to address community concerns about potential air contaminants in neighborhoods near the J.H. Baxter and Company's wood-processing facility in Eugene, Oregon. The health consultation focuses on the wood preservatives used at the site. Because air sampling data is not available, SHINE has classified the site as an indeterminate health hazard. SHINE recommends developing a comprehensive air-monitoring program for the neighborhoods near the site. The data are needed to evaluate whether contaminants in the air and in windblown dust are at levels that could be harmful to people in the area.

NTIS

Air Pollution; Education; Environmental Cleanup; Health; Oregon; Wood

20080031054 Massachusetts Dept. of Public Health, Boston, MA, USA

Air Pollution and Pediatric Asthma in the Merrimack Valley

Jul. 2007; 254 pp.; In English

Contract(s)/Grant(s): ATSDR-U50-ATU187584-03

Report No.(s): PB2007-111375; No Copyright; Avail.: National Technical Information Service (NTIS)

In 1998, in response to community concerns related to air pollution and breast cancer, the Massachusetts Department of Public Health (MDPH) conducted an investigation of breast cancer incidence relative to community concerns over the possible relationship between elevated rates of asthma and opportunities for exposure to incinerator emissions in the Merrimack Valley region of Massachusetts. That investigation showed that the pattern of breast cancer was not likely associated with opportunities for exposure to incinerator emissions. The final report, however, recommended evaluating respiratory health status, as that might allow for a better determination of the effects of exposure to air pollution among residents of the Merrimack Valley. The Merrimack Valley has historically carried a disproportionate number of solid-waste incinerators in close proximity to one another. An investigation of the respiratory health of the Merrimack Valley was designed and carried out by the Massachusetts Department of Public Health (MDPH) Center for Environmental Health's Environmental Epidemiology Program in accordance with the peer reviewed protocol for conducting community-specific environmental health assessments developed by the Center for Environmental Health (CEH). The study was funded, in part, by the U.S. Agency for Toxic Substances and Disease Registry beginning in November, 1999. At the commencement of the study, a community advisory committee, termed the Merrimack Valley Advisory Committee (MVAC), was formed to assist the Department with the investigation. The MVAC was composed of local residents from the study communities, health care professionals, environmental advocates, local health agents/officers, school nurses, and staff from the Massachusetts Department of Environmental Protection and U.S. Environmental Protection Agency (USEPA). Their charge was to identify community health concerns to enable the MDPH to design a study to address such concerns.

NTIS

Air Pollution; Asthma; Breast; Cancer; Incinerators; Public Health

20080031055 National Science and Technology Council, Washington, DC, USA

Multiyear Federal Research Plan for Particulate Matter within the Context of the NRC's Committee on Research Priorities for Airborne Particulate Matter's Report IV

Apr. 2007; 60 pp.; In English

Report No.(s): PB2007-109660; No Copyright; Avail.: National Technical Information Service (NTIS)

This report was prepared by the Air Quality Research Subcommittee (AQRS) of the National Science and Technology Council's Committee on Environment and Natural Resources (CENR). In this report, the AQRS evaluates particulate matter (PM) research being conducted or planned across the federal government against the findings and recommendations of the National Research Council (NRC) report, Research Priorities for Airborne Particulate Matter: IV, published in 2004. In addition, this document describes the organizational role of the AQRS for ensuring that the many PM related research projects conducted or supported by the government address the priorities, issues, and challenges identified in the NRC report. It profiles the agency research being done under each of the ten topic areas identified in the NRC report, establishes research milestones

for major agency-specific research contributions, establishes a process for periodic progress review and refinement, and identifies organizational roles and responsibilities in coordinating cross-agency research.

NTIS

Air Pollution; Air Quality; Ambience; Particles; Particulates; Priorities

20080031175 NASA Langley Research Center, Hampton, VA, USA

An Instrument to Enable Identification of Anthropogenic CO₂ Emissions Using Concurrent CO Measurements

Cook, William B.; Crawford, James H.; Diskin, Glenn S.; Gordley, Larry L.; Rubio, Manuel; Sachse, Glen W.; July 23, 2008; 1 pp.; In English; NASA ASCENDS Workshop, 23-25 Jul. 2008, Ann Arbor, MI, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 698671.01.07.99.03; Copyright; Avail.: CASI: A01, Hardcopy

We have developed an instrument concept that will enable the measurement of CO from the top of the atmosphere to the Earth's surface with very high sensitivity and at the high spatial and temporal resolutions required by the NRC Decadal Survey mission Active Sensing of Carbon Dioxide (CO₂) over Nights, Days and Seasons (ASCENDS). We are developing an innovative CO sensor that will enable the ASCENDS mission to differentiate between anthropogenic and natural sources and sinks of global carbon. The NRC Decadal Survey places particular emphasis on retrieving CO information for the planetary boundary layer. Measurement made using both the 2.3 micron and 4.7 micron channels are needed to achieve the sensitivity required in the lower atmosphere where the degree of CO - CO₂ correlation is indicative of anthropogenic sources of CO₂. Measurements made using only the 4.7 micron channel cannot provide sufficient sensitivity to CO in the very lowest layers of the atmosphere. The fundamental method we use is Gas Filter Correlation Radiometry (GFCR), a highly successful technique used in other airborne and space-based missions for detecting trace species in the Earth's atmosphere. Our version of GFCR overcomes many of the limitations encountered by prior and existing instruments, allowing us to measure weak signals from small targets very quickly and with extremely high specificity by employing a new dual beam radiometer concept using a focal plane array. Our design will provide a means to make the desired CO measurements for the ASCENDS mission. A simple change in gas filter cell contents would allow the same hardware to measure CH₄ with high precision under the nominal ASCENDS mission spatial and temporal constraints. All critical components in the sensor design are mature, many subsystems tested, and the system has been extensively modeled, bringing it to a present Technology Readiness Level (TRL) of 3 (though some individual components are at TRLs 6-9). We are presently developing critical components for the new spectrometer and advancing our understanding of the measurement requirements for both CO and CH₄. This new GFCR technique/sensor will enable measurements of trace gases with high sensitivity while maintaining the inherent robustness and simplicity of the more traditional radiometer hardware. Initial estimates of cost/risk of a spacebased 2-channel GFCR indicate that our design is extremely cost effective and will fit within existing ASCENDS mission budget constraints as determined by the NRC Decadal Survey and a NASA-sponsored mission study.

Derived from text

Carbon Dioxide; Carbon Monoxide; Atmospheric Composition; Earth Surface; Detection; Emission; Radiometers

20080031647 Idaho National Engineering Lab., Idaho Falls, ID, USA

Off-Gas Mercury Control Using Sulfur-Impregnated Activated Carbon-Test Results

Soelberg, N.; Olson, A.; Boardman, R.; Ryan, K.; Mason, B.; May 2007; 15 pp.; In English

Report No.(s): DE2007-912449; INL/CON-07-12422; No Copyright; Avail.: Department of Energy Information Bridge

Several laboratory and pilot-scale tests since the year 2000 have included demonstrations of off-gas mercury control using fixed bed, sulfur-impregnated activated carbon. These demonstrations have included operation of carbon beds with gas streams containing a wide range of mercury and other gas species concentrations representing off-gas from several U.S. Department of Energy (DOE) mixed waste treatment processes including electrical resistance heated (joule-heated) glass melters, fluidized bed calciners, and fluidized bed steam reformers. Surrogates of various DOE mixed waste streams (or surrogates of offgas from DOE mixed waste streams) including INL sodium bearing waste (SBW), liquid low activity waste (LAW) from the Pacific Northwest National Laboratory, and liquid waste from Savannah River National Laboratory (Tank 48H waste) have been tested. Test results demonstrate mercury control efficiencies up to 99.999%, high enough to comply with the Hazardous Waste (HWC) Combustor Maximum Achievable Control Technology (MACT) standards even when the uncontrolled off-gas mercury concentrations exceed 400,000 ug/dscm (at 7% O₂), and confirm carbon bed design parameters for such high efficiencies. Results of several different pilot-scale and engineering-scale test programs performed over several years are presented and compared.

NTIS

Activated Carbon; Radioactive Wastes; Sulfur; Waste Management

20080031690 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Synthesis and Characterization of Nanostructured Iron Powder for Environmental Remediation

Mancilha, Jose Carlos; [2007]; 87 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14790-TDI/1233; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A05](#), Hardcopy

Nanostructured iron has been of high interest due to its excellent chemical properties and potential applications in biomedical, catalysis and environmental engineering area. One express applications is its use as a catalyst for CVD synthesis of multi-walled carbon nanotubes and in remediation of contaminants from wastewater and soil. The quantity of contaminated areas in Brazil is enormous in conformity to CETESB (Organ environmental). The use of zero-valence iron has expand to include in-situ remediation of several types of contaminants, including the reduction metal ion, for example, Cr(VI), Ni(II) and Pb(II). The properties of iron nanostructures are size dependent, thus, obtaining uniform nanoparticles is a challenge. Nanoscale particles are characterized by high surface area to volume ratios and high reactivities. The nanostructured iron can be produced using a solution of Fe(III) and borohydride alkaline react in aqueous. This process is based on the the classical electrochemical equation concept. In this study interest is focused on investigating the quantity and quality parameters for obtaining and applying of nanostructured iron and microstructured iron as environmental remediation. The results this work has demonstrated that, nanoscale iron particles (less than 100 nm) can be synthesized from precursor as Fe(III). The characterization of nanoparticles iron was determined using energy disperse X-ray analysis (EDX) and Transmission Electron Microscopy (TEM), The photomicrographic image of iron nanoparticles was recorded with instruments. The application of iron nanoparticles as reducing agent and in soil contaminated with heavy metal ions, presented a considerable reduction of the concentrations in the studied soil, thus reducing the degree of pollution in the environment. It is important to emphasize that this work was carried through in laboratory scale, where the soil was previously contaminated with dangerous heavy metal ions. The results of this work has shown us satisfactory effect in the use of nanoparticles iron as an environmental remediator, leading to annual growth in the recovery of degraded areas.

Author (revised)

Iron; Metal Powder; Synthesis; Characterization; Nanostructure Growth; Carbon Nanotubes; Environmental Cleanup

20080031725 Public Health Inst., Berkeley , CA, USA; California Dept. of Health Services, Berkeley, CA, USA

Fatality Assessment and Control Evaluation (FACE) Report for California: Three Oil Field Workers Died after Inhaling Carbon Monoxide Gas in an Oil Well Cellar

Jan. 1997; 8 pp.; In English

Report No.(s): PB2007-114514; FACE-94-CA-016-03; No Copyright; Avail.: CASI: [A02](#), Hardcopy

Three oil field workers died after breathing carbon monoxide (CO) gas in an oil well cellar. The incident occurred during perforation, a procedure to create holes in the pipe in the well to allow the well to be used for water disposal. During the procedure, water began flowing from a valve in the well cellar. No plan had been prepared for actions by the workers in the event that this occurred. The first worker (decedent no. 1), a 22 year-old male, entered the well cellar to turn off the valve. Upon entering the area, he collapsed and fell into the cellar. A second worker (decedent no. 2), a 24 year-old male entered the cellar to assist decedent no. 1 but was also overcome and collapsed. A third worker (decedent no. 3), a 26-year-old male, was overcome while kneeling near the opening to the cellar and also fell in. The decedents, all employed by a well maintenance contractor, were not wearing any personal protective equipment (PPE) at the time of the incident. No confined space atmospheric testing was performed prior to entry into the well space by any of the workers. Workers from another contractor, that was performing the well perforation, went into the cellar and pulled the decedents out when they saw what had happened. None of the rescuers wore any type of PPE nor was any available for their use at the incident site. Fire department paramedics arrived on the scene shortly after the incident occurred and pronounced decedent no. 2 dead at the scene. The other two victims were transported to the hospital where they both were later pronounced dead. Four additional workers were hospitalized, but survived the incident. The CA/FACE investigator concluded that in order to prevent similar future occurrences, employers and contractors should: (1) ensure that their Injury and Illness Prevention Programs (IIPP) effectively address all the present and potential hazards of their employees' worksites; (2) test the atmosphere of confined spaces before any employees are allowed entry; (3) if feasible, ventilate confined spaces so that employees are not exposed to hazardous air contaminants; (4) insure employees are provided and wear approved respiratory equipment when entering confined spaces where there is the presence or suspicion of harmful mists, fumes, or gases, or oxygen deficiency; and (5) insure employees are provided and wear approved safety harnesses and life lines when entering confined spaces not kept safe

through forced air ventilation, train employees in rescue operations so that in the event of an emergency, workers understand the risks and how to safely avoid them, and should provide and keep available equipment for rescue operations.

NTIS

Accident Investigation; Carbon Monoxide; Health; Oil Fields; Oils; Personnel; Respiration; Safety

20080032228 Agency for Toxic Substances and Disease Registry, Atlanta, GA, USA

Health Consultation: North Indian Bend Wash Area 12 Treatment Facility, City of Scottsdale, Maricopa County, Arizona. EPA Facility ID: AZD980695969

Mar. 28, 2005; 16 pp.; In English

Report No.(s): PB2007-114256; No Copyright; Avail.: CASI: [A03](#), Hardcopy

This consult is in response to requests from the North Indian Bend Wash Community Advisory Board (CAB) to determine if any air emissions of volatile organic compounds such as trichloroethylene (TCE), perchloroethylene (PCE), dichloroethylene (DCE), and chloroform from the facility at Area 12 are creating an adverse health impact on area residents. There are currently four treatment facilities associated with the NIBW contamination, located over a wide area within the site boundaries. Because of the wide range of locations, the Arizona Department of Health Services (ADHS) determined that a separate evaluation of the treatment facilities would provide a more site-specific approach to answering the CABs concerns.

NTIS

Arizona; Contamination; Health; Volatile Organic Compounds

20080032230 Agency for Toxic Substances and Disease Registry, Atlanta, GA, USA

Health Consultation: Mary McLeod Bethune School and South Phoenix Air Monitoring, Phoenix, Maricopa County, Arizona

Nov. 16, 2005; 18 pp.; In English

Report No.(s): PB2007-114249; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The Arizona Department of Health Services has a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR) to conduct health consultation activities. The purpose of this health consultation is to evaluate the air monitoring conducted by the Arizona Department of Environmental Quality (ADEQ) at Mary McLeod Bethune School (Phoenix, AZ) and evaluate the potential impact on public health. The air monitoring data includes particulate matter and metals. The ADEQs primary objective of this air sampling is to provide an understanding of the hazardous air pollutants in the Phoenix area.

NTIS

Air Quality; Arizona; Environmental Monitoring; Environmental Quality; Health; Schools

20080032233 Environmental Protection Agency, Research Triangle Park, NC USA

Potential Inhalation Exposures to Manganese from the Use of Methylcyclopentadienyl Manganese Tricarbonyl as an Additive to Unleaded Gasoline: U.S. Environmental Protection Agency 1994 Assessment Revisited

Vallero, D.; Huber, A.; Braddock, J.; Robertson, G.; Lewis, C. W.; Sep. 2007; 64 pp.; In English

Report No.(s): PB2007-114769; EPA/600/R-07/112; No Copyright; Avail.: CASI: [A04](#), Hardcopy

In 1994, the Office of Research and Development (ORD) of the U.S. Environmental Protection Agency (EPA) conducted an assessment of the potential U.S. population exposures resulting from the use of methylcyclopentadienyl manganese tricarbonyl (MMT) as an additive in gasoline. In a May 11, 2000, letter from Margo T. Oge, Director, Office of Transportation and Air Quality, U.S. Environmental Protection Agency, to Donald R. Lynam, Vice President, Air Conservation, Ethyl Corporation, EPA committed to consider whether or not there is a need to change the conclusions of that assessment in light of the data developed and submitted to EPA by Ethyl Corporation as a part of the study entitled Manganese Exposure Study (Toronto). The present document presents the methodology and results of the ORD re-evaluation of its 1994 exposure assessment of expected inhalation exposures to manganese particulate, if MMT were to be used in unleaded gasoline in the USA.

NTIS

Additives; Environment Protection; Exposure; Gasoline; Manganese; Respiration

20080032238 National Inst. for Occupational Safety and Health, Washington, DC, USA
NIOSH Health Hazard Evaluation Report: HETA No. 2007-0183-3047, Assessment of Noise Exposures in a Hospital Kitchen, August 2007

Achutan, C.; Aug. 2007; 20 pp.; In English

Report No.(s): PB2007-114517; HETA-2007-0183-3047; No Copyright; Avail.: National Technical Information Service (NTIS)

On March 21, 2007, NIOSH received a management request from the Industrial Hygiene and Safety Office at the Department of Veterans Affairs in Cincinnati, Ohio, to assess employee noise levels in the Nutrition and Food Services Department. The request stated that employees were concerned about noise exposures in the kitchen's pots and pans room after the installation of the PowerSoak, a continuous dishwashing system. On March 27-28, 2007, a NIOSH investigator evaluated employee exposures to noise in this department. Eleven employees (two cooks, eight food service workers, and a materials handler) who worked in the Nutrition and Food Services Department contributed 13 full-shift and two task-based personal noise dosimetry measures over 2 days. None of the measures exceeded the OSHA criteria. Noise levels for two food service workers assigned to the pots and pans room, a cook working in the food preparation area, and a food service worker assigned to the dishwashing room exceeded the NIOSH REL. The noise level from the PowerSoak dishwashing system alone was not excessive, but additional noise from the food preparation area (primarily from blenders and utensils), and from metal-to-metal contact between stainless steel pots and pans and metal racks, may explain exposures above the NIOSH REL for the pots and pans room employees. The cooks are exposed to many intermittent impact noise sources from general handling such as metal-to-metal contact between utensils and the use of industrial-size blenders. The food service workers assigned to the dishwashing room are exposed to intermittent impact noise from contact between utensils and china, and continuous noise from the pulper, a waste-reduction machine.

NTIS

Exposure; Food Processing; Hazards; Health; Hospitals; Noise (Sound); Personnel; Safety

20080032316 Global Change Research Program, Washington, DC, USA
Scenarios of the Greenhouse Gas Emissions and Atmospheric Concentrations. Synthesis and Assessment Product 2.1a

Jul. 2007; 164 pp.; In English

Report No.(s): PB2007-113079; No Copyright; Avail.: National Technical Information Service (NTIS)

This and a companion report constitute one of twenty-one Synthesis and Assessment Products called for in the Strategic Plan for the U.S. Climate Change Science Program. These studies are structured to provide high-level, integrated research results on important science issues with a particular focus on questions raised by decision-makers on dimensions of climate change directly relevant to the U.S. One element of the CCSPs strategic vision is to provide decision support tools for differentiating and evaluating response strategies. Scenario-based analysis is one such tool. The scenarios in this report explore the implications of alternative stabilization levels of anthropogenic greenhouse gases (GHGs) in the atmosphere, and they explicitly consider the economic and technological foundations of such response options. Such scenarios are a valuable complement to other scientific research contained in the twenty-one CCSP Synthesis and Assessment Products. The companion to the research reported here, *Global-Change Scenarios: Their Development and Use*, explores the broader strategic frame for developing and utilizing scenarios in support of climate decision making.

NTIS

Greenhouse Effect; Atmospheric Composition; Emission; Gases; Earth Atmosphere

20080032330 State Dept., Washington, DC, USA
U.S. Climate Action Report: 2006. Fourth National Communication of the USA of America under the United Nations Framework Convention on Climate Change

Jul. 27, 2007; 145 pp.; In English

Report No.(s): PB2007-113811; No Copyright; Avail.: National Technical Information Service (NTIS)

The fourth CAR provides an update on key activities conducted by the U.S. since the third CAR, an inventory of U.S. greenhouse gas emissions and sinks, an estimate of the effects of mitigation measures and policies on future emissions levels, and a description of U.S. leadership and involvement in international programs, including associated contributions and funding efforts. In addition, the text discusses U.S. national circumstances that affect U.S. vulnerability and responses to climate

change. Finally, the CAR presents information on the U.S. Climate Change Science Program, the U.S. Climate Change Technology Program, our efforts in systematic observations, including the U.S. Integrated Earth Observation System, and our education, training and outreach efforts. The report takes into account activities up to and including 2006.

NTIS

Climate; Climate Change

20080032559 California Inst. of Tech., Pasadena, CA, USA

Global Radiative Forcing of Coupled Tropospheric Ozone and Aerosols in a Unified General Circulation Model

Liao, Hong; Seinfeld, John H.; Adams, Peter J.; Mickley, Loretta J.; Journal of Geophysical Research; [2008]; Volume 109; 1 pp.; In English

Contract(s)/Grant(s): NNG04GD53G; Copyright; Avail.: Other Sources

ONLINE: <http://dx.doi.org/10.1029/2003JD004456>

Global simulations of sea salt and mineral dust aerosols are integrated into a previously developed unified general circulation model (GCM), the Goddard Institute for Space Studies (GISS) GCM II', that simulates coupled tropospheric ozone-NO_x-hydrocarbon chemistry and sulfate, nitrate, ammonium, black carbon, primary organic carbon, and secondary organic carbon aerosols. The fully coupled gas-aerosol unified GCM allows one to evaluate the extent to which global burdens, radiative forcing, and eventually climate feedbacks of ozone and aerosols are influenced by gas-aerosol chemical interactions. Estimated present-day global burdens of sea salt and mineral dust are 6.93 and 18.1 Tg with lifetimes of 0.4 and 3.9 days, respectively. The GCM is applied to estimate current top of atmosphere (TOA) and surface radiative forcing by tropospheric ozone and all natural and anthropogenic aerosol components. The global annual mean value of the radiative forcing by tropospheric ozone is estimated to be +0.53 W m^(sup -2) at TOA and +0.07 W m^(sup -2) at the Earth's surface. Global, annual average TOA and surface radiative forcing by all aerosols are estimated as -0.72 and -4.04 W m^(sup -2), respectively. While the predicted highest aerosol cooling and heating at TOA are -10 and +12 W m^(sup -2) respectively, surface forcing can reach values as high as -30 W m^(sup -2), mainly caused by the absorption by black carbon, mineral dust, and OC. We also estimate the effects of chemistry-aerosol coupling on forcing estimates based on currently available understanding of heterogeneous reactions on aerosols. Through altering the burdens of sulfate, nitrate, and ozone, heterogeneous reactions are predicted to change the global mean TOA forcing of aerosols by 17% and influence global mean TOA forcing of tropospheric ozone by 15%.

Author

Aerosols; Atmospheric General Circulation Models; Ozone; Troposphere; Geophysics

20080032598 Idaho Dept. of Health and Welfare, Boise, ID, USA

Health Consultation: Portneuf Valley Air Toxics Ambient Air Data Evaluation and Health Assessment, Pocatello, Chubbuck and Surrounding Areas, Bannock, Idaho. EPA Facility ID: IDD984666610

Aug. 21, 2007; 24 pp.; In English

Report No.(s): PB2008-100524; No Copyright; Avail.: National Technical Information Service (NTIS)

Poor air quality is a concern for both citizens and environmental and public health agencies. It can have an impact on the health of individuals and may adversely impact sensitive populations such as children, the elderly, and those with asthma, respiratory disease, and heart disease. The Portneuf Valley, comprised of Pocatello, Chubbuck and surrounding areas in southeast Idaho, is not exempt from air quality problems. Periods of poor air quality in the Portneuf Valley may be due in part to its valley location, population growth, an increase in vehicles, factory emissions, wood stove burning, agricultural production, and airborne dusts from dry soils. This health consultation resulted from a recommendation made by the Agency for Toxic Substances and Disease Registry (ATSDR) in their 2000 health consultation of air contamination at Eastern Michaud Flats to further examine the air contaminants to determine if they might pose risks for chronic health effects. To understand if the air quality might pose these chronic (long-term) health concerns for area residents, the Bureau of Community and Environmental Health (BCEH) within the Idaho Department of Health and Welfare (IDHW) worked with the Idaho Department of Environmental Quality (IDEQ) to determine the type of contaminants and the levels of contaminants in the air. To determine the types and levels of contaminants, IDEQ collected air samples near the Garrett and Gould (G&G) intersection in Pocatello from 2003-2005. These samples were sent to a lab for analysis. BCEH then looked at the lab results to determine if there were any health risks due to breathing air with these levels of contaminants.

NTIS

Air Pollution; Environmental Surveys; Health; Public Health; Risk; Toxicity; Valleys

GEOPHYSICS

Includes Earth structure and dynamics, aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For related information see *47 Meteorology and Climatology*; and *93 Space Radiation*.

20080030993 NASA Marshall Space Flight Center, Huntsville, AL, USA

Relativistic Electrons at Geostationary Orbit: Modeling Results

Khazanov, George V.; Lyatsky, Wladislaw; May 27, 2008; 1 pp.; In English; American Geophysical Union 2008 Joint Assembly, 27-30 May 2008, Fort Lauderdale, FL, USA; No Copyright; Avail.: Other Sources; Abstract Only

We developed a new prediction model for forecasting relativistic (greater than 2MeV) electrons, which provides a VERY HIGH correlation between predicted and actually measured electron fluxes at geostationary orbit. This model implies the multi-step particle acceleration and is based on numerical integrating two linked continuity equations for primarily accelerated particles and relativistic electrons. The model includes a source and losses, and used solar wind data as only input parameters. We used the coupling function which is a best-fit combination of solar wind/interplanetary magnetic field parameters, responsible for the generation of geomagnetic activity, as a source. The loss function was derived from experimental data. We tested the model for four year period 2004-2007. The correlation coefficient between predicted and actual values of the electron fluxes for whole four year period as well as for each of these years is stable and incredibly high (about 0.9). The high and stable correlation between the computed and actual electron fluxes shows that the reliable forecasting these electrons at geostationary orbit is possible.

Author

Relativistic Particles; Electrons; Geosynchronous Orbits; Particle Acceleration

20080031056 Bureau of Reclamation, Denver, CO, USA

Computer Material Models for Soils, Rock, and Concrete using FLAC and DYNA. Dam Safety Technology Development Program

Harris, D.; May 2006; 164 pp.; In English

Report No.(s): PB2007-109611; DSO-06-01; No Copyright; Avail.: National Technical Information Service (NTIS)

This report summarizes material models available for the analysis of soils in the computer codes, FLAC and DYNA. The input constants needed for these models are emphasized. Typical values or ranges of values are given, and methods to calculate the parameters from laboratory data are discussed. In addition, dynamic dumping in computations is discussed. Two components, mass (structural inertia) and stiffness (material hysteresis), are discussed. Field-measured values are presented and methods to calculate material damping in the lab shown. The report concludes that nonlinear analyses can be used to better understand complex site response of dams; models are available for these analyses. It is recommended that measured values from the structure in question be used for analysis.

NTIS

Computer Programs; Computerized Simulation; Concretes; Dams; Rocks; Safety Devices; Soils

20080031123 NASA Goddard Space Flight Center, Greenbelt, MD, USA

A New Approach to Inferences for Pancake Domes on Venus

Glaze, Lori S.; Baloga, Steve M.; Stofan, Ellen R.; March 10, 2008; 2 pp.; In English; Lunar Planetary Science Conference, 10-14 Mar. 2008, Houston, TX, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

Figure 1 shows a radar image and topography for flat-topped, steep-sided 'pancake' domes on Venus. At least 145 such domes have been identified on Venus [1] and are thought to be volcanic in origin [2]. Based on analysis of the dome surfaces, [3] suggested that only the late stage surface fractures are preserved, indicating entrainment and annealing of fractures during emplacement, consistent with a basaltic composition. Figure 1 shows a radar image and topography for flat-topped, steep-sided 'pancake' domes on Venus. At least 145 such domes have been identified on Venus [1] and are thought to be volcanic in origin [2]. Based on analysis of the dome surfaces, [3] suggested that only the late stage surface fractures are preserved, indicating entrainment and annealing of fractures during emplacement, consistent with a basaltic composition.

Derived from text

Radar Imagery; Topography; Volcanoes; Venus (Planet); Basalt

20080031124 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Sensitivity of Polar Stratospheric Ozone Loss to Uncertainties in Chemical Reaction Kinetics

Kawa, S. Randolph; Stolarski, Richard S.; Douglass, Anne R.; Newman, Paul A.; June 15, 2008; 1 pp.; In English; Polar Chlorine Chemistry Workshop/Stratospheric Processes and their Role in Climate, 15-20 Jun. 2008, Cambridge, UK; No Copyright; Avail.: Other Sources; Abstract Only

Several recent observational and laboratory studies of processes involved in polar stratospheric ozone loss have prompted a reexamination of aspect of our understanding for this key indicator of global change. To a large extent, our confidence in understanding and projecting changes in polar and global ozone is based on our ability to simulate these process in numerical models of chemistry and transport. These models depend on laboratory-measured kinetic reaction rates and photolysis cross section to simulate molecular interactions. In this study we use a simple box-model scenario for Antarctic ozone to estimate the uncertainty in loss attributable to known reaction kinetic uncertainties. Following the method of earlier work, rates and uncertainties from the latest laboratory evaluation are applied in random combinations. We determine the key reaction and rates contributing the largest potential errors and compare the results to observations to evaluate which combinations are consistent with atmospheric data. Implications for our theoretical and practical understanding of polar ozone loss will be assessed.

Author

Stratosphere; Ozone Depletion; Antarctic Regions; Reaction Kinetics; Atmospheric Chemistry

20080031164 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Magnetic Field Observations of Partial Ring Current during Storm Recovery Phase

Le, G.; Russell, C. T.; Slavin, J. A.; Lucek, E. A.; March 09, 2008; 1 pp.; In English; 15th Cluster Workshop, 11-14 Mar. 2008, Tenerife, Canary Islands, Spain; Original contains black and white illustrations; Copyright; Avail.: Other Sources; Abstract Only

We present results of an extensive survey of the magnetic field observations in the inner magnetosphere using 30 years of magnetospheric magnetic field data from Polar, Cluster, ISEE, and AMPTE/CCE missions. The purpose of this study is to understand the magnetic field evolution during the recovery phase of geomagnetic storms, and its implication to the ring current recovery and loss mechanisms of ring current particles. It is now commonly believed that a strong partial ring current is formed during the storm main phase due to the enhanced earthward convection of energetic ions from nightside plasma sheet. But the presence of a strong partial ring current throughout the recovery phase remains controversial. The magnetic field generated by the ring current inflates the inner magnetosphere and causes magnetic field depressions in the equatorial magnetosphere. During the storm recovery phase, we find that the distribution of the equatorial magnetic field depression exhibits similar local time dependence as the ring current distribution obtained from the combined dataset in the earlier study. It shows that a strong partial ring current is a permanent feature throughout the recovery phase. In the early recovery phase, the partial ring current peaks near the dusk terminator as indicated by the peak of the magnetic field depression. As the recovery phase progresses, the partial ring current decays most quickly near the dusk and results in a dusk-to-midnight moving of the peak of the partial ring current. Thus the loss mechanisms work most effectively near the dusk. The magnetic field depression increases the gyroradius of ring current protons to a scale greater or comparable to the thickness of the magnetopause, which increases the chance of ion drift loss near the dusk magnetopause at larger L-shell (L greater than 5). But the drift loss mechanism alone cannot explain the loss of ring current ions especially in the smaller L-shell (L less than 5). The precipitation loss due to wave-particle interaction is most likely the dominant loss mechanism in the small L-shell as it works most effectively at the same local time.

Author

Interplanetary Magnetic Fields; Ring Currents; Magnetic Storms; Earth Magnetosphere

20080031185 Brookhaven National Lab., Upton, NY, USA; Nuclear Regulatory Commission, Washington, DC, USA

Overview on BNL Assessment of Seismic Analysis Methods for Deeply Embedded NPP Structures

Xu, J.; Costantino, C.; Hofmayer, C.; Graves, H.; Apr. 2007; 11 pp.; In English

Report No.(s): DE2007-910371; BNL-78099-2007-CP; No Copyright; Avail.: National Technical Information Service (NTIS)

A study was performed by Brookhaven National Laboratory (BNL) under the sponsorship of the U. S. Nuclear Regulatory Commission (USNRC), to determine the applicability of established soil-structure interaction analysis methods and computer programs to deeply embedded and/or buried (DEB) nuclear power plant (NPP) structures. This paper provides an overview of the BNL study including a description and discussions of analyses performed to assess relative performance of various SSI analysis methods typically applied to NPP structures, as well as the importance of interface modeling for DEB structures.

There are four main elements contained in the BNL study: (1) Review and evaluation of existing seismic design practice, (2) Assessment of simplified vs. detailed methods for SSI in-structure response spectrum analysis of DEB structures, (3) Assessment of methods for computing seismic induced earth pressures on DEB structures, and (4) Development of the criteria for benchmark problems which could be used for validating computer programs for computing seismic responses of DEB NPP structures. The BNL study concluded that the equivalent linear SSI methods, including both simplified and detailed approaches, can be extended to DEB structures and produce acceptable SSI response calculations, provided that the SSI response induced by the ground motion is very much within the linear regime or the non-linear effect is not anticipated to control the SSI response parameters. The BNL study also revealed that the response calculation is sensitive to the modeling assumptions made for the soil/structure interface and application of a particular material model for the soil.

NTIS

Embedding; Nuclear Power Plants; Soils

20080031289 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Ionospheric F-Layer Nocturnal Zonal Drift Studies over Brazilian Region

Arruda, Daniela Cristina Santana; [2007]; 205 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14224-TDI/1125; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A10](#), Hardcopy

This study focused on the nocturnal zonal plasma drifts of the ionosphere (F layer) at equatorial and low latitude regions of Brazil. The analysis is interpreted using the simple plasma drift model (coupled ionosphere-electric field model of Eccles, 1998) and monochromatic digital images of the OI630nm emission, which allow direct visualization of the ionospheric bubbles. The digital images were obtained by two optical imager systems operating at Sao Joao do Cariri (equatorial geographic latitudes: 7.4 S; 36.5 W; 19 S dip latitude) and Cachoeira Paulista (low geographic latitudes: 22.5 S; 45 W; 31 S dip latitude) from October 1998 to December 2003 (peak of maximum solar activity: 2001, F10.7cm=181.4). In total, 498 nights were observed, of which on 192 nights ionospheric bubbles occurred, with 14 nights being geomagnetically quiet nights (SigmaKp less than 24+). The ionospheric bubble zonal drifts were calculated and grouped seasonally. Then, the geophysical conditions of each quiet night were considered in the equations of the model of Eccles (1998) in order to obtain the theoretical ionospheric plasma drifts between 18LT and 6LT (30 minute intervals). The theoretical results were also grouped seasonally. The zonal ionospheric plasma drifts result from low-latitude electrodynamics with a mix of influences from E and F region conductivities and neutral wind shears in altitude and latitude. Analysis of the zonal drifts of the ionospheric bubbles suggests that postsunset zonal drifts are strongly influenced by the F layer dynamo. The statistical results showed that during the maximum solar cycle the ionospheric bubbles occur with high frequency between September and April. The low frequency between May and August was mainly associated with magnetic storms. The maximum frequencies, at Cachoeira Paulista (100%) and at Sao Joao do Cariri (96%), occurred in the Spring at 22LT-23LT. One important result is that, on quiet nights, the ionospheric bubbles (fully developed) and the ionospheric plasma drifts move eastward with zonal neutral winds. The maximum zonal drift velocities were observed between 20LT and 22LT. After 0LT, the zonal drift velocities decreased more rapidly at Cachoeira Paulista than at Sao Joao do Cariri. Another characteristic observed is a significant latitudinal variation in the ionospheric bubble drift velocities in the equatorial and low latitude regions, which may be related to the latitudinal gradients.

Author

F Region; Plasma Drift; Ionospheric Drift; Earth Ionosphere; Night; Geomagnetism

20080031310 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Studies about the Nocturnal Boundary Layer in Amazonia: Observational and Modeling Patterns

Nascimento dos Santos, Rosa Maria; [2007]; 173 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14477-TDI/1158; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A08](#), Hardcopy

The goal of this work is studying the dynamics and structure of the Nocturnal Boundary Layer (NBL) in Amazonia, over forest and deforested areas (pasture) and determining their characteristics during the dry and wet seasons on that region, as well as its main development controlling mechanisms. To this end, 2 data sets have been used for the dry and wet seasons collected on 3 field sites (RM, Forest and FNS) located in Rondonia State. This study was carried out in two parts: an observational one, which describes the structure and evolution of NBL as observed in Rondonia during the two data collection periods; and a modeling one, in which the NBL characteristics are simulated by a numerical model trying to understand the controlling mechanism and processes its development. The result analyses pointed out that the NBL structure was better described during dry season when local effects are predominant and that during the wet season it is more difficult identifying behavior patterns in the NBL due to interaction occurring between local-scale atmospheric phenomena and the meso and

large-scale one (which acting is more strength during the wet period). Furthermore, in general the transition forest-pasture area (RM) presented development patterns similar to the forest ones till 06 lt and on the transition times (late at afternoon and early morning between 06 and 07 lt) these patterns were more similar to those found out on FNS. Has been also showed from modeling part analyses that the OSU-CAPS model represented NBL structure reasonably well, over the three simulation sites, however it did not get to describe the jet origin mechanism (Blackadar's mechanism).

Author (revised)

Atmospheric Boundary Layer; Night; Annual Variations; Rain

20080031658 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Impact on TRMM Products of Conversion to Linux

Stocker, Erich Franz; Kwiatkowski, John; April 16, 2008; 12 pp.; In English; European Geosciences General Assembly 2008, 13-18 Apr. 2007, Vienna, Austria; Original contains color illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

In June 2008, TRMM data processing will be assumed by the Precipitation Processing System (PPS). This change will also mean a change in the hardware production environment from an SGI 32 bit IRIX processing environment to a Linux (Beowulf) 64 bit processing environment. This change of platform and operating system addressing (32 to 64) has some influence on data values in the TRMM data products. This paper will describe the transition architecture and scheduling. It will also provide an analysis of what the nature of the product differences will be. It will demonstrate that the differences are not scientifically significant and are generally not visible. However, they are not always identical with those which the SGI would produce.

Author

TRMM Satellite; Data Processing; Unix (Operating System)

20080031660 NASA Goddard Space Flight Center, Greenbelt, MD, USA

ST5 Observations of the Imbalance of Region 1 and 2 Field-Aligned Currents and its Implication to Ionospheric Closure Currents

Le, G.; Geophysical Research Abstracts; April 13, 2008; Volume 10; 1 pp.; In English; 2008 EGU General Assembly, 13-19 Apr. 2008, Vienna, Austria; No Copyright; Avail.: Other Sources; Abstract Only

A major unsolved question in the physics of ionosphere-magnetosphere coupling is how field-aligned currents (FACs) close. In order to maintain the divergence free condition, overall downward FACs (carried mainly by upward electrons) must eventually balance the overall upward FACs associated with the precipitating electrons through ionospheric Pedersen currents. Although much of the current closure may take place via local Pedersen currents flowing between Region 1 (R1) and Region 2 (R2) FACs, there is a generally an imbalance, i.e., more currents in R1 than in R2, in total currents between them. The net currents may be closed within R1 via cross-polar cap Pedersen currents. In this study, we use the magnetic field observations from Space Technology 5 mission to quantify the imbalance of R1 and R2 currents. We will determine the net R1-R2 currents under various solar wind conditions and discuss the implication of such imbalance to the ionospheric closure currents.

Author

Magnetosphere-Ionosphere Coupling; Field Aligned Currents; Ionospheric Currents; Atmospheric Physics

20080031667 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Messenger Observations of Mercury's Bow Shock and Magnetopause

Slavin J. A.; Acuna, M. H.; Anderson, B. J.; Benna, M.; Gloeckler, G.; Krimigis, S. M.; Raines, M.; Schriver, D.; Travnicsek, P.; Zurbuchen, T. H.; Sep. 21, 2008; 1 pp.; In English; Europlanet Science Conference, 21-26 Sep. 2008, Munster, Germany; Original contains black and white illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

The MESSENGER spacecraft made the first of three flybys of Mercury on January 14, 2008 (1). New observations of solar wind interaction with Mercury were made with MESSENGER'S Magnetometer (MAG) (2.3) and Energetic Particle and Plasma Spectrometer (EPPS) - composed of the Energetic Particle Spectrometer (EPS) and Fast Imaging Plasma Spectrometer (FIPS) (3,4). These MESSENGER observations show that Mercury's magnetosphere has a large-scale structure that is distinctly Earth-like, but it is immersed in a comet-like cloud of planetary ions [5]. Fig. 1 provides a schematic view of the coupled solar wind - magnetosphere - neutral atmosphere - solid planet system at Mercury.

Author

Bow Waves; Mercury (Planet); Shock Waves; Messenger (Spacecraft); Imaging Spectrometers; Energetic Particles; Magnetometers; Plasma Interactions

20080031685 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Study of Methane Emissions on Pantanal of Matogrosso Do Sul

Marani, Luciano; [2007]; 110 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14776-TDI/1229; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A06](#), Hardcopy

The results of an evaluation of the tropical wetland regions contribution to the methane burden are presented. In this study, a total of eight campaigns were performed during the years of 2004 and 2005 inside the Pantanal region of Matogrosso do Sul State in seven sites, near the Miranda River. Static chamber technique with polyurethane syringe sampling was used. In the fluxes analyses, the sites were divided in lakes and floodplains, and some environmental variables that can affect methane emissions, as water depth, pH, dissolved oxygen and water temperature were also measured. The overall average of the 560 individual methane valid fluxes measured from March, 2004 to December, 2005 was $116.8 \pm 257.8 \text{ mgCH}_4\text{m}^{-2}\text{d}^{-1}$ and median of $11.1 \text{ mgCH}_4\text{m}^{-2}\text{d}^{-1}$, near that observed in others tropical flooded regions. In about 40% of flux measurements occurred non-linear increases in the chamber concentrations that were assumed to be linked to methane losses through bubbles. The bubble flux represented about 90% of the total methane losses in the measurements and ranged from 1.1 to $2187.0 \text{ mgCH}_4\text{m}^{-2}\text{d}^{-1}$, with an average of $279.5 \pm 289.5 \text{ mgCH}_4\text{m}^{-2}\text{d}^{-1}$ and median of $127.5 \text{ mgCH}_4\text{m}^{-2}\text{d}^{-1}$. The diffusive fluxes ranged from 1.0 to $145.5 \text{ mgCH}_4\text{m}^{-2}\text{d}^{-1}$, with an average of $13.1 \pm 20.7 \text{ mgCH}_4\text{m}^{-2}\text{d}^{-1}$ and median of $5.0 \text{ mgCH}_4\text{m}^{-2}\text{d}^{-1}$. The fluxes from lakes are smaller than that observed in the floodplains, where the flooding was controlled by the seasonal cycle. The diffusive flux showed a slight seasonal variation, with small average fluxes during the dry season. A direct correlation between fluxes and environmental factor (water depth, water temperature, dissolved oxygen and presence of aquatic vegetation) was not found, however, these factors showed to have some influence on the methane fluxes. Estimates of methane emission from the Pantanal were performed based on estimates of flooded area obtained of a remote sensing model and the extrapolation of our fluxes measurements to the whole region. When considering just the average flux and the average flooded area in the measurement period, the annual methane emission was of $1.37 \text{ TgCH}_4/\text{year}$. When the observed difference between habits and the influence of vegetation was considered, the annual emission was of $2.20 \text{ TgCH}_4/\text{year}$. These estimates conserve a large uncertainty resulting of the extrapolation for the whole Pantanal of the measurements made in one region only, but they indicate that the Pantanal is one of the most important natural sources of atmospheric methane in South America

Author

Methane; Emission; Tropical Regions

20080031710 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Study of Atmospheric Gravity Waves via Airglow of O₂(0,1) and OH(6,2) Molecules

Onohara, Amelia Naomi; [2007]; 92 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14812-TDI/1254; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A05](#), Hardcopy

A study of intensity and temperature variabilities of airglow layers caused by gravity wave perturbations was a main subject of this work. The Krassovsky eta parameter, defines as $\eta = |\eta|e^{-i\Phi}$, was used to investigate the amplitude and phase of periodic variations of the molecular oxygen (O₂(0,1)) and hydroxyl (OH(5,2)) emissions during the night. The data set was obtained by photometer measurements at Rikubetsu (43.5 deg N, 143.8 deg E), Japan, from March 2004 to August 2005, a total of around 280 nights, under collaboration with STEL (Solar-Terrestrial Environment Laboratory), Nagoya University. The Lomb Scargle periodogram was used to analyze data series of O₂ and OH, and predominant periods, wave amplitudes and phases differences between intensity and temperature were calculated. The results showed $|\eta| = 5.3 \pm 1.7$ and $\Phi = -40.2 \text{ deg} \pm 30.6 \text{ deg}$ for O₂ emission, and $|\eta| = 8.0 \pm 4.7$ and $\Phi = -41.9 \pm 41.4 \text{ deg}$ for OH. The $|\eta|$ values obtained from the O₂ emission showed a good agreement with the data presented by the other workers. A large amount of eta values of the OH emission, on the other hand, showed the values larger than 10, which has not been reported previously. However, a model presented by Schubert et al. (1991) predicts eta larger than 10 for the gravity wave with horizontal wavelengths around 100 km.

Author

Gravity Waves; Perturbation; Airglow; Oxygen; Hydroxyl Emission; Atmospheric Physics

20080032365 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

A Study of Mesoscale Gravity Waves over the North Atlantic with Satellite Observations and a Mesoscale Model

Wu, Dong L.; Zhang, Fuqing; Journal Of Geophysical Research; November 25, 2004; ISSN 0148-0227; Volume 109; 14 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NSF ATM-0203238; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40889>; <http://dx.doi.org/10.1029/2004JD005090>

Satellite microwave data are used to study gravity wave properties and variabilities over the northeastern USA and the North Atlantic in the December-January periods. The gravity waves in this region, found in many winters, can reach the stratopause with growing amplitude. The Advanced Microwave Sounding Unit-A (AMSU-A) observations show that the wave occurrences are correlated well with the intensity and location of the tropospheric baroclinic jet front systems. To further investigate the cause(s) and properties of the North Atlantic gravity waves, we focus on a series of wave events during 19-21 January 2003 and compare AMSU-A observations to simulations from a mesoscale model (MM5). The simulated gravity waves compare qualitatively well with the satellite observations in terms of wave structures, timing, and overall morphology. Excitation mechanisms of these large-amplitude waves in the troposphere are complex and subject to further investigations.

Author

Mesoscale Phenomena; Stratopause; Satellite Observation; Advanced Microwave Sounding Unit; Gravity Waves; Microwaves

20080032486 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Recent Ice Loss from the Fleming and Other Glaciers, Wordie Bay, West Antarctic Peninsula

Rignot, E.; Casassa, G.; Gogineni, S.; Kanagaratnam, P.; Krabill, W.; Pritchard, H.; Rivera, A.; Thomas, R.; Turner, J.; Vaughan, D.; Geophysical Research Letters; April 14, 2005; Volume 32; 4 pp.; In English; Original contains color illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40866>; <http://dx.doi.org/10.1029/2004GL021947>

Satellite radar interferometry data from 1995 to 2004, and airborne ice thickness data from 2002, reveal that the glaciers flowing into former Wordie Ice Shelf, West Antarctic Peninsula, discharge 6.8 ± 0.3 km³/yr of ice, which is 84 ± 30 percent larger than a snow accumulation of 3.7 ± 0.8 km³/yr over a $6,300$ km² drainage basin. Airborne and ICESat laser altimetry elevation data reveal glacier thinning at rates up to 2 m/yr. Fifty km from its ice front, Fleming Glacier flows 50 percent faster than it did in 1974 prior to the main collapse of Wordie Ice Shelf. We conclude that the glaciers accelerated following ice shelf removal, and have been thinning and losing mass to the ocean over the last decade. This and other observations suggest that the mass loss from the northern part of the Peninsula is not negligible at present.

Author

Glaciers; Melting; Antarctic Regions; Environmental Monitoring; Glaciology; Hydrology

20080032487 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Monitoring Eruptive Activity at Mount St. Helens with TIR Image Data

Vaughan, R. G.; Hook, S. J.; Ramsey, M. S.; Realmuto, V. J.; Schneider, D. J.; Geophysical Research Letters; October 14, 2005; Volume 32; 4 pp.; In English; Original contains color illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40862>; <http://dx.doi.org/10.1029/2005GL024112>

Thermal infrared (TIR) data from the MASTER airborne imaging spectrometer were acquired over Mount St. Helens in Sept and Oct, 2004, before and after the onset of recent eruptive activity. Pre-eruption data showed no measurable increase in surface temperatures before the first phreatic eruption on Oct 1. MASTER data acquired during the initial eruptive episode on Oct 14 showed maximum temperatures of similar to approximately 330 C and TIR data acquired concurrently from a Forward Looking Infrared (FLIR) camera showed maximum temperatures similar to approximately 675 C, in narrow (approximately 1-m) fractures of molten rock on a new resurgent dome. MASTER and FLIR thermal flux calculations indicated a radiative cooling rate of approximately 714 J/m²/s over the new dome, corresponding to a radiant power of approximately 24 MW. MASTER data indicated the new dome was dacitic in composition, and digital elevation data derived from LIDAR acquired concurrently with MASTER showed that the dome growth correlated with the areas of elevated temperatures. Low SO₂ concentrations in the plume combined with sub-optimal viewing conditions prohibited quantitative measurement of plume SO₂. The results demonstrate that airborne TIR data can provide information on the temperature of both the surface and plume and the composition of new lava during eruptive episodes. Given sufficient resources, the airborne instrumentation could be deployed rapidly to a newly-awakening volcano and provide a means for remote volcano monitoring.

Author

Volcanology; Volcanoes; Volcanic Eruptions; Airborne Equipment; Imaging Spectrometers; Thermal Emission; Infrared Imagery

20080032488 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Mesoscale Gravity Wave Variances from AMSU-A Radiances

Wu, Dong L.; Geophysical Research Letters; June 29, 2004; Volume 31; 4 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40861>; <http://dx.doi.org/10.1029/2004GL019562>

A variance analysis technique is developed here to extract gravity wave (GW) induced temperature fluctuations from NOAA AMSU-A (Advanced Microwave Sounding Unit-A) radiance measurements. By carefully removing the instrument/measurement noise, the algorithm can produce reliable GW variances with the minimum detectable value as small as 0.1 K². Preliminary analyses with AMSU-A data show GW variance maps in the stratosphere have very similar distributions to those found with the UARS MLS (Upper Atmosphere Research Satellite Microwave Limb Sounder). However, the AMSU-A offers better horizontal and temporal resolution for observing regional GW variability, such as activity over sub-Antarctic islands.

Author

Mesoscale Phenomena; Gravity Waves; Advanced Microwave Sounding Unit; Radiance; Analysis of Variance; Algorithms; Atmospheric Temperature

20080032512 NASA Goddard Space Flight Center, Greenbelt, MD, USA

New Understanding of Mercury's Magnetosphere from MESSENGER'S First Flyby

Slavin, James A.; Acuna, Mario H.; Anderson, Brian J.; Baker, Daniel N.; Benna, Mehdi; Gloeckler, George; Gold, Robert E.; Ho, George C.; Killen, M.; Korth, Haje; Krimigis, Stamatios M.; McNutt, Ralph L., Jr.; Raines, James M.; Schriver, David; Somomon, Sean C.; Starr, Richard; Travnicek, Pavel; Zurbuchen, Thomas H.; [2008]; 14 pp.; In English; To appear in Science Magazine; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Observations by the MESSENGER spacecraft on 14 January 2008 have revealed new features of the solar system's smallest planetary magnetosphere. The interplanetary magnetic field orientation was unfavorable for large inputs of energy from the solar wind and no evidence of magnetic substorms, internal magnetic reconnection, or energetic particle acceleration was detected. Large-scale rotations of the magnetic field were measured along the dusk flank of the magnetosphere and ultra-tow frequency waves were frequently observed beginning near closest approach. Outbound the spacecraft encountered two current-sheet boundaries across which the magnetic field intensity decreased in a step-like manner. The outer current sheet is the magnetopause boundary. The inner current sheet is similar in structure, but weaker and -1000 km closer to the planet. Between these two current sheets the magnetic field intensity is depressed by the diamagnetic effect of planetary ions created by the photo-ionization of Mercury's exosphere.

Author

Messenger (Spacecraft); Mercury (Planet); Flyby Missions; Interplanetary Magnetic Fields; Planetary Magnetospheres; Energetic Particles; Magnetopause

20080032560 Arizona State Univ., Tempe, AZ, USA

Electron Tomography of Nanoparticle Clusters: Implications for Atmospheric Lifetimes and Radiative Forcing of Soot

vanPoppel, Laura H.; Friedrich, Heiner; Spinsby, Jacob; Chung, Serena H.; Seinfeld, John H.; Buseck, Peter R.; Geophysical Research Letters; 2005; Volume 32; 1 pp.; In English

Contract(s)/Grant(s): NNG04GD53G; Copyright; Avail.: Other Sources

ONLINE: <http://dx.doi.org/10.1029/2005GL024461>

Nanoparticles are ubiquitous in nature. Their large surface areas and consequent chemical reactivity typically result in their aggregation into clusters. Their chemical and physical properties depend on cluster shapes, which are commonly complex and unknown. This is the first application of electron tomography with a transmission electron microscope to quantitatively determine the three-dimensional (3D) shapes, volumes, and surface areas of nanoparticle clusters. We use soot (black carbon, BC) nanoparticles as an example because it is a major contributor to environmental degradation and global climate change. To the extent that our samples are representative, we find that quantitative measurements of soot surface areas and volumes derived from electron tomograms differ from geometrically derived values by, respectively, almost one and two orders of magnitude. Global sensitivity studies suggest that the global burden and direct radiative forcing of fractal BC are only about 60% of the value if it is assumed that BC has a spherical shape.

Author

Nanoparticles; Soot; Tomography; Climate Change; Transmission Electron Microscopy

20080032620 NASA Goddard Space Flight Center, Greenbelt, MD, USA

International VLBI Service for Geodesy and Astrometry 2007 Annual Report

Behrend, D., Editor; Baver, K. D., Editor; May 2008; 337 pp.; In English; See also 20080032621 - 20080032691; Original contains color and black and white illustrations

Report No.(s): NASA/TP-2008-214162; Copyright; Avail.: CASI: [A15](#), Hardcopy

This volume of reports is the 2007 Annual Report of the International VLBI Service for Geodesy and Astrometry (IVS). The individual reports were contributed by VLBI groups in the international geodetic and astrometric community who constitute the components of IVS. The 2007 Annual Report documents the work of these IVS components over the period January 1, 2007 through December 31, 2007. The reports document changes, activities, and progress of the IVS. The entire contents of this Annual Report also appear on the IVS Web site at <http://ivscc.gsfc.nasa.gov/publications/ar2007>.

Author

Very Long Base Interferometry; Geodesy; Astrometry; Radio Astronomy; Geodynamics; Geophysics; Earth Orientation; Celestial Reference Systems; Earth Sciences

20080032621 Bonn Univ., Germany

Analysis Coordinator Report

Nothnagel, Axel; Artz, Thomas; Bockmann, Sarah; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 16 - 17; In English; See also [20080032620](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

IVS analysis coordination issues in 2007 are reported here. Routine Earth Orientation Parameters (EOP) combinations have been changed to solely using datum-free normal equations as input improving the overall agreement between analysis centers to 50 - 60 micro-as in all components.

Author

Coordination; Earth Orientation; Very Long Base Interferometry

20080032622 Telespazio S.p.A., Rome, Italy

Matera CGS VLBI Analysis Center

Lanotte, Roberto; Bianco, Giuseppe; Luceri, Cinzia; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 185-186; In English; See also [20080032620](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

This paper reports the Very Long Baseline Interferometry (VLBI) data analysis activities at the Space Geodesy Center (CGS) at Matera from January 2007 through December 2007 and the contributions that the CGS intends to provide for the future as an International VLBI Service for Geodesy and Astrometry (IVS) Data Analysis Center. The main VLBI data analysis activities at the CGS in 2007 were directed towards the realization of a global VLBI analysis, named asi2007a, using the CALC/SOLVE software. Regular submission of tropospheric parameters (wet and total zenith path delays, east and north horizontal gradients) for all VLBI stations observing in the IVS R1 and R4 sessions was continued during 2007. Presently 493 sessions have been analyzed and submitted covering the period from 2002 - 2007. Regular submission of station coordinate estimates, in SINEX files, was continued during 2007 for the IVS pilot project 'Time Series of Baseline Lengths'. The series is composed of 31167 sessions, from 1979 to 2007. At present, an analysis of the differences between the CFGS series and those provided by the analysis centers participating in this project is under investigation. Future plans include continued efforts to improve the realization of global VLBI analysis and continued participation in IVS analysis projects.

Author

Very Long Base Interferometry; Geodesy; Data Processing; Computer Programs

20080032624 Honeywell International, Inc., USA

Goddard Geophysical and Astronomical Observatory

Redmond, Jay; Evangelista, Mark; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 41-44; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

This report summarizes the technical parameters and the technical staff of the VLBI system at the fundamental station GGAO. It also gives an overview about the VLBI activities during the previous year. The outlook lists the outstanding tasks to improve the performance of GGAO.

Author

Astronomical Observatories; Geophysical Observatories; Very Long Base Interferometry; Geodesy

20080032625 Tasmania Univ., Hobart, Australia

Hobart, Mt. Pleasant, Station Report for 2007

Reid, Brett; Dickey, John M.; Lovell, Jim; Ellingsen, Simon; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 49-50; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

This is a brief report on the activities carried out at the Mt. Pleasant Radio Astronomy Observatory at Hobart, Tasmania. During 2007, the observatory participated in 61 24-hour IVS VLBI observing sessions, and funding commenced for the AuScope VLBI array which will see three new antennas installed across Australia for geodesy. Included are a brief description of the VLBI facilities, a review of the geodetic VLBI observations, and future plans.

Author

Geodesy; Observatories; Very Long Base Interferometry

20080032626 Hartebeesthoek Radio Astronomy Observatory, Johannesburg, South Africa

Hartebeesthoek Radio Astronomy Observatory (HartRAO)

Combrinck, Ludwig; Nickola, Marisa; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 45-48; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

HartRAO, the only fiducial geodetic site in Africa, participates in VLBI, GNSS, and SLR global networks, among others. This report provides an overview of our geodetic VLBI activities and research during 2007. Further developments regarding the proposed new fundamental space geodetic observatory in the Karoo are presented.

Author

Geodesy; Radio Astronomy; Communication Networks; Very Long Base Interferometry; Telescopes

20080032627 Istituto di Radioastronomia, Bologna, Italy

The Medicina Station Status Report

Orfei, Alessandro; Orlati, Andrea; Maccaferri, Giuseppe; Mantovani, Franco; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 67 - 68; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

General information about the Medicina Radio Astronomy Station, the 32m antenna status, and the staff in charge of VLBI observations are provided. In 2007 the data from geodetic VLBI observations were acquired using the Mark 5A recording system with good results. Updates of the hardware have been performed and are briefly described.

Author

Very Long Base Interferometry; Global Positioning System; Radio Astronomy

20080032628 Crimean Astrophysical Observatory, Russian Federation

Simeiz VLBI Station-New Status

Volvach, Alexandr E.; Graham, D.; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 88-91; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

We summarize briefly the status of our 22-m radio telescope as an IVS Network Station. In 2007 RT-22 was equipped with a modern Mark 5A VLBI recording system by the National Academy of Sciences of Ukraine. That makes it possible to continue astrophysical and fundamental geodetic VLBI observations.

Author

Very Long Base Interferometry; Astrophysics; Radio Telescopes

20080032629 Italian Space Agency, Matera, Italy

Matera CGS VLBI Station

Bianco, Giuseppe; Colucci, Giuseppe; Schiavone, Francesco; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 63-66; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

This report describes the status of the Matera VLBI station. Also an overview of the station, some technical characteristics of the system and staff addresses are given. precision ranging observations of several satellites. The new Matera Laser Ranging Observatory (MLRO), one of the most advanced Satellite and Lunar Laser Ranging facilities in the world, has been installed

in 2002 and replaced the old SLR system. CGS hosted also mobile SLR systems MTLRS (Holland/Germany) and TLRs-1 (NASA). In May 1990 the CGS extended its capabilities to Very Long Baseline Interferometry (VLBI) installing a 20-m radiotelescope. Since then, Matera performed 761 sessions up to December 2007. In 1991 we started GPS activities, participating in the GIG 91 experiment installing in Matera a permanent GPS Rogue receiver. In 1994 six TurboRogue SNR 8100 receivers were purchased in order to create the Italian Space Agency GPS fiducial network (IGFN). At the moment 12 stations are part of the IGFN and all data from these stations, together with 24 other stations in Italy, are archived and made available by the CGS WWW server GeoDAF (<http://geodaf.mt.asi.it>). Thanks to the co-location of all precise positioning space based techniques (VLBI, SLR, LLR and GPS), CGS is one of the few fundamental stations in the world. With the objective of exploiting the maximum integration in the field of Earth observations, in the late 1980s ASI extended CGS involvement also to remote sensing activities for present and future missions (ERS- 1, ERS-2, X-SAR/SIR-C, SRTM, ENVISAT, COSMO-SkyMed).

Author

Very Long Base Interferometry; Satellite Laser Ranging; Radio Telescopes; Position (Location); Lunar Ranging; Shuttle Imaging Radar; ERS-2 (ESA Satellite)

20080032630 Norwegian Mapping Authority, Norway

Ny-Alesund 20 Metre Antenna

Digre, Helge; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 75-77; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

For the year 2007, the 20-meter VLBI antenna at the Geodetic Observatory Ny-Alesund has tried to participate in VLBI experiments at the scheduled level and has done 73 of 79 24-hour experiments. Ny-Alesund has also participated in an e-VLBI test and in e-VLBI experiments, transferring experiment data from Ny-Alesund to the Haystack Correlator and later to the Bonn Correlator. Ny-Alesund has done 14 of 19 Intensive experiments. The reasons for the lost experiments were the personnel situation, problems caused by an error in the main power delivery, and a lack of Mark 5 modules at the station. In 2007, Ny-Alesund has continued to feel some consequences of the reduction in maintenance support and the lack of operator presence, both of which were caused by the reduction in staff that came as a result of the general reduction in the Norwegian Mapping Authority's (NMA) budgets. For 2007, Ny-Alesund was a two person station until June, when Jan-Ivar Tangen's contract ended. The station was closed for three weeks for summer holiday and became a three person station again in September. In August, a new, second operator, Inge Sanden, was employed and started his training, while in September, a new, third operator, Ole Bjoern Ardal, was employed and started his training. At the beginning of the year, maintenance and repair were done at a minimum level, given the personnel situation, and no responses were made to any alarms, and no errors were corrected during unmanned operation. Towards the end of the year, the station was normally manned while experiments were running, as long as all employees were present in Ny-Alesund. Ny-Alesund is a Mark 5 station only.

Author

Very Long Base Interferometry; Geodesy; Warning Systems; Observatories; Modules; Correlators

20080032631 Istituto di Radioastronomia, Bologna, Italy

Noto Station Status Report

Tuccari, G.; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 72-74; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

This brief report summarizes the main activities of the Observatory of Noto in 2007. At present the main issue for the antenna functionality is still the azimuth rail, but news from INAF indicate that the rail and grout replacement could be realized in 2008. If confirmed, this job will probably stop the antenna activity during 2008 summer. A new antenna driving software has been realized, which is able to support all the functionalities available with the TIW ACU and is able to control with better precision. The new software has also a Web interface. The 43 GHz receiver is working with only one polarization and the replacement of a front-end amplifier will be done in the next months. The 86 GHz is still an issue. Functionality measurements will be done in laboratory and a new campaign will be realized during the first months 2008.

Author

Observatories; Radio Receivers; Azimuth

20080032633 NASA Goddard Space Flight Center, Greenbelt, MD, USA; Institute of Applied Astronomy Russian Academy of Sciences, Russia

IAA VLBI Analysis Center Report 2007

Skurikhina, Elena; Kurdubov, Sergey; Gubanova, Vadim; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 204-207; In English; See also [20080032620](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

This report presents an overview of IAA VLBI Analysis Center activities during 2007 and the plans for the coming year. The main directions of IAA AC activities are: daily SINEX file generation on a regular basis for IVS-R1 and IVS-R4 sessions; TRF/CRF estimation from global VLBI data analysis; routine computations of Earth orientation parameters (EOP) for submission to IERS; baseline length and tropospheric parameters from 24-h sessions; UT1-UTC from IVS Intensive sessions; time series of source position calculation and analysis at the scope of the IERS/IVS Working Group on the Second Realization of the ICRF; EOP, UT1-UTC, and station position estimation from domestic observation programs; software development, and NGS-file generation.

Author

Very Long Base Interferometry; General Overviews; Astronomy; Software Engineering

20080032634 TIGO, Chile

Geodetic Observatory TIGO in Concepcion

Sobarzo, Sergio; Jara, Cristobal; Onate, Eric; Herrera, Cristian; Verdugo, Carlos; Hase, Hayo; Boer, Armin; Bernd, Sierk; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 98-101; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

As of 2007, the TIGO Geodetic Observatory was in operation for six years and had 107 successful 24-hour observations. TIGO is located near the Universidad de Concepcion, at longitude 73.025 degrees West, latitude 36.483 degrees South and at an altitude of 180 m, 500 kilometers south of Santiago, Chile. The IVS network station TIGOCONC is the very long base interferometry (VLBI) part of the Geodetic Observatory TIGO, which was designed to be a fundamental station for geodesy. In 2007 the entire TIGO computer network infrastructure was upgraded to 1 Gbps allowing the testing of new e-VLBI protocols and algorithms. During 2007 TIGO was scheduled to participate in 11 International VLBI Service for Geodesy and Astrometry (IVS) experiments; four failed experiments were mainly associated with cooling-related problems. Apart from the regular IVS observation load, the TIGO VLBI group is involved in three development areas: e-VLBI, Remote Control User Interface for the FS and Sattrack testing. During 2007, TIGO continued its participation in the EXPRes project, which aims at connecting 21 VLBI radiotelescopes in 6 continents using high speed networks allowing real-time VLBI. New improvements were made to the Remote Control Software developed in 2005; now the client is a standalone application written in Python running in the Linux Graphical Environment. Final tests of the satellite tracking software were performed in January; the written software was included in the FS station software and uses the North American Aerospace Defense Command (NORAD) and two line elements (TLE) as input. VLBI activities for 2008 will focus on execution of the IVS observation program, participation in the CONT08 campaign, repetition of the local survey, and continued development in e-VLBI, remote control user interface for the FS and new monitor and control solutions for the receiver.

CASI

Geodesy; Very Long Base Interferometry; Astrometry

20080032636 Onsala Space Observatory, Sweden

IVS Chair's Report

Schuh, Harald; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 8 - 10; In English; See also [20080032620](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

This report reviews the achievements during 2007 of the International VLBI Service for Geodesy and Astrometry (IVS). These include: Contributions to the Global Geodetic Observing System (GGOS); the VLBI2010 Committee (V2C) provided a report with recommendations that can be used as benchmark for new VLBI systems; the publication of a special issue of the Journal of Geodesy on Very Long Baseline Interferometry; the establishment of a working group on VLBI Data structures and participation by IVS in several meetings of note.

CASI

Astrometry; Geodesy; Very Long Base Interferometry

20080032638 Deutsches Geodaetisches Forschungsinstitut, Munich, Germany

DGFI Analysis Center Annual Report 2007

Tesmer, Volker; Drewes, Hermann; Kruegel, Manuela; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 187-190; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

This report summarizes the activities of the DGFI Analysis Center in 2007 and outlines the planned activities for the year 2008. The German Geodetic Research Institute (Deutsches Geodatisches Forschungsinstitut, DGFI) is an autonomous and independent research institution located in Munich. The research covers all fields of geodesy and includes the participation in national and international projects as well as functions in international bodies. Efforts in 2007 included understanding how station position time series improve when using the latest, high-end models for geodetic analysis, presenting alternative models to estimate nutation and polar motion rates, and comparing the results from two Very Long Baseline Interferometry (VLBI) analysis software packages, OCCAM and CALC/SOLVE, to detect systematic differences, caused by model differences. In 2008, plans include further improving the VLBI software OCCAM, support IVS TRF and CRF preparation activities (submit solutions computed at DGFI and analyze different contributions), and submitting SINEX files for all 24-h sessions to the IVS on an operational basis.

Author (revised)

Geodesy; Computer Programs; Data Processing; Very Long Base Interferometry

20080032639 Geoscience Australia, Canberra, Australia

Geoscience Australia Analysis Center

Titov, Oleg; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 177-180; In English; See also [20080032620](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

This report gives an overview about activity of the Geoscience Australia (GA) International Very Long Baseline Interferometry (VLBI) Service for Geodesy and Astrometry (IVS) Analysis Center during the year 2007. Currently the GA IVS Analysis Center contributes nutation offsets, three Earth Orientation Parameters (EOPs) and their rates on a regular basis for IVS-R1 and IVS-R4 networks and their predecessors (IRIS-A, NEOS-A). Several CRF solutions have been prepared using the OCCAM 6.2 software. The last four solutions (aus000a, aus001a, aus002a, aus003a) were submitted within the scope of the IERS/IVS Working Group on the Second Realization of the ICRF. The aus000a solution strategy used all radio sources as global parameters. The aus001a solution strategy used radio sources as close as possible to the ICRF. The aus002a solution treated as global parameters only 582 radio sources which satisfy two conditions: 1) z greater than or equal to 1 and 2) not 'unstable' in the classification by Feissel-Vernier. The aus003a solution treated as global parameters only 486 radio sources which satisfy two conditions: 1) z less than or equal to 1 and 2) not 'unstable'. Statistics of these solutions are provided. Station coordinates were also estimated using NNR and NNT constraints. Additional activities of GA are briefly described.

Author (revised)

Geodesy; Very Long Base Interferometry; Data Acquisition; Data Processing; Computer Programs

20080032641 Onsala Space Observatory, Sweden

The IVS Technology Development Center at the Onsala Space Observatory

Haas, Rudiger; Hagstrom, Magne; Gunnarsson, Lars-Goran; Johansson, Karl-Ake; Pantaleev, Miroslav; Elgered, Gunnar; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 261-263; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

We briefly describe the technical development during 2007 that is related to geodetic VLBI. The work focussed mainly on a new S/X receiver, a new time lab, and the radiometers.

Author

Geodesy; Global Positioning System; Transmitter Receivers; Very Long Base Interferometry; Microwave Radiometers; Technology Utilization

20080032642 NASA Goddard Space Flight Center, Greenbelt, MD, USA

GSFC VLBI Analysis Center

Gordon, David; Ma, Chopo; MacMillan, Dan; Petrov, Leonid; Gipson, John; Bayer, Karen; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 197-199; In English; See also [20080032620](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

This report presents the activities of the GSFC VLBI Analysis Center during 2007. The GSFC Analysis Center analyzes

all IVS sessions, makes regular IVS submissions of data and analysis products, and performs research and software development aimed at improving the VLBI technique.

Author

Very Long Base Interferometry; Astrometry; Information Systems; Data Bases; Geodesy

20080032643 Shanghai Astronomical Observatory, China

Sheshan VLBI Station Report for 2007

Hong, Xiaoyu; Fan, Qingyuan; Tao, An; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 86-87; In English; See also [20080032620](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

This report summarizes the observing activities carried out at the Sheshan station in 2007. The SESHAN25 radio telescope participated in ten 24-hour VLBI sessions organized by the IVS and twenty-seven VLBI experiments organized by the EVN. Apart from its international VLBI activities, the SESHAN25 telescope spent a large amount of time on the Chinese Lunar Project, including the testing before the launch of the Chang E-1 satellite, and the tracking campaign after the launch. We also report the updates and developments in the facilities at the station.

Author

Very Long Base Interferometry; Radio Telescopes; Satellite Tracking; Astronomical Observatories; Astrophysics; Astrometry

20080032644 Academy of Sciences (Russia), Saint Petersburg, Russian Federation

Svetloe Radio Astronomical Observatory

Smolentsev, Sergey; Rahimov, Ismail; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 92-93; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

This report summarizes information on recent activities at the Svetloe Radio Astronomical Observatory (SvRAO). During the previous year a number of changes were carried out at the observatory to improve some technical parameters and upgrade some units to required status. The report provides also an overview of current geodetic VLBI activities and gives an outlook for the next year.

Author

Astronomical Observatories; Very Long Base Interferometry; Radio Telescopes; Parabolic Reflectors; Geodesy; Astronomy

20080032645 Bundesamt fuer Kartographie und Geodaesie, Leipzig, Germany

The BKG/IGGB VLBI Analysis Center

Thorandt, Volkmar; Nothnagel, Axel; Engelhardt, Gerald; Ullrich, Dieter; Artz, Thomas; Boeckmann, Sarah; Vennebusch, Markus; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 193-196; In English; See also [20080032620](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

In 2007 the activities of the BKG/IGGB (former GIUB, only renamed) VLBI Analysis Center, as in previous years, consisted of routine computations of Earth orientation parameter (EOP) time series and a number of research topics in geodetic VLBI. The VLBI group at BKG continued its regular submissions of time series of tropospheric parameters and the generation of daily SINEX (Solution INdependent EXchange format) files. Quarterly updated solutions were computed to produce terrestrial reference frame (TRF) and celestial reference frame (CRF) realizations. Routine computations of the UT1-UTC Intensive observations include all sessions of the Kokee-Wettzell and Tsukuba-Wettzell baselines and the networks Kokee-Svetloe-Wettzell and Ny- Alesund-Tsukuba-Wettzell. At the same time, new models have been implemented in the data analysis software and first contributions to the Working Group on ICRF2 were finished at BKG. At IGGB the emphasis was placed on individual research topics.

Author

Very Long Base Interferometry; Celestial Reference Systems; Time Series Analysis; Geodesy

20080032652 Norwegian Defence Research Establishment, Kjeller, Norway

FFI Analysis Center

Anderson, Per Helge; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 191-192; In English; See also [20080032620](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

FFI's contribution to the IVS as an analysis center focuses primarily on a combined analysis at the observation level of data from VLBI, GPS, and SLR using the GEOSAT software. This report shortly summarizes the current status of analyses

performed with the GEOSAT software. FFI is currently Analysis Center for IVS and ILRS, Technology Development Center for IVS, and Combination Research Center for IERS.

Author

Very Long Base Interferometry; Global Positioning System; GEOSAT Satellites; Parameter Identification; Geodesy; Geophysics; Meteorological Parameters; Calibrating

20080032653 Institute of Applied Astronomy Russian Academy of Sciences, Russia

Badary Radio Astronomical Observatory

Smolentsev, Sergey; Sergeev, Roman; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 33-36; In English; See also [20080032620](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

This report provides information about Badary network station: general information, facilities, staff, present status and outlook. The Badary Radio Astronomical Observatory (BdRAO) was founded by the Institute of Applied Astronomy (IAA) as one of three stations of the Russian VLBI network QUASAR [1]. The sponsoring organization of the project is the Russian Academy of Sciences (RAS). The Badary Radio Astronomical Observatory is situated in the Buryatia Republic (East Siberia) about 130 km east of Baikal Lake (see Table 1). The geographic location of the observatory is shown on the IAA RAS [3] Web site. The basic instruments of the observatory are a 32-m radio telescope and technical systems for doing VLBI observations.

Author

Very Long Base Interferometry; Radio Telescopes; Astronomical Observatories; Quasars

20080032655 NVI, Inc., Greenbelt, MD, USA

Network Coordinator Report

Himwich, Ed; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 18-25; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A02](#), Hardcopy

This report includes an assessment of the network performance in terms of lost observing time for the 2007 calendar year. Overall, the observing time loss was about 11.4%. A table of relative incidence of problems with various subsystems is presented. The most significant causes of loss were antenna reliability (accounting for about 34.6%), receiver problems (14.9%), unclassified problems (14.9%), rack problems (11.4%), and RFI (10.4%). There are prospects for Korea, India, and New Zealand to start contributing to IVS. New antennas are being purchased by Australia and New Zealand. The current situation for the handling of correlator clock adjustments by the correlators, which directly impacts UT1-UTC estimates from VLBI data, is reviewed. This is found generally to be a stable continuation of last year's results.

Author

Very Long Base Interferometry; Correlators; Estimates; Receivers; Reliability; Universal Time

20080032656 Massachusetts Inst. of Tech., Boston, MA, USA

IVS Technology Coordinator Report

Whitney, Alan; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 26-29; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

The efforts of the Technology Coordinator in 2007 included the following areas: 1) support of work to implement a new geodetic VLBI system as outlined in the IVS Working Group 3 'VLBI2010' study, 2) continued development and deployment of e-VLBI, 3) 6th annual e-VLBI workshop held at MPI in Bonn, Germany, and 4) TOW workshop at Haystack Observatory. We will briefly describe each of these activities.

Author

Very Long Base Interferometry; Geodesy; Deployment

20080032657 Geographical Survey Inst., Tsukuba, Japan

Tsukuba 32-m VLBI Station

Kokado, Kensuke; Machida, Morito; Kurihara, Shinobu; Matsuzaka, Shigeru; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 102-105; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

Tsukuba 32-m radio telescope is operated by Geographical Survey Institute (GSI) Very Long Baseline Interferometry (VLBI) group. This report summarizes the current status and the future plans of Tsukuba 32-m VLBI station. We had

participated in a total of 164 domestic/international VLBI sessions scheduled at the beginning of this year and some new sessions, such as INT3 and Ultra Rapid dUT1 experiments in 2007. All of the observations have been performed with the K5/VSSP32 system. We had some troubles at our facility, so we ran an overall check of the antenna. In the near future, we plan to do an overall maintenance.

Author

Very Long Base Interferometry; Radio Telescopes

20080032661 Istituto di Radioastronomia, Bologna, Italy

Italy INAF Analysis Center Report

Negusini, M.; Sarti, P.; Montaguti, S.; Abbondanza, C.; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 212-213; In English; See also [20080032620](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

This report summarizes the activity of the Italian INAF VLBI Analysis Center. Our Analysis Center is located in Bologna, Italy and belongs to the Institute of Radioastronomy which is part of the National Institute of Astrophysics. IRA runs the observatories of Medicina and Noto, where two 32m VLBI AZ-EL telescopes are situated. This report contains the AC VLBI data analysis activity and shortly outlines the investigations carried out in Medicina and Noto concerning gravitational deformations of the VLBI telescopes.

Author

Very Long Base Interferometry; Geodesy; Telescopes; Radio Astronomy

20080032663 National Inst. of Information and Communications Technology, Kashima, Japan

Data Center at NICT

Koyama, Yasuhiro; Sekido, Mamoru; Tsutsumi, Masanori; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 168-171; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

The Data Center at National Institute of Information and Communications Technology (NICT) archives and releases the databases and analysis results processed at the Correlation Center and the Analysis Center at NICT. Regular Very Long Baseline Interferometry (VLBI) sessions with the Key Stone Project VLBI Network were the primary objects of the Data Center. These regular sessions continued until the end of November 2001. In addition to the Key Stone Project VLBI sessions, NICT has been conducting geodetic VLBI sessions for various purposes, and these data are also archived and released by the Data Center.

Author

Data Acquisition; Data Processing; Very Long Base Interferometry; Geodesy; Data Management

20080032665 Institute of Applied Astronomy Russian Academy of Sciences, Russia

IAA Correlator Center

Surkis, Igor; Bogdanov, Andrey; Fateev, Artemy; Melnikov, Alexey; Shantyr, Violet; Zimovsky, Vladimir; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 143-146; In English; See also [20080032620](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

The 12-board correlator MicroPARSEC equipped with S2-PT terminals was completed in 2007. This correlator is used for processing up to 3-station observations. The new correlator ARC for 6-station VLBI observations processing is under development. The VLBI data of the 3-station observations of the Russian national network Quasar was processed using MicroPARSEC correlator.

Author

Very Long Base Interferometry; Astrophysics; Correlators; Field-Programmable Gate Arrays; Geodetic Surveys; Quasars; Statistical Correlation; Astrometry

20080032667 NASA Goddard Space Flight Center, Greenbelt, MD, USA

VLBI Correlators at Kashima

Sekido, Minghui; Kondo, Testuro; Kimura, Moritaka; Koyama, Yasuhiro; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 147-150; In English; See also [20080032620](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

The software correlator systems developed at Kashima Space Research Center are used for data processing of R&D VLBI experiments. In 2007 the correlation tasks processed were an e-VLBI project for rapid UT1 measurements, the

CARAVAN2400 project for reference baseline determination with small diameter antennas, and a project for comparison of time standards with VLBI. An automatic data processing scheme was newly introduced and it has drastically reduced the latency of UT1 determination. The rapid UT1 measurement with e-VLBI was demonstrated at the JGN2 symposium 2008. The automated correlation processing scheme also works efficiently in the other projects. The implementation of the high speed correlation software package GICO3 into the correlation system for the VERA project is in progress under contract with NAOJ.

Author

Correlators; Software Engineering; Very Long Base Interferometry; Data Acquisition

20080032669 Naval Observatory, Flagstaff, AZ, USA

NEOS Operation Center

Kingham, Kerry; Carter, Merri Sue; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 132; In English; See also [20080032620](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

This report covers the activities of the NEOS Operation Center at USNO for 2007. The Operation Center schedules IVS-R4 and the INT1 Intensive experiments.

Author

Communication Networks; Earth Orientation; Geodesy; Very Long Base Interferometry

20080032672 Massachusetts Inst. of Tech., Westford, MA, USA

Haystack Observatory Technology Development Center

Whitney, Alan; Niell, Arthur; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 253-256; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

Work at MIT Haystack Observatory is currently focusing on four areas: Mark 5C VLBI data systems, e-VLBI, digital backends, and VLBI2010 progress. We will describe each of these areas.

Author

Very Long Base Interferometry; Data Flow Analysis; Observatories; Rates (Per Time); Frequencies; Correlators; Modules; Data Systems

20080032673 National Astronomical Observatory, Japan

VERA Geodetic Activities

Jike, Takaaki; Manabe, Seiji; Tamura, Yoshiaki; Shizugami, Makoto; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 69 - 71; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

This report describes the status of the VERA network in terms of geodetic VLBI. The main contents are information about the technical parameters of the VERA observation system and a summary of geodetic VLBI activities during 2007.

Author

Very Long Base Interferometry; Geodesy; Geodetic Surveys; Superhigh Frequencies; Radio Telescopes; Astrometry; Field Theory (Physics)

20080032674 Central Astronomical Observatory, Pulkovo, Russian Federation

PUL IVS Analysis Center Report 2007

Malkin, Zinovy; Sokolova, Julia; Miller, Natalia; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 232-234; In English; See also [20080032620](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

The report briefly presents the PUL IVS Analysis Center activities during 2007 and plans for the coming year. Main topics of investigation in 2007 year were comparison and combination of catalogues of radio source positions, analysis of VLBI EOP series, analysis of radio source position and zenith troposphere delay time series. The main topics are: (1) Improvement of the International Celestial Reference Frame (ICRF), including investigations of radio source catalogues, constructing combined catalogues, investigation of the ICRF stability, and investigation of radio source position time series. (2) Computation and analysis of EOP, station position, baseline length and zenith troposphere delay time series. (3) Investigation of Free Core Nutation (FCN). (4) Comparison of VLBI results with other space geodesy techniques.

Author

Celestial Reference Systems; Geodesy; Nutation; Very Long Base Interferometry

20080032675 NASA Goddard Space Flight Center, Greenbelt, MD, USA

CDDIS Data Center Summary for the 2007 IVS Annual Report

Noll, Carey; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 163-165; In English; See also [20080032620](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

This report summarizes activities during the year 2007 and future plans of the Crustal Dynamics Data Information System (CDDIS) with respect to the International VLBI Service for Geodesy and Astrometry (IVS). Included in this report are background information about the CDDIS, the computer architecture, staff supporting the system, archive contents, and future plans for the CDDIS within the IVS. The Crustal Dynamics Data Information System has supported the archiving and distribution of Very Long Baseline Interferometry (VLBI) data since its inception in 1982. The CDDIS is a central facility providing users access to raw and analyzed data to facilitate scientific investigation. The CDDIS archive of GNSS (GPS and GLONASS), laser ranging, VLBI, and DORIS data is stored on-line for remote access. Information about the system is available via the Web at the URL <http://cddis.gsfc.nasa.gov>. The current and future plans for the system's support of the IVS are discussed below.

Author

Geodesy; Global Positioning System; Information Systems; Very Long Base Interferometry

20080032676 Massachusetts Inst. of Tech., Westford, MA, USA

Haystack Observatory VLBI Correlator

Titus, Mike; Cappallo, Roger; Corey, Brian; Dudevoir, Kevin; Niell, Arthur; Whitney, Alan; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 139-142; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

This report summarizes the activities of the Haystack Correlator during 2007. Linux correlator runtime software was developed and migrated to Bonn. Testing of new observing modes and equipment, primarily Digital Back Ends (DBE), was conducted. Mark 5B capability was migrated to Bonn and Washington, and Mark 5A/B development continues. One real-time e-VLBI test was conducted, and real-time e-VLBI capability was restored. Non-real-time transfers continue, and that software and capability were installed at Bonn. Investigation of 1 Gb/sec EOP results were conducted. Engineering support of other correlators continues.

Author

Correlators; Very Long Base Interferometry; Radio Astronomy; Software Engineering

20080032677 Bonn Univ., Germany

The Bonn Astro/Geo Mark IV Correlator

Bertarini, Alessandra; Mueskens, Arno; Alef, Walter; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 135-138; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

The Bonn Mark IV VLBI correlator is operated jointly by the MPIfR and the IGGB in Bonn and the BKG in Frankfurt. In 2007, e-VLBI transfers became routine for geodetic experiments and, thanks to that, a new intensive series (INT3) was introduced and is correlated in Bonn. Three Mark 5B units have been installed and are in regular use for stream correlation. In late December, the first phase of a Linux cluster dedicated for the software correlator, which will become the long-term future replacement for the hardware correlator, has been installed.

Author

Correlators; Geodesy; Very Long Base Interferometry; Radio Astronomy

20080032679 National Inst. of Polar Research, Tokyo, Japan

JARE Syowa Station 11-m Antenna, Antarctica

Doi, Koichiro; Shibuya, Kazuo; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 94-97; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

The operation of the 11 m S/X-band antenna at Syowa Station (69.0 deg S, 39.6 deg E) by the Japanese Antarctic Research Expeditions (JAREs) started in February 1998 and continues till today (January 2008). The number of quasi-regular geodetic Very Long Base Interferometry (VLBI) experiments attained 77 at the end of 2007. Syowa Station will participate in six OHIG sessions in 2008. Data of five OHIG sessions in 2007 were recorded on hard disks through the K5 terminal. They will be brought back from Syowa Station to Japan in April 2008. Data of OHIG44 to OHIG49 sessions observed by JARE47 in 2006

are now being transferred to Bonn Correlator directly by using one of NICT's servers. Analysis results obtained from the data until OHIG43 session indicate that baseline length between Syowa and Hobart is increasing with a rate of 53.8 +/- 0.5 mm/yr and the one between Syowa and HartRAO is also increasing with a rate of 11.5 +/- 0.4 mm/yr.

Author

Geodesy; Very Long Base Interferometry; Antarctic Regions

20080032680 Observatoire de Paris, France

Paris Observatory Analysis Center OPAR: Report on Activities, January - December 2007

Gontier, Anne-Marie; Lambert, Sebastien B.; Barache, Christophe; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 224 - 227; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

This report summarizes the activities of the VLBI Analysis Center at the Paris Observatory (OPAR) for calendar year 2007. Quarterly solutions were processed to estimate EOP per session and global terrestrial and celestial reference frames. Additionally, the analysis center organized the operational analysis of weekly IVS-R1 and IVS-R4 sessions for regular submission to the IVS (scheduled to start early 2008). Other activities of the OPAR personnel related to VLBI include two main research topics: (i) the realization of a stable celestial reference frame (in the frame of the IVS/IERS Working Group on the 'Second Realization of the ICRF'), and (ii) the analysis of VLBI-derived nutation time series to retrieve deep Earth's interior parameters.

Author

Celestial Reference Systems; Nutation; Very Long Base Interferometry; Earth Orientation

20080032681 Onsala Space Observatory, Sweden

The IVS Analysis Center at the Onsala Space Observatory

Haas, Rudiger; Nilson, Tobias; Scherneck, Hans-Georg; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 228 - 231; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

This report briefly summarizes the activities of the IVS Analysis Center at the Onsala Space Observatory during 2007. Some examples of ongoing work are presented. We concentrate on a number of research topics that are relevant for space geodesy and geosciences. These research topics are addressed in connection to data observed with geodetic VLBI and complementing techniques. As in previous years the main focus was on high-frequency Earth orientation, loading phenomena, and atmospheric water vapor.

Derived from text

Earth Orientation; Geodesy; Very Long Base Interferometry

20080032682 Bundesamt fuer Kartographie und Geodaesie, Wettzell, Germany

German Antarctic Receiving Station (GARS) O'Higgins

Schlueter, Wolfgang; Ploetz, Christian; Wojdziak, Reiner; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 78-81; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

The German Antarctic Receiving Station (GARS) is jointly operated by the Federal Office of Cartography and Geodesy (BKG) and the German Aerospace Center (DLR). The Institute for Antarctic Research Chile (INACH) coordinated the preparatory activities and logistics prior to the campaigns. The 9m radiotelescope at O Higgins is used for geodetic VLBI and for downloading of remote sensing images from satellites such as ERS and TerraSAR. The access to the station is organized campaign-wise during the Antarctic spring and summer. In 2007 the station was occupied from January to March and from October to December. DLR and BKG jointly send engineers and operators for the campaigns together with a team which maintains the infrastructure, such as the provision of power. Over the last years, special flights with Hercules -aircrafts and small TwinOtters-aircrafts were organized by INACH in close collaboration with the Chilean Army, Navy, and Airforce and with the Brazilian Airforce in order to transport the staff, the technical material and also the food for the entire campaign from Punta Arenas via station Frei at King George Island to the station O Higgins on the Antarctic Peninsula. Only a few times, the staff and material were transported by ship to O Higgins. Due to the fact that the conditions for landing on the glacier have become unpredictable, requiring a lot of security precautions, the employment of ships for transportation to O Higgins has become more and more important. As a consequence of global warming, the glacier is melting. During the summer period, landing with TwinOtters airplanes has become impossible. Arrival time and departure time is strongly dependent on the

weather conditions and on general logistics. Today more time to travel from Punta Arenas to O Higgins has to be considered. At the end of 2007, the cruiseliner 'Explorer' sank approximately 50 miles away from O Higgins. This disaster affected the second campaign dramatically, as all the means of transportation were employed for the rescue of the passengers. The staff had to stay more than 10 days longer at O Higgins. After the long Antarctic winter usually the equipment at the station has to be initialized. Damages, which result from the strong winter period, have to be identified and repaired. Shipment of spare parts or material for upgrades from Germany needs careful preparation in advance.

Author

Radio Telescopes; Very Long Base Interferometry; Relativistic Effects; Global Warming; Antarctic Regions; Remote Sensing

20080032683 Onsala Space Observatory, Sweden

The IVS Network Station Onsala Space Observatory

Haas, Rudiger; Elgered, Gunnar; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 82-85; In English; See also [20080032620](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

We briefly summarize the status of the Onsala Space Observatory in its function as an IVS Network Station. The activities during the year 2007, the current status, and future plans are described. In 2007 the observatory was involved in the five IVS-series EUROPE, R1, T2, RDV, and RD07. In total, Onsala participated successfully in 27 experiments. See Table 2. All experiments were recorded on Mark 5 modules, and for many experiments the data were transferred by e-VLBI to the Bonn correlator [2] using the PCEVN-computer [3]. The latter is daisy-chained to the Mark 5 computer to allow us to record in parallel on Mark 5 modules and the PCEVN raid-system and also to simultaneously transfer the data in real-time from the PCEVN to the correlator. In the second half of 2007 we upgraded the PCEVN raid-system to a capacity of 2 TB, i.e. large enough for most of today's IVS experiments. Radio interference due to UMTS mobile telephone signals continued to interfere with S-band observations.

Author

Observatories; Very Long Base Interferometry; Radio Frequency Interference; Superhigh Frequencies; Ultrahigh Frequencies; Modules; Correlators

20080032684 National Inst. of Information and Communications Technology, Japan

Kashima and Koganei 11-m VLBI Stations

Koyama, Yasuhiro; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 55-58; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

Two 11-m VLBI stations at Kashima and Koganei used to be a part of the Key Stone Project VLBI Network. The network consisted of four VLBI stations at Kashima, Koganei, Miura, and Tateyama. Since Miura and Tateyama stations have been transported to Tomakomai and Gifu, Kashima and Koganei 11-m stations are remaining as IVS Network Stations. After the regular VLBI sessions with the Key Stone Project VLBI Network terminated in 2001, these stations are mainly used for the purposes of technical developments and miscellaneous observations. In 2007, a series of geodetic VLBI experiments was performed between Kashima and Koganei 11-m VLBI stations to evaluate the capability of the VLBI technique for precise time transfer between Time and Frequency laboratories to construct Coordinated Universal Time. In addition, efforts to determine the precise orbit of spacecraft were continued by using Hayabusa and Geotail spacecraft. Another series of experiments was also carried out for developments of e-VLBI by using the high speed network connection between the sites.

Author

Very Long Base Interferometry; Communication Networks; Systems Engineering; Antenna Design

20080032685 NASA Goddard Space Flight Center, Greenbelt, MD, USA; Kokee Park Geophysical Observatory, Waimea, HI, USA

Kokee Park Geophysical Observatory

Kim, Kelly; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 59-62; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

This report summarizes the technical parameters and the staff of the VLBI system at Kokee Park on the Island of Kauai. The status of the KPGO VLBI experiments from 1984-2007 is also presented.

Author

Geophysical Observatories; Very Long Base Interferometry; Communication Networks; Antenna Design

20080032688 Wien Univ., Austria

Vienna IGG Special Analysis Center Annual Report 2007

Schuh, Harald; Boehm, Johannes; Englisch, Sigrid; Heinkelmann, Robert; Mendes, Cerveira, Paulo Jorge; Pany, Andrea; Tanir, Emine; Teke, Kamil; Todorova, Sonya; Wresnik, Joerg; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 208-211; In English; See also [20080032620](#); Original contains color illustrations
Contract(s)/Grant(s): Proj. P-16992-N10; Proj. P-18404-N10; Proj. SCHU 1103/3-1; Copyright; Avail.: CASI: [A01](#),
Hardcopy

In April 2007, the Institute of Geodesy and Geophysics (IGG) of the Vienna University of Technology organized the 18th European VLBI for Geodesy and Astrometry (EVGA) Working Meeting, the 8th VLBI Analysis Workshop and the 2nd IVS VLBI2010 Working Meeting. 69 scientists from all over the world (20 countries) came to Vienna to present and discuss results of recent research in geodetic and astrometric VLBI. Apart from these meetings, the main focus of research in 2007 has been on VLBI2010: Simulation studies have been carried out with three different software packages: (1) the Kalman Filter version of OCCAM, (2) the Vienna VLBI Simulation Software (VVSIM), and (3) a special Precise-Point-Positioning software for VLBI simulations.

Author

Geodesy; Geophysics; Very Long Base Interferometry; Technology Utilization; Computerized Simulation

20080032689 Massachusetts Inst. of Tech., Westford, MA, USA

MIT Haystack Observatory Analysis Center

Neill, Arthur; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 200-203; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

The contributions of Haystack Observatory to the analysis of geodetic VLBI data focus on improvement in the accuracy of the estimation of atmospheric delays and on the reduction of instrumental errors through analysis. In 2007 most of the effort was related to evaluating error sources for the proposed VLBI2010 system, primarily regarding the sensitivity and performance of the broadband development prototype hardware that has been installed on the MV-3 antenna at GGAO. Since atmosphere delay error continues to be a significant source of geodetic error, a potential method to improve the measurement of wet delay by Water Vapor Radiometer was investigated and is reported here.

Author

Geodesy; Very Long Base Interferometry; Radiometers; Water Vapor

20080032690 National Inst. of Information and Communications Technology, Japan

Technology Development Center at NICT

Kondo, Tetsuro; Koyama, Yasuhiro; Ichikawa, Ryuichi; Sekido, Mamoru; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 257 - 260; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

National Institute of Information and Communications Technology (NICT) has led the development of VLBI technique and has been keeping high activities in both observations and technical developments. This report gives a review of the Technology Development Center (TDC) at NICT and summarizes recent activities.

Author

Very Long Base Interferometry; Technology Utilization; Communication Networks; Antenna Design

20080032691 Centro de Radio Astronomia e Aplicacoes Espaciais, Sao Paulo, Brazil

Fortaleza Station Report for 2007

Kaufmann, Pierre; PereiradeLucena, A. Macilio; Tateyama, Claudio E.; Tavares, Francisco A.; daSilva, F.; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 37-40; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

This is a brief report about the activities carried out at Fortaleza geodetic VLBI Station (ROEN: Radio Observatorio Espacial do Nordeste), located in Eusebio, CE, Brazil, in 2007. The observing activities consisted of 90 VLBI sessions and continuous GPS monitoring recordings. The installation of optical fiber was completed, and the station switched to a 1 Gbit/s high speed network, to be used in e-VLBI operations.

Author

Geodesy; Very Long Base Interferometry; Communication Networks; Radio Observation

20080032720 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Investigation of Gravity Wave Momentum Fluxes in the Upper Atmosphere Derived from Airglow

Vargas, Fabio Augusto; [2008]; 217 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14815-TDI/1257; Copyright; Avail.: CASI: C01, CD-ROM: A10, Hardcopy

In this study, momentum fluxes due to gravity wave propagation into the MLT region was calculated by using airglow image data and theoretical modeling. Airglow O((exp 1)S) 557,7, O₂(0-1,b) and OH NIR images were obtained from Cachoeira Paulista (22,7 deg S; 45,0 deg W) and Sao Joao do Cariri (7,4 deg S; 36,6 deg W) and processed for estimation of gravity wave intrinsic parameters. One-dimensional linear model of gravity waves perturbing O((exp 1)S), O₂(0-1,b) and OH emissions was carried out in order to derive amplitude and phase relations among multiple airglow layers in response to gravity waves with various intrinsic parameters and damping rates. Airglow weighted responses to waves are related through a cancellation factor (CF) for both intensity and temperature wave-induced amplitudes. The model showed that the layer centroid is lower in altitude and its full-width-half-maximum thickness is thinner than the unperturbed layers due to the wave perturbation. The vertical wavelength of the wave can be estimated from the relative phase information from different airglow layers, while damping of waves can be estimated from amplitude information. For an upward vertically propagating wave, the perturbation in upper layers leads perturbations in lower layers because the wave has downward phase propagation. Modeled parameters and airglow images were used for deducing momentum of high frequency, fast waves in multiple emissions. The results showed that dominant gravity waves disturb the intensity in 2,6-5% and carry momentum flux of 4,2-11,1 m(exp 2)s-(exp 2). The momentum flux convergence between upper and lower airglow layers was also estimated. The strongest gravity wave forcing of 18 m/s/day was imposed to the meridional wind by gravity waves observed in Cachoeira Paulista during the winter time.

Author

Gravity Waves; Momentum; Upper Atmosphere; Airglow

47

METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20080030985 NASA Marshall Space Flight Center, Huntsville, AL, USA

Simulation of the Impact of New Ocean Surface Wind Measurements on H*Wind Analyses

Miller, Timothy; Atlas, Robert; Black, Peter; Chen, Shuyi; Hood, Robbie; Johnson, James; Jones, Linwood; Ruf, Chris; Uhlhorn, Eric; April 28, 2008; 1 pp.; In English; 28th Conference on Hurricanes and Tropical Meteorology, 28 Apr. - 2 May 2008, Orlando, FL, USA; No Copyright; Avail.: Other Sources; Abstract Only

The H*Wind analysis, a product of the Hurricane Research Division of NOAA's Atlantic Oceanographic and Meteorological Laboratory, brings together wind measurements from a variety of observation platforms into an objective analysis of the distribution of surface wind speeds in a tropical cyclone. This product is designed to improve understanding of the extent and strength of the wind field, and to improve the assessment of hurricane intensity. See http://www.aoml.noaa.gov/hrd/data_sub/wind.html. The Hurricane Imaging Radiometer (HIRAD) is a new passive microwave remote sensor for hurricane observations that is currently under development by NASA Marshall Space Flight Center, NOAA Hurricane Research Division, the University of Central Florida and the University of Michigan. HIRAD is being designed to enhance the current real-time airborne ocean surface winds observation capabilities of NOAA and USAF Weather Squadron hurricane hunter aircraft using the operational airborne Stepped Frequency Microwave Radiometer (SFMR). Unlike SFMR, which measures wind speed and rain rate along the ground track directly beneath the aircraft, HIRAD will provide images of the surface wind and rain field over a wide swath (approximately 3 x the aircraft altitude, or approximately 2 km from space). The instrument is described in a separate paper presented at this conference. The present paper describes a set of Observing System Simulation Experiments (OSSEs) in which measurements from the new instrument as well as those from existing instruments (air, surface, and space-based) are simulated from the output of a numerical model from the University of Miami, and those results are used to construct H*Wind analyses. Evaluations will be presented on the relative impact of HIRAD and other instruments on H*Wind analyses, including the use of HIRAD from 2 aircraft altitudes and from a space-based platform.

Author

Hurricanes; Tropical Meteorology; Wind Measurement; Ocean Surface; Wind Velocity; Simulation

20080030986 NASA Marshall Space Flight Center, Huntsville, AL, USA

The NASA Real Time Mission Monitor - A Situational Awareness Tool for Conducting Tropical Cyclone Field Experiments

Goodman, Michael; Blakeslee, Richard; Hall, John; Parker, Philip; He, Yubin; April 28, 2008; 1 pp.; In English; 28th Conference on Hurricanes and Tropical Meteorology, 28 Apr. - 2 May 2008, Orlando, FL, USA; Copyright; Avail.: Other Sources; Abstract Only

The NASA Real Time Mission Monitor (RTMM) is a situational awareness tool that integrates satellite, aircraft state information, airborne and surface instruments, and weather state data in to a single visualization package for real time field experiment management. RTMM optimizes science and logistic decision-making during field experiments by presenting timely data and graphics to the users to improve real time situational awareness of the experiment's assets. The RTMM is proven in the field as it supported program managers, scientists, and aircraft personnel during the NASA African Monsoon Multidisciplinary Analyses (investigated African easterly waves and Tropical Storm Debby and Helene) during August-September 2006 in Cape Verde, the Tropical Composition, Cloud and Climate Coupling experiment during July-August 2007 in Costa Rica, and the Hurricane Aerosonde mission into Hurricane Noel in 2-3 November 2007. The integration and delivery of this information is made possible through data acquisition systems, network communication links, and network server resources built and managed by collaborators at NASA Marshall Space Flight Center (MSFC) and Dryden Flight Research Center (DFRC). RTMM is evolving towards a more flexible and dynamic combination of sensor ingest, network computing, and decision-making activities through the use of a service oriented architecture based on community standards and protocols. Each field experiment presents unique challenges and opportunities for advancing the functionality of RTMM. A description of RTMM, the missions it has supported, and its new features that are under development will be presented.

Author

Real Time Operation; Situational Awareness; Tropical Storms; Cyclones; Decision Support Systems; Weather Forecasting

20080031138 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Impact of Aerosols on Cloud and Precipitation Processes: Cloud-Resolving Model Simulations

Tao, Wei-Kuo; Li, Xiaowen; Khain, Alexander; Matsui, Toshihisa; Lang, Stephen; Simpson, Joanne; July 06, 2008; 4 pp.; In English; International Conference on Clouds and Precipitation/ICCP 2008, 6-12 Jul. 2008, Cancun, Mexico; Original contains black and white illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

Aerosols and especially their effect on clouds are one of the key components of the climate system and the hydrological cycle [Ramanathan et al., 2001]. Yet, the aerosol effect on clouds remains largely unknown and the processes involved not well understood. A recent report published by the National Academy of Science states 'The greatest uncertainty about the aerosol climate forcing - indeed, the largest of all the uncertainties about global climate forcing - is probably the indirect effect of aerosols on clouds [NRC, 2001].' The aerosol effect on clouds is often categorized into the traditional 'first indirect (i.e., Twomey)' effect on the cloud droplet sizes for a constant liquid water path [Twomey, 1977] and the 'semi-direct' effect on cloud coverage [e.g., Ackerman et al., 2001]. Enhanced aerosol concentrations can also suppress warm rain processes by producing a narrow droplet spectrum that inhibits collision and coalescence processes [e.g., Squires and Twomey, 1961; Warner and Twomey, 1967; Warner, 1968; Rosenfeld, 1999]. The aerosol effect on precipitation processes, also known as the second type of aerosol indirect effect [Albrecht, 1989], is even more complex, especially for mixed-phase convective clouds. Table 1 summarizes the key observational studies identifying the microphysical properties, cloud characteristics, thermodynamics and dynamics associated with cloud systems from high-aerosol continental environments. For example, atmospheric aerosol concentrations can influence cloud droplet size distributions, warm-rain process, cold-rain process, cloud-top height, the depth of the mixed phase region, and occurrence of lightning. In addition, high aerosol concentrations in urban environments could affect precipitation variability by providing an enhanced source of cloud condensation nuclei (CCN). Hypotheses have been developed to explain the effect of urban regions on convection and precipitation [van den Heever and Cotton, 2007 and Shepherd, 2005]. Please see Tao et al. (2007) for more detailed description on aerosol impact on precipitation. Recently, a detailed spectral-bin microphysical scheme was implemented into the Goddard Cumulus Ensemble (GCE) model. Atmospheric aerosols are also described using number density size-distribution functions. A spectral-bin microphysical model is very expensive from a computational point of view and has only been implemented into the 2D version of the GCE at the present time. The model is tested by studying the evolution of deep tropical clouds in the west Pacific warm pool region and summertime convection over a mid-latitude continent with different concentrations of CCN: a low 'clean' concentration and a high 'dirty' concentration. The impact of atmospheric aerosol concentration on cloud and precipitation will be investigated.

Derived from text

Aerosols; Clouds (Meteorology); Atmospheric Models; Simulation; Condensation Nuclei; Precipitation (Meteorology)

20080031157 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Quantifying the Uncertainty in Passive Microwave Snow Water Equivalent Observations

Foster, James L.; Sun, Chaojiao; Walker, Jeffrey P.; Kelly, Richard; Chang, Alfred; Dong, Jiarui; Powell, Hugh; July 23, 2004; 43 pp.; In English

Contract(s)/Grant(s): NRA99-OES-04; Copyright; Avail.: Other Sources

Passive microwave sensors onboard satellites provide all-weather global snow cover and snow depth observations day and night. However, there are known errors associated with the passive microwave measurements of snow depth and the amount of water stored in snowpacks, referred to as the snow water equivalent (SWE). The existence of these errors are well known but have not been adequately documented in the past. This paper is the first to quantify these errors. Understanding the errors is important for correctly interpreting remotely sensed SWE, which is estimated using an algorithm or model that looks at differences between two microwave frequencies on a satellite sensor.

Author

Snow Cover; Passive Satellites; Microwave Sensors; Estimating; Water Depth; Remote Sensing; Algorithms

20080031199 Iowa State Univ., Ames, IA, USA; Illinois Univ. at Urbana-Champaign, Savoy, IL, USA

Application of Seasonal CRM Integrations to Develop Statistics and Improved GCM Parameterization of Subgrid Cloud Radiation Interactions. Final Report

Wu, X.; Liang, X. Z.; Jan. 23, 2007; 9 pp.; In English

Contract(s)/Grant(s): DE-FG02-02ER63483

Report No.(s): DE2007-897856; DOE/ER/63483-1; No Copyright; Avail.: National Technical Information Service (NTIS)

The works supported by this ARM project lay the solid foundation for improving the parameterization of subgrid cloud-radiation interactions in the NCAR CCSM and the climate simulations. We have made a significant use of CRM simulations and concurrent ARM observations to produce long-term, consistent cloud and radiative property datasets at the cloud scale (Wu et al. 2006, 2007). With these datasets, we have investigated the mesoscale enhancement of cloud systems on surface heat fluxes (Wu and Guimond 2006), quantified the effects of cloud horizontal inhomogeneity and vertical overlap on the domain-averaged radiative fluxes (Wu and Liang 2005), and subsequently validated and improved the physically-based mosaic treatment of subgrid cloud-radiation interactions (Liang and Wu 2005). We have implemented the mosaic treatment into the CCM3. The 5-year (1979-1983) AMIP-type simulation showed significant impacts of subgrid cloud-radiation interaction on the climate simulations (Wu and Liang 2005). We have actively participated in CRM intercomparisons that foster the identification and physical understanding of common errors in cloud-scale modeling (Xie et al. 2005; Xu et al. 2005, Grabowski et al. 2005).

NTIS

Atmospheric General Circulation Models; Cloud Cover; Parameterization

20080031332 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Space Weather: What is it, and Why Should a Meteorologist Care?

SaintCyr, Chris; Murtagh, Bill; May 05, 2008; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

'Space weather' is a term coined almost 15 years ago to describe environmental conditions ABOVE Earth's atmosphere that affect satellites and astronauts. As society has become more dependent on technology, we have found that space weather conditions increasingly affect numerous commercial and infrastructure sectors: airline operations, the precision positioning industry, and the electric power grid, to name a few. Similar to meteorology where 'weather' often refers to severe conditions, 'space weather' includes geomagnetic storms, radiation storms, and radio blackouts. But almost all space weather conditions begin at the Sun--our middle-age, magnetically-variable star. At NASA, the science behind space weather takes place in the Heliophysics Division. The Space Weather Prediction Center in Boulder, Colorado, is manned jointly by NOAA and US Air Force personnel, and it provides space weather alerts and warnings for disturbances that can affect people and equipment working in space and on Earth. Organizationally, it resides in NOAA's National Weather Service as one of the National Centers for Environmental Prediction. In this seminar we hope to give the audience a brief introduction to the causes of space weather, discuss some of the effects, and describe the state of the art in forecasting. Our goal is to highlight that meteorologists are increasingly becoming the 'first responders' to questions about space weather causes and effects.

Author

Space Weather; Astronauts; Meteorology; Magnetic Storms; Sun; Variable Stars; Forecasting

20080031335 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Solar Variability, Earth's Climate, and the Space Environment: Where We Go From Here

Rabin, Douglas M.; [2008]; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

I will review key results presented at the Workshop with an eye toward future measurements, models, and theory that have the potential to accelerate progress in understanding and prediction.

Author

Climate; Solar Activity; Aerospace Environments; Earth Atmosphere; Variability

20080031633 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Ground-based Network and Supersite Measurements for Studying Aerosol Properties and Aerosol-Cloud Interactions

Tsay, Si-Chee; Holben, Brent N.; June 2008; 1 pp.; In English; From Deserts to Monsoons: Aerosols and Their Impacts at Regional and Global Scales, 1-6 Jun. 2008, Crete, Greece; No Copyright; Avail.: Other Sources; Abstract Only

From radiometric principles, it is expected that the retrieved properties of extensive aerosols and clouds from reflected/emitted measurements by satellite (and/or aircraft) should be consistent with those retrieved from transmitted/emitted radiance observed at the surface. Although space-borne remote sensing observations contain large spatial domain, they are often plagued by contamination of surface signatures. Thus, ground-based in-situ and remote-sensing measurements, where signals come directly from atmospheric constituents, the sun, and the Earth-atmosphere interactions, provide additional information content for comparisons that confirm quantitatively the usefulness of the integrated surface, aircraft, and satellite datasets. The development and deployment of AERONET (AEROSOL ROBOTIC NETWORK) sunphotometer network and SMART-COMMIT (Surface-sensing Measurements for Atmospheric Radiative Transfer - Chemical, Optical & Microphysical Measurements of In-situ Troposphere) mobile supersite are aimed for the optimal utilization of collocated ground-based observations as constraints to yield higher fidelity satellite retrievals and to determine any sampling bias due to target conditions. To characterize the regional natural and anthropogenic aerosols, AERONET is an internationally federated network of unique sunphotometry that contains more than 250 permanent sites worldwide. Since 1993, there are more than 480 million aerosol optical depth observations and about 15 sites have continuous records longer than 10 years for annual/seasonal trend analyses. To quantify the energetics of the surface-atmosphere system and the atmospheric processes, SMART-COMMIT instrument into three categories: flux radiometer, radiance sensor and in-situ probe. Through participation in many satellite remote-sensing/retrieval and validation projects over eight years, SMART-COMMIT have gradually refine (and been proven vital for field deployment. In this paper, we will demonstrate the capability of AERONET SMART-COMMIT in current Asian Monsoon Year-2008 campaigns that are designed and being executed to study the compelling variability in temporal scale of both anthropogenic and natural aerosols (e.g., airborne dust, smoke, mega-city pollutant). Feedback mechanisms between aerosol radiative effects and monsoon dynamics have been recently proposed, however there is a lack of consensus on whether aerosol forcing would be more likely to enhance or reduce the strength of the monsoon circulation. We envision robust approaches which well-collocated ground-based measurements and space-borne observations will greatly advance our understanding of absorbing aerosols (e.g., 'Global Dimming' vs. 'Elevated Heat-Pump' effects) on aerosol cloud water cycle interactions.

Author

Aerosols; Atmospheric Composition; Monsoons; Remote Sensing; In Situ Measurement

20080031652 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Precipitation Measurements from Space: The Global Precipitation Measurement Mission

Hou, Arthur Y.; October 25, 2007; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

Water is fundamental to the life on Earth and its phase transition between the gaseous, liquid, and solid states dominates the behavior of the weather/climate/ecological system. Precipitation, which converts atmospheric water vapor into rain and snow, is central to the global water cycle. It regulates the global energy balance through interactions with clouds and water vapor (the primary greenhouse gas), and also shapes global winds and dynamic transport through latent heat release. Surface precipitation affects soil moisture, ocean salinity, and land hydrology, thus linking fast atmospheric processes to the slower components of the climate system. Precipitation is also the primary source of freshwater in the world, which is facing an emerging freshwater crisis in many regions. Accurate and timely knowledge of global precipitation is essential for understanding the behavior of the global water cycle, improving freshwater management, and advancing predictive capabilities of high-impact weather events such as hurricanes, floods, droughts, and landslides. With limited rainfall networks on land and the impracticality of making extensive rainfall measurements over oceans, a comprehensive description of the space and time variability of global precipitation can only be achieved from the vantage point of space. This presentation will examine current capabilities in space-borne rainfall measurements, highlight scientific and practical benefits derived from

these observations to date, and provide an overview of the multi-national Global Precipitation Measurement (GPM) Mission scheduled to be launched in the early next decade.

Author

Precipitation Measurement; Precipitation (Meteorology); Meteorological Satellites; Satellite-Borne Instruments; Satellite Observation

20080031688 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Precipitation Characteristics over South America using Different Sources of Data with Emphasis in Brazil

Vasques, Ana Carolina; [2007]; 148 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14801-TDI/1244; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A07](#), Hardcopy

In this work the potentialities and limitations from different precipitation sources over South America, with emphasis on Brazil were investigated. The regional similarities and differences were analyzed between the precipitation values obtained from ANEEL (National Electrical Energy Agency), and the rain gauge series obtained from the reanalysis of NCEP/NCAR (National Centers for Environmental Prediction/National Center for Atmospheric Research), GPCP (Global Precipitation Climatology Project) and TRMM (Tropical Rainfall Measuring Mission). For the ANEEL data, GPCP and reanalysis of NCEP/NCAR was considered monthly rain gauge series from the period of 1979-2000, while for the data coming from TRMM was considered the period of 1998-2005. The analysis considers the annual and seasonal averages and the standard deviations of the data measured (ANEEL stations) and the rain gauge series obtained from the other sources from the different country regions. Moreover, the annual and semi-annual representations of the precipitation cycle from these sources were investigated using harmonic analysis. The differences in the precipitation anomalies during JFMA of 1998 and 1999, years of El Niño and La Niña, using the different data sources were also analyzed. The main results show that there are a large number of meteorological stations from ANEEL with reliable values of monthly precipitation over Brazil's northeast, south and southeast. However, this agency's data are sparse mainly over north and center-west of Brazil, there are missing also monthly precipitation values and there are a lack of continuity in some stations. The data reanalysis from NCEP/NCAR was the one that represented the biggest regional differences in the precipitation values in comparison with the other data sources. In the great part of the Brazil's north region the precipitation values obtained from the reanalysis were overestimated. The rain gauges series from GPCP shows conformity with the series obtained from ANEEL stations. Similarities were also observed between TRMM and ANEEL data in El Niño's and La Niña's last phase in 1998 and 1999. The main characteristics observed in these years were reproduced in all the data sources used, with some regional differences between them, mainly in the north region.

Author

Precipitation (Meteorology); Precipitation Measurement; Data Acquisition; Reliability; Meteorological Services; South America; Brazil

20080031697 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Modeling Evapotranspiration for Water Resources Management in Irrigated Perimeter using Satellite Imagery

Folhes, Marcelo Theophilo; [2007]; 189 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14804-TDI/1256; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A09](#), Hardcopy

Using satellite imagery of this dissertation evaluates the utility of a process that measures the level of water use in irrigated agriculture. The experiment, which models evapotranspiration (ET(sub c)), was carried out within the irrigated perimeter of Jaguaribe-Apodi, Ceara, during three months of the agricultural season. The ET(sub c) was estimated with the model Mapping Evapotranspiration at High Resolution and with Internalized Calibration (METRIC). The model uses the residual of the energy balance equation to estimate ET(sub c) for each pixel in the image. This information is combined with radiance values for each of the seven bands of the TM/Landsat 5 sensor and with climate information, including wind velocity and relative humidity, which were collected from local meteorological stations. METRIC is a variant of the model Surface Energy Balance Algorithm for Land (SEBAL). The results of the estimates were validated using measurements of energy flux from a micrometeorological tower installed within a banana plantation located near the irrigated perimeter. After evaluating the ET estimates using a multitemporal series, a regression equation is defined that characterizes the statistical relationship of the ET(sub c) estimates generated with the METRIC model with direct measures of water abstraction including hydrometers and water outflow. Finally, the dissertation discusses the potential use of the model as an alternative method to calculate levels of water consumption in irrigated agriculture and the implications for water resource management in irrigated perimeters.

Author

Evapotranspiration; Water Resources; Water Consumption; Irrigation; Agriculture; Satellite Imagery; Micrometeorology

20080031701 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Consequences of Global Climatic Changes on South American Biomes: A Potential Vegetation Model Including the Carbon Cycle

MontenegroLapola, David; [2007]; 186 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14806-TDI/1249; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A09](#), Hardcopy

The CPTEC-PVM2 has been developed, a potential vegetation model (PVM) which adds a carbon cycle sub-model to CPTEC-PVM. From monthly climatologies of temperature, precipitation and CO₂ atmospheric concentration this sub-model calculates net primary productivity (NPP) and heterotrophic respiration of ecosystems, as well as soil carbon storage, with a good agreement when compared to observational and modeled data. Therefore, from three calculated variables (mean annual NPP, a seasonality index of NPP and the coldest month temperature), CPTEC-PVM2 assigns a biome in equilibrium with a given climate. CPTEC-PVM2 shows a skill classified as regular which is comparable to other PVM that simulate the carbon cycle. As an immediate application of the model, the effects of future climatic changes on biomes distribution are analyzed by forcing CPTEC-PVM2 with climatologies originated from 14 IPCC-AR4 s AOGCM, under two anthropogenic emissions scenarios, SRES-A2 and SRES-B1. In South America larger impacts would concentrate in Amazonia and Northeast Brazil. Still there are uncertainties regarding a savannization of Southeast Amazonia and a semi-desertification or savannization of Northeast Brazil. The possible savannization of Southeast Amazonia, would rely mainly on an increase of seasonality, while in Northeast Brazil the uncertainties depend upon the signal of precipitation anomalies in the region. However, the insertion of CO₂ vegetation interaction mechanisms (carbon cycle) results in prognostics different, less catastrophic, and probably more realistic than those pointed by studies with the original version of CPTEC-PVM.

Author

Climate Change; Carbon Cycle; Ecosystems; Vegetation; South America; Climate Models

20080031714 NASA Marshall Space Flight Center, Huntsville, AL, USA; NASA Marshall Space Flight Center, Huntsville, AL, USA; NASA Marshall Space Flight Center, Huntsville, AL, USA; NASA Marshall Space Flight Center, Huntsville, AL, USA

An Overview of the Hurricane Imaging Radiometer (HIRAD)

April 28, 2008; 2 pp.; In English; 28th Conference on Hurricanes and Tropical Meteorology, 28 Apr. - 2 May 2008, Florida, USA; No Copyright; Avail.: Other Sources; Abstract Only

Accurate observations of ocean surface vector winds (OSVW) with high spatial and temporal resolution are critically important to improve both our understanding and predictability of tropical cyclones. As the successful NASA QuikSCAT satellite continues to age beyond its planned life span, many members of the tropical cyclone research and operational community recognize the need to develop new observational technologies and strategies to meet the essential need for OSVW information. This concern has been expressed in both the 'Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond' developed by the National Research Council Committee on Earth Science and Applications from Space and the 'Interagency Strategic Research Plan for Tropical Cyclone The Way Ahead' developed by the Joint Action Group for Tropical Cyclone Research (JAG-TCR) sponsored by the Office of the Federal Coordinator for Meteorology. One innovative technology development which offers the potential for new, unique remotely sensed observations of tropical cyclone OSVW and precipitation is the Hurricane Imaging Radiometer (HIRAD). This new instrument is passive microwave synthetic thinned aperture radiometer under development at the NASA Marshall Space Flight Center that will operate at the C-Band frequencies of 4, 5, 6, and 7 GHz. These frequencies have been successfully demonstrated by the NOAA nadir-staring Stepped Frequency Microwave Radiometer (SFMR) as useful for monitoring tropical cyclone ocean surface wind speeds and rain rates from low altitude reconnaissance aircraft. The HIRAD design incorporates a unique antenna design as well as several technologies that have been successfully demonstrated by the University of Michigan Lightweight Rain Radiometer sponsored by NASA Earth Science Technology Office Instrument Incubator Program. HIRAD will be a compact, lightweight, low-power instrument with no moving parts that will produce imagery of ocean wind surface wind parameters and rain rate during the strong wind and heavy rain hurricane conditions that hamper the observational capabilities of higher frequency passive microwave radiometers or scatterometers. It will also produce imagery of sea surface temperature under cloudy and lightly precipitating skies eliminating the need for additional thermal infrared imagers. The strategic plan for HIRAD includes a roadmap for ocean surface wind speed and OSVW technology development using flight demonstrations on piloted aircraft, uninhabited aerial vehicle systems, and satellite platforms. The roadmap will include exit opportunities for technology transfer from research to operations based on satisfactory demonstrations. The first aircraft version of HIRAD will be singular polarization sensor designed to observe ocean surface wind speed and rainfall. The second aircraft version of HIRAD will be

dual polarization sensor designed to observe OSVW as a prototype for a future satellite sensor.

Author

Microwave Radiometers; Imaging Techniques; Wind Velocity; Sea Surface Temperature; Ocean Surface; Temporal Resolution; Spatial Resolution; Tropical Storms; Cyclones; Hurricanes; Antenna Design

20080032225 Congressional Research Service, Washington, DC, USA

Climate Change Legislation in the 110th Congress. CRS Report for Congress (Updated July 17, 2007)

Ramseur, J. L.; Yacobucci, B. D.; Jul. 17, 2007; 28 pp.; In English

Report No.(s): PB2008-100492; CRS-RL34067-REV; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Congressional interest in climate change legislation has grown in recent years. In the 110th Congress, Members have introduced multiple bills that directly address various aspects of climate change. These bills cover a wide spectrum, ranging from climate change research to comprehensive greenhouse gas (GHG) emissions cap-and-trade programs. Additional bills focus on GHG reporting or registration, or on power plant emissions of carbon dioxide (CO₂) as part of wider controls on pollutant emissions. Within several broad categories, the bills vary in their approaches to climate change issues. For example, some bills covering research issues focus solely on modeling the effects of future climate change, whereas others address the development of monitoring systems. Bills focusing on technology deployment do so through tax incentives and credit-based programs within the USA or by promoting technology deployment in developing countries. Bills that include GHG registries are designed either as a part of a larger reduction bill or as a method for establishing a baseline for some future reduction program. Bills with mandatory emission reductions differ by the entities covered, the gases limited, and the emission targets required. This report briefly discusses the basic concepts on which these bills are based, and compares major provisions of the bills in each of the following categories: climate change research; emissions reduction technologies; U.S. actions pursuant to international emission reduction agreements; adaptation to the effects of climate change; GHG reporting and registration; and GHG emissions reduction programs.

NTIS

Air Pollution; Climate Change; Law (Jurisprudence); Pollution Control

20080032229 Office of Management and Budget, Washington, DC USA

Federal Climate Change Expenditures. Report to Congress

May 2007; 45 pp.; In English

Report No.(s): PB2007-113813; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The President's 2008 Budget supports a wide range of climate change-related research, development, and deployment programs, voluntary partnerships, and international aid efforts. This report presents the expenditures associated with this portfolio of activities in four main categories: science, technology, international assistance, and tax provisions.

NTIS

Climate Change; Congressional Reports; Federal Budgets

20080032361 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

The Experimental MJO Prediction Project

Waliser, Duane; Weickmann, Klaus; Dole, Randall; Schubert, Siegfried; Alves, Oscar; Jones, Charles; Newman, Matthew; Pan, Hua-Lu; Roubicek, Andres; Saha, Suranjana; Smith, Cathy; VanDenDool, Huug; Vitart, Frederic; Wheeler, Matthew; Whitaker, Jeffrey; Bulletin American Meteorological Society; April 2006, pp. 425-431; In English; Original contains color illustrations

Contract(s)/Grant(s): NOAA NA16GP2021; NSF ATM-0094416; NSF ATM-0094387; NOAA NA16GP1019; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40894>; <http://dx.doi.org/10.1175/BAMS-87-4-425>

Weather prediction is typically concerned with lead times of hours to days, while seasonal-to-interannual climate prediction is concerned with lead times of months to seasons. Recently, there has been growing interest in 'subseasonal' forecasts---those that have lead times on the order of weeks (e.g., Schubert et al. 2002; Waliser et al. 2003; Waliser et al. 2005). The basis for developing and exploiting subseasonal predictions largely resides with phenomena such as the Pacific North American (PNA) pattern, the North Atlantic oscillation (NAO), the Madden-Julian Oscillation (MJO), mid-latitude blocking, and the memory associated with soil moisture, as well as modeling techniques that rely on both initial conditions and slowly varying boundary conditions (e.g., tropical Pacific SST). An outgrowth of this interest has been the development of an Experimental MJO Prediction Project (EMPP). The project provides real-time weather and climate information and predictions

for a variety of applications, broadly encompassing the subseasonal weather-climate connection. The focus is on the MJO because it represents a repeatable, low-frequency phenomenon. MJO's importance among the subseasonal phenomena is very similar to that of El Niño-Southern Oscillation (ENSO) among the interannual phenomena. This note describes the history and objectives of EMPP, its status, capabilities, and plans.

Author

Climate; El Niño; Temperate Regions; Low Frequencies; Soil Moisture; Boundary Conditions; Forecasting

20080032362 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

On the Cause of Eastern Equatorial Pacific Ocean T-S Variations Associated with El Niño

Wang, Ou; Fukumori, Ichiro; Lee, Tong; Cheng, Benny; Geophysical Research Letters; August 12, 2004; Volume 31; 5 pp.; In English; Original contains color illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40879>; <http://dx.doi.org/10.1029/2004GL020188>

The nature of observed variations in temperature-salinity (T-S) relationship between El Niño and non-El Niño years in the pycnocline of the eastern equatorial Pacific Ocean (NINO3 region, 5(deg)S-5(deg)N, 150(deg)W-90(deg)W) is investigated using an ocean general circulation model. The origin of the subject water mass is identified using the adjoint of a simulated passive tracer. The higher salinity during El Niño is attributed to larger convergence of saltier water from the Southern Hemisphere and smaller convergence of fresher water from the Northern Hemisphere.

Author

El Niño; Ocean Models; Southern Hemisphere; Ocean Currents; Equatorial Regions; Convergence

20080032381 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Characterization of MJO-Related Upper Tropospheric Hydrological Processes using MLS

Schwartz, Michael J.; Waliser, Duane E.; Tian, Baijun; Wu, Dong L.; Jiang, Jonathan H.; Read, William G.; Geophysical Research Letters; April 26, 2008; Volume 35; 5 pp.; In English; Original contains color illustrations; Copyright; Avail.:

Other Sources

ONLINE: <http://hdl.handle.net/2014/40886>; <http://dx.doi.org/10.1029/2008GL033675>

This study quantifies Madden-Julian Oscillation (MJO)-related hydrological variability in the upper troposphere/ lower stratosphere (UT/LS) using Aura Microwave Limb Sounder (MLS) cloud ice water content (IWC) and water vapor (H₂O). In a composite of six boreal-winter MJO events, the UT/LS IWC anomaly is strongly positively correlated with the convection (TRMM rainfall) anomaly. IWC anomalies range from +/-2 mg/cu m at 215 hPa to +/-0.08 mg/cu m at 100 hPa. The UT/LS H₂O anomaly has an eastward-tilting structure similar to the previous-documented temperature structure, but the H₂O maximum lags the temperature maximum by about a week. The H₂O anomaly is positively correlated with the convection anomaly in the UT (261 hPa) and LS (68 hPa) but negatively correlated with the convection anomaly near the tropopause (100 hPa). This analysis provides a multi-parameter construct useful in validating and improving the parameterization of convection, clouds and cloud microphysics in MJO modeling.

Author

Atmospheric Temperature; Microwave Sounding; Troposphere; Tropopause; TRMM Satellite; Convection Clouds; Moisture Content

20080032382 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

First Satellite Observations of Lower Tropospheric Ammonia and Methanol

Beer, Reinhard; Shephard, Mark W.; Kulawik, Susan S.; Clough, Shepard A.; Eldering, Annmarie; Bowman, Kevin W.; Sander, Stanley P.; Fisher, Brendan M.; Payne, Vivienne H.; Luo, Mingzhao; Osterman, Gregory B.; Worden, John R.; Geophysical Research Letters; May 1, 2008; Volume 35; 5 pp.; In English; Original contains color illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40891>; <http://dx.doi.org/10.1029/2008GL033642>

The Tropospheric Emission Spectrometer (TES) on the EOS Aura satellite makes global measurements of infrared radiances which are used to derive profiles of species such as O₃, CO, H₂O, HDO and CH₄ as routine standard products. In addition, TES has a variety of special modes that provide denser spatial mapping over a limited geographical area. A continuous-coverage mode (called "transect", about 460 km long) has now been used to detect additional molecules indicative of regional air pollution. On 10 July 2007 at about 05:37 UTC (13:24 LMST) TES conducted such a transect observation over the Beijing area in northeast China. Examination of the residual spectral radiances following the retrieval of the TES standard products revealed surprisingly strong features attributable to enhanced concentrations of ammonia (NH₃)

and methanol (CH₃OH), well above the normal background levels. This is the first time that these molecules have been detected in space-based nadir viewing measurements that penetrate into the lower atmosphere.

Author

Troposphere; Ammonia; Methyl Alcohol; Air Pollution; Lower Atmosphere; Satellite Observation; Ozone

20080032418 Meteorological Satellite Center, Kiyose, Japan

Monthly Report of the Meteorological Satellite Center: February 2008

February 2008; In English; Copyright; Avail.: Other Sources

These CD-ROMs contain the Monthly Report of observation data derived from MTSAT-1R and the polar orbital meteorological satellite NOAA. This monthly report contains image data observed by the following 4 channels and processed satellite product data from the observation data: IR:Infrared (10.2-11.3 microns), VS:Visible(0.55-0.90 microns), WV:Water Vapor(6.5-7.0 microns), and SW:3.8 micron image (3.5-4.0 microns). These CD-ROMS contain the following data: Full Disk Earth's Cloud Image; Cloud Image of Japan and its Vicinity; Cloud Motion Wind; Water Vapor Motion Wind; HRIT Image Data Catalog; TOVS (TIROS Operational Vertical Sounder) Vertical Profile of Temperature and Precipitable Water; TOVS Total Ozone Amount; Aerosol Optical Thickness; Snow and Ice Index; Sea Surface Temperature; and, Cloud Grid Information.

Author

Satellite Observation; Meteorological Satellites; Satellite Imagery; Data Acquisition; Data Products; Atmospheric Sounding; Satellite Sounding

20080032500 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Incorporation of New Solar Radiation Scheme Into CPTEC GCM

Tarasova, Tatiana; FigueroaRivero, Silvio Nilo; deMeloJorgeBarbosa, Henrique; [2007]; 44 pp.; In English; Original contains black and white illustrations

Report No.(s): INPE-14052-NTC/371; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A03](#), Hardcopy

A sophisticated solar radiation scheme has been incorporated in the global model of CPTEC. The scheme considers fine effects of gaseous absorption and particle scattering which are not taken into account in the original scheme of the model. The new scheme demonstrates much higher accuracy in offline solar radiation calculations for the test cases. The two versions of the model, with the original and new traditional schemes, were integrated for time periods of 2.5 and 6 months with different initial conditions. The impact of the new solar radiation scheme on surface solar radiative fluxes and meteorological variables during astral summer over South America are analyzed here. The values of surface solar radiation provided by the model integrations with new radiation scheme are in a better agreement with satellite-derived data than those provided by the original model. The magnitude of precipitation is improved over equatorial Atlantic Ocean and over Southeastern Brazil, however there is not significant impact over Amazonia. Therefore, further improvement in the model performance requires changes in the convection scheme as well as in other physical parameterizations of the model.

Author

Solar Radiation; Climatology; Meteorological Parameters

20080032502 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Present-Day Climate Variability Simulations over South America using a Climate Regional Model

Alves, Lincoln Muniz; March 26, 2007; 98 pp.; In Portuguese; Original contains color and black and white illustrations

Report No.(s): INPE-14825-TDI/1265; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A05](#), Hardcopy

The purpose of this work was to evaluate the accuracy of The Hadley Centre Regional Climate Model (HadRM3P) in describing the seasonal variability of the main climatological features over South America and adjacent (surrounding) oceans by using long-term simulations (30 years, 1961-1990). The analysis was performed using seasonal averages from observed and simulated precipitation, temperature, sea level pressure and wind (850 and 200 hPa). The impact of lateral boundary conditions and two different sea surface temperature (SST) conditions (1983 El Nino and 1985 La Nina) on the simulated climate and on the accuracy in simulating both interannual and seasonal variability was studied subjectively and objectively (skill scores). Precipitation and temperature patterns in space and time as well as the main general circulation features, including details captured by the model at finer scales than those resolved by global model were simulated by the model. However, regionally, there are still systematic errors which might be related to the physics of the model (convective schemes, topography and land surface processes) and the lateral boundary conditions inherited from the global model.

Author

Climatology; Climate Models; Climate Change; Annual Variations; South America; Oceans; Oceanography

20080032506 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Evaluation of the Data Produced by the S Band Weather Radars Network Located in Central Southern Brazil

daCosta, Isabelly Carvalho; January 2008; 139 pp.; In Portuguese; Original contains color and black and white illustrations
Report No.(s): INPE-14986-TDI/1273; Copyright; Avail.: CASI: **C01**, CD-ROM: **A07**, Hardcopy

Data from the weather radars located in central, southeastern and southern Brazil has been used by the CPTEC and DECEA since the agreement between both institutions was signed in 2004. Before this date the radar data was used by flight protection purposes only, and was not stored. Nowadays, the radar products derived from the scanning strategy of all radars are recorded and then sent to the CPTEC and DECEA. The quality of the data was not evaluated yet, and for applications like nowcasting, data assimilation and rainfall estimation it is necessary to guarantee that the data are good enough to be used. Therefore, the main goal of this assignment was to evaluate the quality of the data produced by the radar network using the information acquired by the TRMM-PR (Tropical Rainfall Measurement Mission Precipitation Radar) as reference. The results showed that in most cases (excepting Gama) the ground radars tend to overestimate reflectivity values when compared with PR. It was also showed that Sao Roque requires attention due to its large offset and noises present in its products. The differences found in the remaining radars were related to the time difference between the data acquisition of the two types of sensors (ground and orbital radars).

Author

Meteorological Radar; Radar Networks; Radar Data; Data Acquisition; Data Products; Quality Control

20080032524 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Global Precipitation Measurement (GPM) Mission: NASA Precipitation Processing System (PPS)

Stocker, Erich Franz; June 02, 2008; 7 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: **A02**, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080032524>

NASA is contributing the precipitation measurement data system PPS to support the GPM mission. PPS will distribute all GPM data products including NASA's GMI data products freely and quickly. PPS is implementing no system mechanisms for restricting access to GPM data. PPS is implementing no system mechanisms for charging for GPM data products. PPS will provide a number of geographical and parameter subsetting features available to its users. The first implementation of PPS (called PPS--) will assume processing of TRMM data effective 1 June 2008. TRMM realtime data will be available via PPS-- to all users requesting access

Derived from text

Precipitation (Meteorology); Data Systems; Real Time Operation; Precipitation Measurement; TRMM Satellite

20080032548 California Inst. of Tech., Pasadena, CA, USA

Impact of Nonabsorbing Anthropogenic Aerosols on Clear-Sky Atmospheric Absorption

Stier, Philip; Seinfeld, John H.; Kinne, Stefan; Feichter, Johann; Boucher, Olivier; Journal of Geophysical Research; 2006; Volume 111; 1 pp.; In English

Contract(s)/Grant(s): NNG04GD53G; Copyright; Avail.: Other Sources

ONLINE: <http://dx.doi.org/10.1029/2006JD007147>

Absorption of solar radiation by atmospheric aerosol has become recognized as important in regional and global climate. Nonabsorbing, hydrophilic aerosols, such as sulfate, potentially affect atmospheric absorption in opposing ways: first, decreasing absorption through aging initially hydrophobic black carbon (BC) to a hydrophilic state, enhancing its removal by wet scavenging, and consequently decreasing BC lifetime and abundance, and second, increasing absorption through enhancement of the BC absorption efficiency by internal mixing as well as through increasing the amount of diffuse solar radiation in the atmosphere. On the basis of General Circulation Model studies with an embedded microphysical aerosol module we systematically demonstrate the significance of these mechanisms both on the global and regional scales. In remote transport regions, the first mechanism prevails, reducing atmospheric absorption, whereas in the vicinity of source regions, despite enhanced wet scavenging, absorption is enhanced owing to the prevalence of the second mechanisms. Our findings imply that the sulfur to BC emission ratio plays a key role in aerosol absorption.

Author

Aerosols; Atmospheric Attenuation; Atmospheric General Circulation Models; Climatology; Radiation Absorption

20080032550 NASA Goddard Inst. for Space Studies, New York, NY, USA

Climate Response to the Increase in Tropospheric Ozone since Preindustrial Times: A Comparison between Ozone and Equivalent CO₂ Forcings

Mickley L. J.; Jacob, D. J.; Field, B. D.; Rind, D.; Journal of Geophysical Research; 2004; Volume 109; 2 pp.; In English
Contract(s)/Grant(s): NNG04GD53G; Copyright; Avail.: Other Sources

ONLINE: <http://dx.doi.org/10.1029/2003JD003653>

We examine the characteristics of the climate response to anthropogenic changes in tropospheric ozone. Using a general circulation model, we have carried out a pair of equilibrium climate simulations with realistic present-day and preindustrial ozone distributions. We find that the instantaneous radiative forcing of 0.49 W m^{-2} due to the increase in tropospheric ozone since preindustrial times results in an increase in global mean surface temperature of 0.28 C . The increase is nearly 0.4 C in the Northern Hemisphere and about 0.2 C in the Southern Hemisphere. The largest increases (greater than 0.8 C) are downwind of Europe and Asia and over the North American interior in summer. In the lower stratosphere, global mean temperatures decrease by about 0.2 C due to the diminished upward flux of radiation at 9.6 micrometers . The largest stratospheric cooling, up to 1.0 C , occurs over high northern latitudes in winter, with possibly important implications for the formation of polar stratospheric clouds. To identify the characteristics of climate forcing unique to tropospheric ozone, we have conducted two additional climate equilibrium simulations: one in which preindustrial tropospheric ozone concentrations were increased everywhere by 18 ppb , producing the same global radiative forcing as present-day ozone but without the heterogeneity; and one in which CO_2 was decreased by 25 ppm relative to present day, with ozone at present-day values, to again produce the same global radiative forcing but with the spectral signature of CO_2 rather than ozone. In the first simulation (uniform increase of ozone), the global mean surface temperature increases by 0.25 C , with an interhemispheric difference of only 0.03 C , as compared with nearly 0.2 C for the heterogeneous ozone increase. In the second simulation (equivalent CO_2), the global mean surface temperature increases by 0.36 C , 30% higher than the increase from tropospheric ozone. The stronger surface warming from CO_2 is in part because CO_2 forcing (obscured by water vapor) is shifted relatively poleward where the positive ice-albedo feedback amplifies the climate response and in part because the magnitude of the CO_2 forcing in the mid-troposphere is double that of ozone. However, we find that CO_2 is far less effective than tropospheric ozone in driving lower stratospheric cooling at high northern latitudes in winter.

Author

Carbon Dioxide; Climate Change; Ozone; Polar Meteorology; Troposphere

20080032553 National Oceanic and Atmospheric Administration, Boulder, CO, USA

Climate Response of Direct Radiative Forcing of Anthropogenic Black Carbon

Chung, Serena H.; Seinfeld, John H.; Journal of Geophysical Research; [2008]; Volume 110; 2 pp.; In English

Contract(s)/Grant(s): NNG04GD53G; Copyright; Avail.: Other Sources

ONLINE: <http://dx.doi.org/10.1029/2004JD005441>

The equilibrium climate effect of direct radiative forcing of anthropogenic black carbon (BC) is examined by 100-year simulations in the Goddard Institute for Space Studies General Circulation Model II-prime coupled to a mixed-layer ocean model. Anthropogenic BC is predicted to raise globally and annually averaged equilibrium surface air temperature by 0.20 K if BC is assumed to be externally mixed. The predicted increase is significantly greater in the Northern Hemisphere (0.29 K) than in the Southern Hemisphere (0.11 K). If BC is assumed to be internally mixed with the present day level of sulfate aerosol, the predicted annual mean surface temperature increase rises to 0.37 K globally, 0.54 K for the Northern Hemisphere, and 0.20 K for the Southern Hemisphere. The climate sensitivity of BC direct radiative forcing is calculated to be 0.6 K W^{-1} square meters, which is about 70% of that of CO_2 , independent of the assumption of BC mixing state. The largest surface temperature response occurs over the northern high latitudes during winter and early spring. In the tropics and midlatitudes, the largest temperature increase is predicted to occur in the upper troposphere. Direct radiative forcing of anthropogenic BC is also predicted to lead to a change of precipitation patterns in the tropics; precipitation is predicted to increase between 0 and 20 N and decrease between 0 and 20 S , shifting the intertropical convergence zone northward. If BC is assumed to be internally mixed with sulfate instead of externally mixed, the change in precipitation pattern is enhanced. The change in precipitation pattern is not predicted to alter the global burden of BC significantly because the change occurs predominantly in regions removed from BC sources.

Author

Climatology; Carbon; Computerized Simulation; Geophysics; Ocean Models

20080032583 Meteorological Satellite Center, Kiyose, Japan

Monthly Report of the Meteorological Satellite Center: March 2008

March 2008; In English; Copyright; Avail.: Other Sources

These CD-ROMs contain the Monthly Report of observation data derived from MTSAT-1R and the polar orbital meteorological satellite NOAA. This monthly report contains image data observed by the following 4 channels and processed satellite product data from the observation data: IR:Infrared, VS:Visible, WV:Water Vapor, and SE:3.8 micron image. These CD-ROMs contain the following data: Full Disk Earth's Cloud Image; Cloud Image of Japan and its Vicinity; Cloud Motion Wind; Water Vapor Motion Wind; HRIT Image Data Catalog; TOVS (TIROS Operational Vertical Sounder) Vertical Profile of Temperature and Precipitable Water; TOVS Total Ozone Amount; Aerosol Optical Thickness; Snow and Ice Index; Sea Surface Temperature, and Cloud Grid Information.

Author

Meteorological Satellites; Satellite Observation; Satellite Sounding; Atmospheric Sounding; Satellite Imagery; Data Acquisition; Data Products

20080032588 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

The Influence of Upper Tropospheric Cyclonic Vortex (UTCV) on the Rainfall over the Northeast Brazil (NEB) and the Characteristics Associated

AlvesdaSilva, Ligia; [2007]; 134 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14488-TDI/1169; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A07](#), Hardcopy

The Upper Tropospheric Cyclonic Circulation Systems (UTCS) over the Northeast Brazil (NEB) and the adjoining ocean in the austral summer have a strong influence on the rainfall over different subregions of NEB. The occurrence and the characteristics of the UTCS over and near NEB in the 7 summers from 1994-2001 are examined. The influence of the UTCS over the three important and distinct subregions of NEB namely, the northwestern part of NEB, northern part of Bahia state and the semiarid interior of the Northeast, are studied (by focusing the study on three target areas within the subregions). The interannual variability is quite high in the frequency and the intensity of the UTCS. The UTCS on the average, have an intensity of $-5 \times 10^{10} \text{ s}(\text{exp } -1)$ and horizontal extent of $2,000,000 \text{ km}(\text{exp } 2)$ as seen from the vorticity ($\zeta -2.5 \times 10^{10}(\text{exp } -5) \text{ s}(\text{exp } -1)$) charts at 200 hPa. The three subregions considered are influenced by the UTCS with reduction of daily precipitation when the UTCS is directly over the subregion considered, confirming the result of Kousky and Gan (1981) that the subsidence in the center of UTCS over these regions inhibits precipitation. When the UTCS is far from the subregion in the northeastern, eastern and southeastern sectors in relation to the subregion within 1000 and 2000 km distance, the frequency of mode rate to intense rainfall increases substantially due to the effect of the convective cloud band near the border of the system in its western sector. When the distance is less than 1000 km the effect of the convective band is marginal and when the distance is greater than 2000 km the effect of the UTCS is reduced. The vorticity balance for three cases of UTCS revealed that divergence term is dominant, both in the formative stage and the dissipative stage. As is expected, for larger UTCS the effect of beta is significant and the advection of zeta plays an important role on the western and eastern sides of the vortex. The life of UTCS has duration of about 10 days and they mostly move to northeast from the Atlantic.

Author

Troposphere; Atmospheric Circulation; Vortices; Rain; Summer; Annual Variations

20080032671 NASA Goddard Space Flight Center, Greenbelt, MD, USA

GSFC Technology Development Center Report

Himwich, Ed; Gipson, John; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 250-252; In English; See also [20080032620](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

This report summarizes the activities of the GSFC Technology Development Center (TDC) for 2007 and forecasts planned activities for 2008. The GSFC TDC develops station software including the Field System, scheduling software (SKED), hardware including tools for station timing and meteorology, scheduling algorithms and operational procedures, and it provides a pool of individuals to assist with station implementation, check-out, upgrades, and training.

Author

Meteorology; Forecasting; Education; Algorithms

Includes the physical, chemical and biological aspects of oceans and seas; ocean dynamics; and marine resources. For related information see also 43 *Earth Resources and Remote Sensing*.

20080031699 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Diurnal Tide Variability in the Region between 80 and 100 km Height over Cachoeira (22.7 deg S, 45 deg W)

Tokumoto, Apredido Seigim; [2007]; 166 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14805-TDI/1248; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A08](#), Hardcopy

Six years of data collected by a SkYmet meteor radar were used to study the tidal seasonal and the day-to-day variabilities. The tidal seasonal variability has a well known climatology and has been studied for many years. Conversely, the tidal day-to-day variability is not well known and its producing mechanisms are not completely explained. This variability is probably the result of several mechanisms acting on the tide, among the mechanisms there is the gravity wave momentum deposition, non-linear interactions between diurnal and semidiurnal tides, non-linear interactions between diurnal tide and planetary waves, geomagnetic storms influences, and the interactions between migrating and non-migrating tides. All the mechanisms were investigated in this work, except the last, and it was concluded that all of the mechanisms studied contributed to tidal variability. The gravity wave momentum deposition contributed better to seasonal variability of diurnal tide and the interactions between tides and between diurnal tide and planetary wave contributed better to day-to-day variability.

Author

Diurnal Variations; Tides; Variability

20080032250 Naval Postgraduate School, Monterey, CA USA

Determination of the Current System on Isopycnal Surface Between Mindanao and New Guinea from GDEM

Chu, Peter C; Li, Rongfeng; Fan, Chenwu; Jan 2003; 22 pp.; In English

Report No.(s): AD-A480144; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this study, we used the Navy's Generalized Digital Environmental Model (GDEM) climatological temperature and salinity data on a 0.5 deg x 0.5 deg grid to investigate the seasonal variabilities of the southwest Philippines Sea (0.5 deg - 9 deg N, 123.5 deg - 136.5 deg) thermohaline structure and circulation. The GDEM for the area was built up on historical (1930 - 1997) temperature and salinity profiles. A three dimensional estimate of the absolute geostrophic velocity field on isopycnal surface was obtained from the GDEM temperature and salinity fields using the P-vector method. The seasonal variabilities of the thermohaline structure and currents (obtained from the inverse method) such as the Mindanao Current, Mindanao Undercurrent, North Equatorial Counter Current, New Guinea Coastal Undercurrent, and dual-eddies (cyclonic Mindanao Eddy and anticyclonic Halmahera Eddy) are identified.

DTIC

Thermohaline Circulation; Seas; Surface Properties; Currents

20080032364 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Summer Sea Ice Motion from the 18 GHz Channel of AMSR-E and the Exchange of Sea Ice between the Pacific and Atlantic Sectors

Kwok, Ronald; Geophysical Research Letters; February 5, 2008; Volume 35; 6 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40883>; <http://dx.doi.org/10.1029/2007GL032692>

We demonstrate that sea ice motion in summer can be derived reliably from the 18GHz channel of the AMSR-E instrument on the EOS Aqua platform. The improved spatial resolution of this channel with its lower sensitivity to atmospheric moisture seems to have alleviated various issues that have plagued summer motion retrievals from shorter wavelength observations. Two spatial filters improve retrieval quality: one reduces some of the microwave signatures associated with synoptic-scale weather systems and the other removes outliers. Compared with daily buoy drifts, uncertainties in motion are approx.3-4 km/day. Using the daily motion fields, we examine five years of summer ice area exchange between the Pacific and Atlantic sectors of the Arctic Ocean. With the sea-level pressure patterns during the summer of 2006 and 2007 favoring the export of sea ice into the Atlantic Sector, the regional outflow is approx.21% and approx.15% of the total sea ice retreat in the Pacific sector.

Author

Sea Ice; Microwave Signatures; Arctic Ocean; Aqua Spacecraft; Sea Level

20080032385 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Seasat--A 25-Year Legacy of Success

Evans, Diane L.; Alpers, Werner; Cazenave, Anny; Elachi, Charles; Farr, Tom; Glackin, David; Holt, Benjamin; Jones, Linwood; Liu, W. Timothy; McCandless, Walt; Menard, Yves; Moore, Richard; Njoku, Eni; Remote Sensing of Environment; February 15, 2005; Volume 94, pp. 384-404; In English; Original contains color illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40868>; <http://dx.doi.org/10.1016/j.rse.2004.09.011>

Thousands of scientific publications and dozens of textbooks include data from instruments derived from NASA's Seasat. The Seasat mission was launched on June 26, 1978, on an Atlas-Agena rocket from Vandenberg Air Force Base. It was the first Earth-orbiting satellite to carry four complementary microwave experiments--the Radar Altimeter (ALT) to measure ocean surface topography by measuring spacecraft altitude above the ocean surface; the Seasat-A Satellite Scatterometer (SASS), to measure wind speed and direction over the ocean; the Scanning Multichannel Microwave Radiometer (SMMR) to measure surface wind speed, ocean surface temperature, atmospheric water vapor content, rain rate, and ice coverage; and the Synthetic Aperture Radar (SAR), to image the ocean surface, polar ice caps, and coastal regions. While originally designed for remote sensing of the Earth's oceans, the legacy of Seasat has had a profound impact in many other areas including solid earth science, hydrology, ecology and planetary science.

Author

Seasat Satellites; Oceanography; Remote Sensing

20080032445 NASA Marshall Space Flight Center, Huntsville, AL, USA

Dominance of ENSO-Like Variability in Controlling Tropical Ocean Surface Energy Fluxes in the Satellite Era

Robertson, F. R.; Miller, T. L.; Bosilovich, M. G.; May 27, 2008; 1 pp.; In English; Spring American Geophysical Union Meeting, 27-30 May 2008, Fort Lauderdale, FL, USA; No Copyright; Avail.: Other Sources; Abstract Only

Ocean surface turbulent and radiative fluxes are critical links in the climate system since they mediate energy exchange between the two fluid systems (ocean and atmosphere) whose combined heat transport determines the basic character of Earth's climate. Moreover, interannual to decadal climate variability depends crucially on the nature of these exchange processes. For example, addressing the question of the degree to which the global hydrologic cycle is changing depends on our ability to observe and model these fluxes accurately. In this work we investigate the interannual to decadal variation of fluxes over the global tropics, especially the tropical oceans. Recent versions of satellite-derived fresh water flux estimates as well as some reanalyses (e.g. products from Remote Sensing Systems, the Woods Hole Oceanographic Institute, and Global Precipitation Climatology Project) suggest that increases in evaporation and precipitation over the past 20 years exceed those expected on the basis of climate model projected responses to greenhouse gas forcing. At the same time, it is well known that El Niño / Southern Oscillation behavior in the Pacific exhibits significant variability at scales longer than interannual. We examine here the degree to which surface fluxes attending these interannual to decadal fluctuations are related to ENSO. We examine consistency between these data sets and explore relationships between SST variations, flux changes and modulation of tropical Walker and Hadley circulations.

Author

El Niño; Flux Quantization; Ocean Surface; Oceanography; Tropical Regions; Energy Transfer; Southern Oscillation; Variability; Remote Sensing

51

LIFE SCIENCES (GENERAL)

Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance of animals and plants in space and related environmental conditions. For specific topics in life sciences see *categories 52 through 55*.

20080031061 NASA Marshall Space Flight Center, Huntsville, AL, USA

Health and Environment Linked for Information Exchange (HELIX)-Atlanta: A CDC-NASA Joint Environmental Public Health Tracking Collaborative Project

Al-Hamdan, Mohammad; Luvall, Jeff; May 16, 2008; 5 pp.; In English; American Thoracic Society's (ATS) 2008 Toronto International Conference/ATS, 16-21 May 2008, Ontario, Canada; Original contains black and white illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

HELIX-Atlanta was developed to support current and future state and local EPHT programs to implement data linking

demonstration projects which could be part of the CDC EPHT Network. HELIX-Atlanta is a pilot linking project in Atlanta for CDC to learn about the challenges the states will encounter. NASA/MSFC and the CDC are partners in linking environmental and health data to enhance public health surveillance. ~ The use of NASA technology creates value added geospatial products from existing environmental data sources to facilitate public health linkages. Proving the feasibility of the approach is the main objective

Derived from text

Public Health; Surveillance; Health; Environmental Quality

20080031070 Library of Congress, Washington, DC USA

Veterans and Homelessness

Perl, Libby; May 31, 2007; 31 pp.; In English

Report No.(s): AD-A479690; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA479690>

The current conflicts in Iraq and Afghanistan have brought renewed attention to the needs of veterans, including the needs of homeless veterans. The Department of Veterans Affairs (VA) estimates that it has served approximately 300 returning veterans in its homeless programs and has identified over 1,000 more as being at risk of homelessness. Both male and female veterans are overrepresented in the homeless population, and as the number of veterans increases due to the current wars, there is concern that the number of homeless veterans could rise commensurately. Congress has created numerous programs that serve homeless veterans specifically, almost all of which are funded through the Veterans Health Administration. These programs provide health care and rehabilitation services for homeless veterans (the Health Care for Homeless Veterans and Domiciliary Care for Homeless Veterans programs), employment assistance (Homeless Veterans Reintegration Program and Compensated Work Therapy program), transitional housing (Grant and Per Diem and Loan Guarantee programs) as well as other supportive services. Through an arrangement with the Department of Housing and Urban Development (HUD), approximately 1,000 veterans currently use dedicated Section 8 vouchers for permanent housing, with supportive services provided through the VA. These are referred to as HUD-VASH vouchers. In FY2007, it is estimated that approximately \$270 million will be used to fund homeless veterans programs.

DTIC

Medical Services; Therapy; Health

20080031326 NASA Johnson Space Center, Houston, TX, USA

Iron Tolerant Cyanobacteria as an Effective Tool to Study Early Evolution of Life and the Development of Biosignatures

Brown, Igor; Mummey, Daniel; Sarkisova, Svetlana; Allen, Carlton; McKay, David S.; March 13, 2006; 2 pp.; In English; Lunar and Planetary Sciences Conference, 13-17 Mar. 2006, League City, TX, USA; Copyright; Avail.: CASI: [A01](#),

Hardcopy

We are currently conducting preliminary studies on the diversity of iron-tolerant cyanobacteria (CB) isolated from iron-depositing hot springs in and around Yellowstone National Park (WY, USA). In conclusion, there is no consensus on the divergence of cyanobacteria from a common ancestor for either anoxygenic or oxygenic phototrophs. Anoxygenic photosynthesis may have provided energy for the common ancestor, but it is unclear what environmental pressure induced the evolving of oxygenic phototrophs. It is supposed, however, that predecessors of contemporary CB were capable of oxidizing various substrates other than water, and it is likely that Fe²⁺ could be one of those substrates. If that were the case, the work of entire photosystems in Precambrian cyanobacteria and/or in their predecessors could follow three scenarios (at least): 1) ferrous iron may have been oxidized in PS II but without significant effects on oxygen evolution, and environmental iron could have been oxidized either enzymatically or chemically; 2) ferrous iron may have been oxidized only enzymatically by PS II, accompanied by the repression of O₂ evolution; or 3) ferrous iron may have been oxidized by PS I upon the prevalence of anoxygenic photosynthesis or without any effect on PS II. All of these scenarios will be the subject of our future studies with the aim to understand which line-ages of CB could be typical for Precambrian time.

Derived from text

Bacteria; Biological Evolution; Biomarkers; Iron; Oxidation; Archaeobacteria; Paleobiology

20080031730 Idaho National Engineering Lab., Idaho Falls, ID, USA
Occupational Injury Rate Estimates in Magnetic Fusion Experiments

Cadwallader, L. C.; Nov. 01, 2006; 6 pp.; In English

Contract(s)/Grant(s): DE-AC07-99ID-13727

Report No.(s): DE2007-911929; INL/CON-06-11428; No Copyright; Avail.: Department of Energy Information Bridge

In nuclear facilities, there are two primary aspects of occupational safety. The first aspect is radiological safety, which has rightly been treated in detail in nuclear facilities. Radiological exposure data have been collected from the existing tokamaks to serve as forecasts for ITER radiation safety. The second aspect of occupational safety, traditional industrial safety, must also be considered for a complete occupational safety program. Industrial safety data on occupational injury rates from the JET and TFTR tokamaks, three accelerators, and U.S. nuclear fission plants have been collected to set industrial safety goals for the ITER operations staff. The results of this occupational safety data collection and analysis activity are presented here. The data show that an annual lost workday case rate of 0.3 incidents per 100 workers is a conceivable goal for ITER operations.

NTIS

Estimates; Injuries; Nuclear Fusion; Radiology; Safety; Tokamak Devices

20080032540 NASA Marshall Space Flight Center, Huntsville, AL, USA

Remote Sensing, Air Quality, and Public Health

Quattrochi, Dale A.; Rickman, Douglas; Mohammad, Al-Hamdan; Crosson, William; Estes, Maurice, Jr.; Limaye, Ashutosh; Qualters, Judith; May 20, 2008; 38 pp.; In English; The Second Workshop on Earth Observation for Urban Planning and Management, 20-21 May 2008, Kowloon, Hong Kong; Original contains black and white illustrations; Copyright; Avail.:

CASI: A03, Hardcopy

HELIX-Atlanta was developed to support current and future state and local EPHT programs to implement data linking demonstration projects which could be part of the EPHT Network. HELIX-Atlanta is a pilot linking project in Atlanta for CDC to learn about the challenges the states will encounter. NASA/MSFC and the CDC are partners in linking environmental and health data to enhance public health surveillance. The use of NASA technology creates value-added geospatial products from existing environmental data sources to facilitate public health linkages. Proving the feasibility of the approach is the main objective

Derived from text

Health; Air Quality; Public Health; Remote Sensing; Linkages; Surveillance

52

AEROSPACE MEDICINE

Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments, see *53 Behavioral Sciences*. For the effects of space on animals and plants see *51 Life Sciences*.

20080031128 NASA Johnson Space Center, Houston, TX, USA

Ground Reaction Forces and Gait Parameters during Motorized and Non-Motorized Treadmill Walking and Running on the International Space Station Treadmill

Hagan, Ronald Donald; Norcross, Jason; DeWitt, John; Lee, Stuart M.; McCleary, Frank; Edwards, W. Brent; May 31, 2006; 2 pp.; In English; American College of Sports Medicine, 31 May - 3 Jun. 2006, Denver, Co, USA; Copyright; Avail.:

CASI: A01, Hardcopy

Both motorized (T-M) and non-motorized (T-NM) treadmill locomotion are used on the International Space Station (ISS) as countermeasures to the deleterious effects of prolonged weightlessness. However, the ground reaction forces (GRF) and gait parameters of these exercise modes have not been examined. The purpose of this study was to determine if differences in GRF and gait parameters exist while walking (1.34 m/s) and running (3.13 m/s) on T-M and T-NM. Dissimilar GRF and gait

parameters suggest that T-M and T-NM locomotion may elicit different physiologic effects. T-NM may result in a reduced stimulus to bone formation due to a lower LR, but an increased energy cost as a result of shorter, more frequent strides. Therefore, the usage of each mode should depend upon the desired training stimulus.

Derived from text

Countermeasures; Gait; Physical Exercise; Physiological Effects; Treadmills; Bone Demineralization; Weightlessness; Aerospace Medicine

20080031330 NASA Johnson Space Center, Houston, TX, USA

Assessment of Postflight Locomotor Performance Utilizing a Test of Functional Mobility: Strategic and Adaptive Responses

Warren, L. E.; Mulavara, A. P.; Peters, B. T.; Cohen, H. S.; Richards, J. T.; Miller, C. A.; Brady, R.; Ruttley, T. M.; Bloomberg, J. J.; June 07, 2006; 2 pp.; In English; Seventh Symposium on the Role of the Vestibular, 7-9 Jun. 2006, Noordwijk, Netherlands

Contract(s)/Grant(s): NCC9-58; Copyright; Avail.: Other Sources; Abstract Only

Space flight induces adaptive modification in sensorimotor function, allowing crewmembers to operate in the unique microgravity environment. This adaptive state, however, is inappropriate for a terrestrial environment. During a re-adaptation period upon their return to Earth, crewmembers experience alterations in sensorimotor function, causing various disturbances in perception, spatial orientation, posture, gait, and eye-head coordination. Following long duration space flight, sensorimotor dysfunction would prevent or extend the time required to make an emergency egress from the vehicle; compromising crew safety and mission objectives. We are investigating two types of motor learning that may interact with each other and influence a crewmember's ability to re-adapt to Earth's gravity environment. In strategic learning, crewmembers make rapid modifications in their motor control strategy emphasizing error reduction. This type of learning may be critical during the first minutes and hours after landing. In adaptive learning, long-term plastic transformations occur, involving morphological changes and synaptic modification. In recent literature these two behavioral components have been associated with separate brain structures that control the execution of motor strategies: the strategic component was linked to the posterior parietal cortex and the adaptive component was linked to the cerebellum (Pisella, et al. 2004). The goal of this paper was to demonstrate the relative contributions of the strategic and adaptive components to the re-adaptation process in locomotor control after long duration space flight missions on the International Space Station (ISS). The Functional Mobility Test (FMT) was developed to assess crewmember's ability to ambulate postflight from an operational and functional perspective. Sixteen crewmembers were tested preflight (3 sessions) and postflight (days 1, 2, 4, 7, 25) following a long duration space flight (approx 6 months) on the ISS. We have further analyzed the FMT data to characterize strategic and adaptive components during the postflight readaptation period. Crewmembers walked at a preferred pace through an obstacle course set up on a base of 10 cm thick medium density foam (Sunmate Foam, Dynamic Systems, Inc., Leicester, NC). The 6.0m X 4.0m course consisted of several pylons made of foam; a Styrofoam barrier 46.0cm high that crewmembers stepped over; and a portal constructed of two Styrofoam blocks, each 31cm high, with a horizontal bar covered by foam and suspended from the ceiling which was adjusted to the height of the crewmember's shoulder. The portal required crewmembers to bend at the waist and step over a barrier simultaneously. All obstacles were lightweight, soft and easily knocked over. Crewmembers were instructed to walk through the course as quickly and as safely as possible without touching any of the objects on the course. This task was performed three times in the clockwise direction and three times in the counterclockwise direction that was randomly chosen. The dependent measures for each trial were: time to complete the course (seconds) and the number of obstacles touched or knocked down. For each crewmember, the time to complete each FMT trial from postflight days 1, 2, 4, 7 and 25 were further analyzed. A single logarithmic curve using a least squares calculation was fit through these data to produce a single comprehensive curve (macro). This macro curve composed of data spanning 25 days, illustrates the re-adaptive learning function over the longer time scale term. Additionally, logarithmic curves were fit to the 6 data trials within each individual post flight test day to produce 5 separate daily curves. These micro curves, produced from data obtained over the course of minutes, illustrates the strategic learning function exhibited over a relative shorter time scale. The macro curve for all subjects exhibited adaptive motor learning patterns over the 25 day period. However, 9/16 crewmembers exhibited significant strategic motor learning patterns in their micro curves, as defined by $m > 1$ in the equation of the line $y = m * \ln(x) + b$. These data indicate that postflight recovery in locomotor function involves both strategic and adaptive mechanisms. Future countermeasures will be designed to enhance both recovery processes.

Author

Adaptation; Earth Gravitation; Long Duration Space Flight; Spacecrews; Biological Effects; Physiological Effects; Weightlessness

20080031641 Civil Aerospace Medical Inst., Oklahoma City, OK, USA; Army Center for Health Promotion and Preventive Medicine (Provisional), Aberdeen Proving Ground, MD, USA

Infrared Radiation Transmittance and Pilot vision Through Civilian Aircraft Windscreens

Nakagawara, Van B.; Montgomery, Ronald W.; Marshall, Wesley J.; June 2008; 16 pp.; In English; Original contains color and black and white illustrations

Report No.(s): DOT/FAA/AM-08/15; No Copyright; Avail.: CASI: [A03](#), Hardcopy

INTRODUCTION: In support of a Department of Homeland Security project, the Federal Aviation Administration's Civil Aerospace Medical Institute measured the optical transmittance properties of aircraft windscreens. This paper focuses on windscreen transmittance in the infrared (IR) spectral region (780 - 4000 nm) of the electromagnetic spectrum. **METHOD:** Transmission measurements were performed on eight aircraft windscreens. Three windscreens were from large commercial jets (MD 88, Airbus A320, and Boeing 727/737); two from commercial, propeller-driven passenger planes (Fokker 27 and the ATR 42); one from a small private jet (Raytheon Aircraft Corporation Hawker Horizon); and two from small general aviation (GA), single-engine, propeller-driven planes (Beech Bonanza and Cessna 182). The two GA aircraft windscreens were plastic (polycarbonate); the others were multilayer (laminated) composite glass. **RESULTS:** The average transmittance for both glass laminate and plastic windscreens in the IR-A region (780 - 1400 nm) varied considerably (47.5% - 11.7%), with glass windscreens consistently attenuating more IR than plastic windscreens. The average difference in transmittance between the two materials fluctuated (27.3% +/- 15.9%) throughout the first half of the IR-B spectrum (1400 - 3000 nm) up to approximately 2200 nm when transmittance dropped below 7%. The average transmittance for glass and plastic windscreens became negligible beyond 2800 nm. **CONCLUSION:** Aircraft windscreens provide a level of protection from potential ocular and skin hazards due to prolonged or intense exposure to IR radiation. The amount of protection is dependent on the type of windscreen material, the wavelength of the radiation, and angle of incidence. On average, laminated glass windscreens attenuate more IR than plastic. Additional research is recommended to confirm that the measured transmittance values for this sample of windscreens are typical of all aircraft windscreens currently in service and to evaluate the potential threat posed by new applications, such as IR lasers, in navigable airspace.

Author

Aerospace Medicine; General Aviation Aircraft; Glass; Infrared Radiation; Windshields; Vision

20080031645 Civil Aerospace Medical Inst., Oklahoma City, OK, USA

Laser Illumination of Aircraft by Geographic Location for a 3-Year Period (2004-2006)

Nakagawara, Van B.; Montgomery, Ron W.; Wood, Kathryn J.; June 2008; 17 pp.; In English; Original contains black and white illustrations

Report No.(s): DOT/FAA/AM-08/14; No Copyright; Avail.: CASI: [A03](#), Hardcopy

INTRODUCTION: Incidents involving laser illumination of aircraft in the National Airspace System have raised concerns within the aviation community for more than a decade. The principal concern is the visual effect laser illumination may have on flight crew performance during terminal operations, such as landing and departure maneuvers, when operational activities are extremely critical. This 3-year study examines the frequency and rate of aviation-related laser incidents by year and location. **METHODS:** Incident reports of civilian aircraft illuminated by high-intensity lights have been collected from various sources and entered into a database maintained by the Vision Research Team at the Civil Aerospace Medical Institute. Reported incidents of laser exposure of civilian aircraft in the USA for a 3-year period (January 1, 2004 to December 31, 2006) were collated and analyzed. **RESULTS:** A total of 832 incidents during the study period took place within the USA in the nine FAA-designated regions. For the period, total laser incident rates per 100,000 flight operations ranged from zero in the Alaskan region to 0.86 in the Western Pacific Region. Of the 202 airports where laser incidents occurred, there were 20 (9.9%) that reported 10 or more laser incidents during the study period. The majority of airports (52.6%) with 10 or more laser incidents reported a higher number of incidents in 2005 than in 2006. **CONCLUSION:** Laser illumination incidents that could compromise aviation safety and threaten flight crew vision performance occur with some regularity within the contiguous USA. While the study data indicate the Western Pacific Region had a significantly higher prevalence rate than the other FAA regions, analysis was complicated by incident clusters that occurred randomly at various airports. Actions taken by aviators, as well as local air traffic and law enforcement authorities that can minimize this threat to aviation safety, are discussed.

Author

Aerospace Medicine; Aircraft Pilots; Aircraft Safety; Flight Safety; Human Performance; Lasers; Eye (Anatomy)

BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

20080031643 Civil Aerospace Medical Inst., Oklahoma City, OK, USA

Screening Air Traffic Control Specialists for Psychopathology using the Minnesota Multiphasic Personality Inventory-2

King, Raymond E.; Schroeder, David J.; Manning, Carol A.; Retzlaff, Paul D.; Williams, Clara A.; June 2008; 19 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): AM-HRR-523

Report No.(s): DOT/FAA/AM-08/13; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The purpose of this paper is to model and document the use of the Minnesota Multiphasic Personality Inventory-2 (MMPI-2) as a psychological screening tool for conditionally selected FAA Air Traffic Control Specialists (ATCSs). A sample of 1,014 ATCSs in training voluntarily completed the MMPI-2 as part of a research program. Those data are used to estimate the number of future candidates that will be referred for follow-up psychological evaluations, given varying MMPI-2 scale cut-scores. At the individual scale level, Scale 1 (Hypochondriasis) had the lowest percentage of subjects identified across all cut scores, while Scale 9 (Hypomania) had the highest. Looking at participants with one or more scales above the cut-scores, about 15% had one or more scales at or above 65T, but only about 2% had one or more scales at or above 80T. A final algorithm of 70T or above on scales 1,2,3, 4, 6 and 8, as well as 75T on scale 9, was selected. The identification rates are discussed in terms of impact on follow-up psychological evaluation referral. Initial cut scores are recommended.

Author

Air Traffic Controllers (Personnel); Personality; Psychological Tests; Personality Tests; Personnel Selection

MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human factors engineering, bionics, man-machine systems, life support, space suits and protective clothing. For related information see also *16 Space Transportation and Safety* and *52 Aerospace Medicine*.

20080031008 Idaho National Engineering Lab., Idaho Falls, ID, USA

Meeting Human Reliability Requirements through Human Factors Design, Testing, and Modeling

Boring, R. L.; Jun. 01, 2007; 8 pp.; In English

Contract(s)/Grant(s): DE-AC07-99ID-13727

Report No.(s): DE2007-912476; INL/CON-07-12772; No Copyright; Avail.: Department of Energy Information Bridge

In the design of novel systems, it is important for the human factors engineer to work in parallel with the human reliability analyst to arrive at the safest achievable design that meets design team safety goals and certification or regulatory requirements. This paper introduces the System Development Safety Triptych, a checklist of considerations for the interplay of human factors and human reliability through design, testing, and modeling in product development. This paper also explores three phases of safe system development, corresponding to the conception, design, and implementation of a system.

NTIS

Human Factors Engineering; Reliability; Reliability Analysis; Systems Engineering

20080031131 NASA Johnson Space Center, Houston, TX, USA

A History of Spacecraft Environmental Control and Life Support Systems

Daes, Katherine R.; [2006]; 13 pp.; In English; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031131>

A spacecraft's Environmental Control and Life Support (ECLS) system enables and maintains a habitable and sustaining environment for its crew. A typical ECLS system provides for atmosphere consumables and revitalization, environmental monitoring, pressure, temperature and humidity control, heat rejection (including equipment cooling), food and water supply and management, waste management, and fire detection and suppression. The following is a summary of ECLS systems used in USA (US) and Russian human spacecraft.

Derived from text

Environmental Control; Life Support Systems; Temperature Control; Histories; Spacecraft Temperature

20080031649 Idaho National Engineering Lab., Idaho Falls, ID, USA

Culture Representation in Human Reliability Analysis

Gertman, D.; Novack, S.; Marble, J.; Dec. 01, 2006; 19 pp.; In English

Contract(s)/Grant(s): DE-AC07-99ID-13727

Report No.(s): DE2007-911966; INL/CON-06-11512; No Copyright; Avail.: Department of Energy Information Bridge

Understanding human-system response is critical to being able to plan and predict mission success in the modern battlespace. Commonly, human reliability analysis has been used to predict failures of human performance in complex, critical systems. However, most human reliability methods fail to take culture into account. This paper takes an easily understood state of the art human reliability analysis method and extends that method to account for the influence of culture, including acceptance of new technology, upon performance. The cultural parameters used to modify the human reliability analysis were determined from two standard industry approaches to cultural assessment: Hofstede's (1991) cultural factors and Davis (1989) technology acceptance model (TAM). The result is called the Culture Adjustment Method (CAM). An example is presented that (1) reviews human reliability assessment with and without cultural attributes for a Supervisory Control and Data Acquisition (SCADA) system attack, (2) demonstrates how country specific information can be used to increase the realism of HRA modeling, and (3) discusses the differences in human error probability estimates arising from cultural differences.

NTIS

Failure Analysis; Predictions; Reliability Analysis

20080032236 Naval Research Lab., Washington, DC USA

The Use of Spatial Cognition in Graph Interpretation

Trickett, Susan B; Trafton, J G; Aug 2007; 7 pp.; In English

Contract(s)/Grant(s): N0001403WX30001

Report No.(s): AD-A480109; XB-NRL/ITD/5500; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We conducted an experiment to investigate whether spatial processing is used in graph comprehension tasks. Using an interference paradigm, we demonstrate that a graph task interfered more with performance on a spatial memory task than on a visual 'non-spatial' memory task. Reaction times showed there was no speed-accuracy tradeoff. We conclude that it was the spatial nature of the graph task that caused the additional interference in the spatial memory task. We propose that current theories of graph comprehension should be expanded to include a spatial processing component.

DTIC

Cognition; Graphs (Charts)

20080032331 Buchanan Ingersoll, PC, Alexandria, VA, USA; North Carolina Univ., Chapel Hill, NC, USA

Computed Tomography System for Imaging of Human and Small Animal

Zhou, O. Z., Inventor; Lu, J., Inventor; Lee, Y., Inventor; Lin, W., Inventor; Cheng, Y., Inventor; 20 Aug 04; 18 pp.; In English

Contract(s)/Grant(s): N00014-98-1-0597

Patent Info.: Filed Filed 20 Aug 04; US-Patent-Appl-SN-10-923-385

Report No.(s): PB2007-113330; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Computed tomography device comprising an x-ray source and an x-ray detecting unit. The x-ray source comprises a cathode with a plurality of individually programmable electron emitting units that each emit an electron upon an application of an electric field, an anode target that emits an x-ray upon impact by the emitted electron, and a collimator. Each electron emitting unit includes an electron field emitting material. The electron field emitting material includes a nanostructured material or a plurality of nanotubes or a plurality of nanowires. Computed tomography methods are also provided.

NTIS

Animals; Detection; Display Devices; Imaging Techniques; Medical Equipment; Tomography; X Rays

MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see *categories 60 through 67*.

20080031090 Government Accountability Office, Washington, DC, USA

Information Security: Sustained Management Commitment and Oversight are Vital to Resolving Long-Standing Weaknesses at the Department of Veterans Affairs

Sep. 2007; 52 pp.; In English

Report No.(s): PB2007-114540; GAO-07-1019; No Copyright; Avail.: CASI: [A04](#), Hardcopy

In May 2006, the Department of Veterans Affairs (VA) announced that computer equipment containing personal information on approximately 26.5 million veterans and active duty military personnel had been stolen. Given the importance of information technology (IT) to VA's mission, effective information security controls are critical to maintaining public and veteran confidence in its ability to protect sensitive information. GAO was asked to evaluate (1) whether VA has effectively addressed GAO and VA Office of Inspector General (IG) information security recommendations and (2) actions VA has taken since May 2006 to strengthen its information security practices and secure personal information. To do this, GAO examined security policies and action plans, interviewed pertinent department officials, and conducted testing of encryption software at select VA facilities.

NTIS

Computer Information Security; Information Management; Information Systems; Military Personnel; Resolution

20080031110 NASA Langley Research Center, Hampton, VA, USA

Modifications to Axially Symmetric Simulations Using New DSMC (2007) Algorithms

Liechty, Derek S.; July 21, 2008; 6 pp.; In English; 26th Rarefied Gas Dynamics Conference, 21-25 Jul. 2008, Kyoto, Japan; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 52628201070405; No Copyright; Avail.: CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031110>

Several modifications aimed at improving physical accuracy are proposed for solving axially symmetric problems building on the DSMC (2007) algorithms introduced by Bird. Originally developed to solve nonequilibrium, rarefied flows, the DSMC method is now regularly used to solve complex problems over a wide range of Knudsen numbers. These new algorithms include features such as nearest neighbor collisions excluding the previous collision partners, separate collision and sampling cells, automatically adaptive variable time steps, a modified no-time counter procedure for collisions, and discontinuous and event-driven physical processes. Axially symmetric solutions require radial weighting for the simulated molecules since the molecules near the axis represent fewer real molecules than those farther away from the axis due to the difference in volume of the cells. In the present methodology, these radial weighting factors are continuous, linear functions that vary with the radial position of each simulated molecule. It is shown that how one defines the number of tentative collisions greatly influences the mean collision time near the axis. The method by which the grid is treated for axially symmetric problems also plays an important role near the axis, especially for scalar pressure. A new method to treat how the molecules are traced through the grid is proposed to alleviate the decrease in scalar pressure at the axis near the surface. Also, a modification to the duplication buffer is proposed to vary the duplicated molecular velocities while retaining the molecular kinetic energy and axially symmetric nature of the problem.

Author

Axisymmetric Flow; Algorithms; Monte Carlo Method; Nonequilibrium Flow; Kinetic Energy; Rarefied Gas Dynamics; Simulation

20080031734 Idaho National Engineering Lab., Idaho Falls, ID, USA

Nightmares with Mobile Devices are Just Around the Corner. IEEE Portable 2007

Derr, K. W.; Dec. 2006; 6 pp.; In English

Report No.(s): DE2007-911859; INL/CON-06-11576; No Copyright; Avail.: Department of Energy Information Bridge

Mobile Devices (MDs) such as Personal Digital Assistants (PDAs), smart phones, handheld personal computers, and Tablet PCs, are proliferating in the marketplace. Cheap and ubiquitous mobile computing devices represent computing's fifth wave (1), bringing about new opportunities in the marketplace. As MDs become more powerful and commonplace with ubiquitous connectivity, the line that currently divides these handheld devices from typical network computers will become very unclear. Mobile devices have become integrated into the business processes of both government and commercial

institutions. MDs are small, portable, and able to store large amounts of information. The breadth of communication options (infrared, wireless, docking station) for MDs introduces many security risks. Some of the problems associated with MDs are: easy to lose, misplace, or have stolen, potential loss/comprise of company data (user ids, passwords, contacts, sensitive documentation, credit card numbers), increases the opportunity for a backdoor into an enterprise's network, lack of authentication and limited logging capability. The use of these devices poses a risk to the security of an organization.

NTIS

Corners; Personal Computers

20080032211 Holland and Knight, Miami, FL, USA

System and Method for Efficient Visualization and Comparison of Ladar Point Data to Detailed CAD Models of Targets

Faulkner, T., Inventor; Blask, S. G., Inventor; 15 Jul 04; 14 pp.; In English

Contract(s)/Grant(s): DARPA-DAA17-01-D-0004

Patent Info.: Filed Filed 15 Jul 04; US-Patent-Appl-SN-10-892 063

Report No.(s): PB2008-100418; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A method (300) for comparison of point data to detailed CAD models of known targets. The method comprises the acts of receiving a CAD model space (302); storing the received CAD model space in a three-dimensional voxel array (304); computing, for each voxel in the array, a distance to a closest surface facet (306); and storing information in a hybrid PolyVox file (310) comprising both voxel and polygonal representations of the point data stored therein. The method is practiced with an information processing system (200) such as a microprocessor powered computer. The method can also be implemented as a software product executed by a programmable general purpose computer apparatus, such as the one discussed above; or as a set of machine executable instructions embedded in a semiconductor memory; or as a special-purpose processing device or application-specific integrated circuit (ASIC).

NTIS

Computer Aided Design; Image Processing; Laser Range Finders; Optical Radar; Patent Applications; Targets

20080032216 Columbia Univ., New York, NY, USA

Apparatus Method and Medium for Identifying Files Using N-Gram Distribution of Data

Stolfo, S. J., Inventor; Herzog, B., Inventor; 12 Nov 04; 42 pp.; In English

Contract(s)/Grant(s): DARPA-F30602-02-2-0209

Patent Info.: Filed Filed 12 Nov 04; US-Patent-Appl-SN-10-986 432

Report No.(s): PB2008-100422; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A method, apparatus, and medium are provided for identifying files. Files are received from various sources, and a statistical distribution is generated for data contained in each file. The statistical distribution is compared to model distributions that are representative of known files or file types. Based on the comparison, file types can be verified or detected. Known file types can also be used to generate representative statistical distributions for the type. The invention can also detect malicious programs such as viruses or worms, and generate signatures that can be used to filter such programs.

NTIS

Computer Storage Devices; Data Transmission; Identifying; Patent Applications

20080032218 Ryan, Mason and Lewis, LLP, Locust Valley, NY, USA; International Business Machines Corp., New York, NY, USA

System and Method for Distributed Privacy Preserving Data Mining

Aggarwal, C. C., Inventor; Shi-Lung Yu, P., Inventor; 16 Jul 04; 11 pp.; In English

Contract(s)/Grant(s): H98230-04-3-0001

Patent Info.: Filed Filed 16 Jul 04; US-Patent-Appl-SN-10-892-691

Report No.(s): PB2008-100420; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Distributed privacy preserving data mining techniques are provided. A first entity of a plurality of entities in a distributed computing environment exchanges summary information with a second entity of the plurality of entities via a privacy-preserving data sharing protocol such that the privacy of the summary information is preserved, the summary information associated with an entity relating to data stored at the entity. The first entity may then mine data based on at least the summary information obtained from the second entity via the privacy-preserving data sharing protocol. The first entity may obtain, from

the second entity via the privacy-preserving data sharing protocol, information relating to the number of transactions in which a particular itemset occurs and/or information relating to the number of transactions in which a particular rule is satisfied.
NTIS

Computers; Data Mining; Patent Applications; Protocol (Computers)

20080032224 Quine Intellectual Property Law Group, P. C., Alameda, CA, USA

Methods and Systems for Data Analysis

Parks, D. R., Inventor; Moore, W. A., Inventor; 20 Jun 05; 57 pp.; In English

Contract(s)/Grant(s): NIH-EB00231

Patent Info.: Filed Filed 20 Jun 05; US-Patent-Appl-SN-11-157 468

Report No.(s): PB2008-100417; No Copyright; Avail.: CASI: [A04](#), Hardcopy

The present invention provides methods of analyzing and/or displaying data. In one aspect, the invention provides methods for visualizing or displaying high dynamic range data obtained from flow cytometry analyses. Related systems and computer programs products are also provided.

NTIS

Computer Programs; Cytology; Patent Applications; Scientific Visualization; Systems Analysis

20080032377 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Joint Bayesian Component Separation and CMB Power Spectrum Estimation

Eriksen, H. K.; Jewell, J. B.; Dickinson, C.; Banday, A. J.; Gorski, K. M.; Lawrence, C. R.; The Astrophysical Journal; March 20, 2008; Volume 676, pp. 10-32; In English; Original contains color and black and white illustrations; Copyright; Avail.:

Other Sources

ONLINE: <http://hdl.handle.net/2014/40875>

We describe and implement an exact, flexible, and computationally efficient algorithm for joint component separation and CMB power spectrum estimation, building on a Gibbs sampling framework. Two essential new features are (1) conditional sampling of foreground spectral parameters and (2) joint sampling of all amplitude-type degrees of freedom (e.g., CMB, foreground pixel amplitudes, and global template amplitudes) given spectral parameters. Given a parametric model of the foreground signals, we estimate efficiently and accurately the exact joint foreground- CMB posterior distribution and, therefore, all marginal distributions such as the CMB power spectrum or foreground spectral index posteriors. The main limitation of the current implementation is the requirement of identical beam responses at all frequencies, which restricts the analysis to the lowest resolution of a given experiment. We outline a future generalization to multiresolution observations. To verify the method, we analyze simple models and compare the results to analytical predictions. We then analyze a realistic simulation with properties similar to the 3 yr WMAP data, downgraded to a common resolution of 3 deg FWHM. The results from the actual 3 yr WMAP temperature analysis are presented in a companion Letter.

Author

Bayes Theorem; Microwave Anisotropy Probe; Prediction Analysis Techniques; Spectrum Analysis; Algorithms; Degrees of Freedom

20080032483 Pacific Northwest National Lab., Richland, WA, USA

User's Guide for Getter Rate Test System

Elmore, M. R.; Jun. 2007; 31 pp.; In English

Contract(s)/Grant(s): DE-AC05-76RLO01830

Report No.(s): DE2007-912729; PNNL-16675; No Copyright; Avail.: National Technical Information Service (NTIS)

This Users Guide describes the operation and maintenance of the Getter Rate Test System, including the mechanical equipment, instrumentation, and datalogger/computer components. The Getter Rate Test System includes equipment and instrumentation to conduct two getter rate tests simultaneously. The mechanical equipment comprises roughing and high-vacuum pumps, heated test chambers, standard hydrogen leaks, and associated piping and valves. Instrumentation includes thermocouples, pressure (vacuum) transducers, panel displays, analog-to-digital signal converter, and associated wiring. The datalogger/computer is a stand-alone computer with installed software to allow the user to record data input from the pressure transducers to data files and to calculate the getter rate from the data in an Excel spreadsheet.

NTIS

Getters; Maintenance; User Manuals (Computer Programs)

20080032591 Townsend and Townsend and Crew, LLP, San Francisco, CA, USA

Methods and Systems for Synthesis of Accurate Visible Speech Via Transformation of Motion Capture Data

Ma, J., Inventor; Cole, R., Inventor; Ward, W., Inventor; Pellom, B., Inventor; 1 Jul 05; 21 pp.; In English

Contract(s)/Grant(s): EIA-9996075; IIS-0086107

Patent Info.: Filed Filed 1 Jul 05; US-Patent-Appl-SN-11-173 921

Report No.(s): PB2008-100100; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The disclosure describes methods for synthesis of accurate visible speech using transformations of motion-capture data. Methods are provided for synthesis of visible speech in a three-dimensional face. A sequence of visemes, each associated with one or more phonemes, are mapped onto a three-dimensional target face, and concatenated. The sequence may include divisemes corresponding to pairwise sequences of phonemes, wherein the diviseme is comprised of motion trajectories of a set facial points. The sequence may also include multi-units corresponding to words and sequences of words. Various techniques involving mapping and concatenation are also addressed.

NTIS

Patent Applications; Sequencing; Words (Language); Speech

20080032596 Federal Reserve System, Washington, DC, USA

Rational Seasonality

Nesmith, T. D.; Nov. 28, 2006; 36 pp.; In English

Report No.(s): PB2008-100554; FRS-2007-04; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Seasonal adjustment usually relies on statistical models of seasonality that treat seasonal fluctuations as noise corrupting the true data. But seasonality in economic series often stems from economic behavior such as Christmas-time spending. Such economic seasonality invalidates the separability assumptions that justify the construction of aggregate economic indexes. To solve this problem, Diewert (1980, 1983, 1998, 1999) incorporates seasonal behavior into aggregation theory. Using duality theory, I extend these results to a larger class of decision problems. I also relax Diewerts assumption of homotheticity. I provide support for Diewerts preferred seasonally-adjusted economic index using weak separability assumptions that are shown to be sufficient.

NTIS

Cycles; Economics; Seasons

20080032618 Idaho National Engineering Lab., Idaho Falls, ID, USA; Korean Atomic Energy Research Inst., Daeduk, Korea, Republic of

HyPEP FY06 Report: Models and Methods

Oh, C. H.; Davis, C. B.; Han, J.; Barner, R.; Sherman, S. R.; Sep. 2006; 98 pp.; In English

Report No.(s): DE2007-911677; INL/EXT-06-11725; No Copyright; Avail.: National Technical Information Service (NTIS)

The Department of Energy envisions the next generation very high-temperature gas-cooled reactor (VHTR) as a single-purpose or dual-purpose facility that produces hydrogen and electricity. The Ministry of Science and Technology (MOST) of the Republic of Korea also selected VHTR for the Nuclear Hydrogen Development and Demonstration (NHDD) Project. This research project aims at developing a user-friendly program for evaluating and optimizing cycle efficiencies of producing hydrogen and electricity in a Very-High-Temperature Reactor (VHTR). Systems for producing electricity and hydrogen are complex and the calculations associated with optimizing these systems are intensive, involving a large number of operating parameter variations and many different system configurations. This research project will produce the HyPEP computer model, which is specifically designed to be an easy-to-use and fast running tool for evaluating nuclear hydrogen and electricity production facilities. The model accommodates flexible system layouts and its cost models will enable HyPEP to be well-suited for system optimization. Specific activities of this research are designed to develop the HyPEP model into a working tool, including (a) identifying major systems and components for modeling, (b) establishing system operating parameters and calculation scope, (c) establishing the overall calculation scheme, (d) developing component models, (e) developing cost and optimization models, and (f) verifying and validating the program. Once the HyPEP model is fully developed and validated, it will be used to execute calculations on candidate system configurations. FY-06 report includes a description of reference designs, methods used in this study, models and computational strategies developed for the first year effort. Results from computer codes such as HYSYS and GASS/PASS-H used by Idaho National Laboratory and Argonne National Laboratory, respectively will be benchmarked with HyPEP results in the following years.

NTIS

Computer Programs; High Temperature Gas Cooled Reactors

COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware and data processing. For components see 33 *Electronics and Electrical Engineering*. For computer vision see 63 *Cybernetics, Artificial Intelligence and Robotics*.

20080031422 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Onboard Software Improvement of INPE's Satellites: Proposal for a Step Ahead

BotelhodeSouza, Primavera; [2007]; 144 pp.; In Portuguese; CD-ROM contains full text document in PDF format
Report No.(s): INPE-14616-TDI/1195; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A07](#), Hardcopy

The development of onboard satellite software designed to accomplish critical functions in INPE's satellites has not coincided with the collaboration of software development specialists to aid in continuous improvement of product quality. In practice, the occurrence of failures can result in success or malfunctioning, with significant economical losses or, yet, in a very long and expensive project. Despite the existence of several standards in the area of onboard software development, including some that are considered quality standards by other space agencies in the world, in practice it is impossible to follow or implement them, since the present level of the organization and the development team (related to software quality) is still below the required maturity level. Based upon this scenario a step in the software quality evolution process is being proposed. This step is easy to absorb and to be implemented by the development team; it may give a new boost in the improvement of onboard software quality, aiming to obtain a more dependable, better quality software product. To achieve this goal, we propose a set of additional activities, to be added to the present development process, including modifications in the adopted methodology for quality control strategies. When developing this proposal, we considered the team profile and maturity, the software complexity to be studied and INPE's organizational conditions.

Author (revised)

Software Engineering; Computer Programs; Quality Control; Satellites; Onboard Data Processing

20080032646 Istituto di Radioastronomia, Bologna, Italy

Italy INAF Data Center Report

Negusini, M.; Sarti, P.; Montaguti, S.; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 166-167; In English; See also [20080032620](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

This report summarizes the activities of the Italian INAF VLBI Data Center. Our Data Center is located in Bologna, Italy, and belongs to the Institute of Radioastronomy, which is part of the National Institute of Astrophysics. We also report about some changes in the hardware facilities devoted to IVS activities. The IRA started to store geodetic VLBI databases in 1989, but the databases archived in Bologna mostly contain data including European antennas from 1987 onward. In particular most of the databases available here have VLBI data with at least three European stations. However we also store all the databases with the Ny-Alesund antenna observations. In 2002 we decided to store the complete set of databases available on the IVS data centers, although we limited the time span to the observations performed from 1999 onwards. All the databases have been processed and saved with the best selection of parameters for the final arc solutions. In order to perform global solutions, we have computed and stored the superfiles for all the databases. In some cases we have introduced GPS-derived wet delays into the European databases (for the time being, we have done this for 1998 and 1999 EUROPE experiments), as if they were produced by a WVR. These databases are available and stored with a different code from the original databases. In order to produce these databases, we have modified DBCAL and this new version is available to external users.

Author

Data Bases; Geodesy; Information Systems; Very Long Base Interferometry

20080032647 Bundesamt fuer Kartographie und Geodaesie, Leipzig, Germany

BKG Data Center

Thorandt, Volkmar; Wojdziak, Reiner; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 161-162; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI:

[A01](#), Hardcopy

This report summarizes the activities and background information of the IVS Data Center for the year 2007. Included are information about functions, structure, technical equipment and staff members of the BKG Data Center. The BKG (Federal Agency for Cartography and Geodesy) Data Center is one of the three IVS Primary Data Centers. It archives all VLBI related data of IVS components and provides public access for the community.

Author

Data Processing; Data Storage; Geodesy

20080032678 Naval Observatory, Washington, DC, USA

Washington Correlator

Kingham, Kerry A.; Hall, David M.; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 155-157; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

This report summarizes the activities of the Washington Correlator for the year 2007. The Washington Correlator provides up to 80 hours of processing per week, primarily supporting Earth Orientation and astrometric observations. An additional 40 hours per week of unattended processing is also provided routinely. In 2007 the major programs supported include the IVS-R4, IVS-INT, IVS-R1, APSG, and CRF (CRF,CRMS,CRDS,CRFS) observing sessions. The Washington Correlator (WACO) is located at and staffed by the U. S. Naval Observatory (USNO) in Washington, DC, USA. The correlator is sponsored and funded by the National Earth Orientation Service (NEOS) which is a joint effort of the USNO and NASA. Dedicated to processing geodetic and astrometric VLBI observations, the facility spent 100 percent of its time on these experiments. All of the weekly IVS-R4 sessions, all of the daily Intensives, and several IVS-R1 sessions were processed at WACO. The remaining time was spent on terrestrial reference frame and astrometry sessions. The facility houses a Mark IV Correlator.

Author

Astrometry; Correlators; Earth Orientation; Geodetic Surveys

61

COMPUTER PROGRAMMING AND SOFTWARE

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

20080031116 NASA Langley Research Center, Hampton, VA, USA

Experimental Evaluation of a Planning Language Suitable for Formal Verification

Butler, Rick W.; Munoz, Cesar A.; Siminiceanu, Radu I.; June 21, 2008; 17 pp.; In English; MOCHART-2008: The Fifth International Workshop on Model Checking and Artificial Intelligence, 21-22 Jul. 2008, Patras, Greece; Original contains color and black and white illustrations

Contract(s)/Grant(s): NCC-1-02043; WBS 015792.04.01.04; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031116>

The marriage of model checking and planning faces two seemingly diverging alternatives: the need for a planning language expressive enough to capture the complexity of real-life applications, as opposed to a language simple, yet robust enough to be amenable to exhaustive verification and validation techniques. In an attempt to reconcile these differences, we have designed an abstract plan description language, ANMLite, inspired from the Action Notation Modeling Language (ANML) [17]. We present the basic concepts of the ANMLite language as well as an automatic translator from ANMLite to the model checker SAL (Symbolic Analysis Laboratory) [7]. We discuss various aspects of specifying a plan in terms of constraints and explore the implications of choosing a robust logic behind the specification of constraints, rather than simply propose a new planning language. Additionally, we provide an initial assessment of the efficiency of model checking to search for solutions of planning problems. To this end, we design a basic test benchmark and study the scalability of the generated SAL models in terms of plan complexity.

Author

Mathematical Models; Program Verification (Computers); Language Programming; Autonomy

20080031349 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Framework Based Guidance Navigation and Control Flight Software Development

McComas, David; November 05, 2007; 15 pp.; In English; Flight Software Workshop 2007 (FSW-07), 5-6 Nov. 2007, Laurel, MD, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031349>

This viewgraph presentation describes NASA's guidance navigation and control flight software development background. The contents include: 1) NASA/Goddard Guidance Navigation and Control (GN&C) Flight Software (FSW) Development Background; 2) GN&C FSW Development Improvement Concepts; and 3) GN&C FSW Application Framework.

CASI

Software Engineering; Navigation; Space Flight; Guidance (Motion); Architecture (Computers); Applications Programs (Computers)

20080031421 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Development and Applications of a Computational Environment for the Analysis of Patterns-Gradients

AffonsodaCostaJunior, Roberto; [2007]; 207 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14618-TDI/1197; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A10](#), Hardcopy

The goal of this work is to develop and to apply a computational environment, the GPASim - Gradient Pattern Analysis Simulator, developed for the IDL environment. The function of this software is to analyze space-temporal structures and pattern formation through the calculation of the gradients moments obtained from Gradient Pattern Analysis (GPA). With this tool we present properties of two moments of GPA operator, and its applicability on pattern sequences related to systems with structural complexity. Also the program offers the possibility of nonlinear variability investigation related to time series and elementary gradient pattern series.

Author

Gradients; Pattern Recognition; Computer Programs

20080031457 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

A Model of Process of Requirements Engineering Applicable to the Environments of Centered Engineering of Software in Process

Genvigir, Elias Canhadas; [2007]; 258 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14630-TDI/1201; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A12](#), Hardcopy

The need for knowledge and improvement in software processes has stimulated research within the software engineering area. The process-related problems have stemmed new elements research such as new methods, new tools and new procedures, besides the improvement of those already tested. Among several products derived from such research, this work focuses on requisite engineering, which has contributed to the knowledge of software requisites as well as the way such a process establishes the requisites guarantee in order to be implemented in the software product. Research environments focused on the processes and techniques of product modeling are also discussed. Along with this research a requirements engineering organization is proposed, which is demonstrated in a modeled process that allows systematizing it to the area and uses the visual specification of a meta-model for processes as a modeling technique. An architecture model is also proposed to support the process, both for centered environments in process and for those where such a resource is not available. Finally, a case study about the requirements engineering process development is presented and an analysis of the obtained results is provided.

Author (revised)

Requirements; Software Engineering

20080031606 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

A Roadmap for Using Agile Development in a Traditional Environment

Streiffert, Barbara; Starbird, Thomas; Grenander, Sven; June 19, 2006; 8 pp.; In English; 9th International Conference on Space Operations (SpaceOps), 19-24 Jun. 2006, Rome, Italy; Original contains color illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40784>

One of the newer classes of software engineering techniques is called 'Agile Development'. In Agile Development software engineers take small implementation steps and, in some cases, they program in pairs. In addition, they develop automatic tests prior to implementing their small functional piece. Agile Development focuses on rapid turnaround, incremental planning, customer involvement and continuous integration. Agile Development is not the traditional waterfall method or even a rapid prototyping method (although this methodology is closer to Agile Development). At the Jet Propulsion Laboratory (JPL) a few groups have begun Agile Development software implementations. The difficulty with this approach becomes apparent when Agile Development is used in an organization that has specific criteria and requirements handed down for how software development is to be performed. The work at the JPL is performed for the National Aeronautics and Space Agency (NASA). Both organizations have specific requirements, rules and processes for developing software. This paper will discuss some of the initial uses of the Agile Development methodology, the spread of this method and the current status of the successful incorporation into the current JPL development policies and processes.

Author

Software Engineering; Rapid Prototyping; Computer Programming; Computer Programs; Environmental Engineering

20080032239 Naval Postgraduate School, Monterey, CA USA

Monitoring the Performance of IWS Processes in an Open Architecture Environment

Simmons, Alexander L; Mar 2008; 115 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480025; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This thesis focuses on a trial implementation of Knowledge Value Added (KVA) software supporting the management of an Open Architecture (OA) process performance monitoring analysis. During this research Maritime Domain Awareness (MDA) business processes establish the baseline Return On Investment (ROI) analysis. Trial implementation of KVA software tools focus on the assessing and monitoring performance of OA. Installation of KVA software tools are used to support ongoing assessment and performance monitoring for Integrated Weapons System (IWS) OA management. This work illustrates the capability to perform ongoing ROI analysis on OA processes for development and acquisition processes enabled through the use of the OA approach. Included in management reports derived from the GaussSoft KVA software, a crucial output of this thesis is the ability of the organization to extend the use of the method and toolset over time to meet ongoing needs of Program Executive Office (PEO) - IWS from MDA into other programs/systems. All data gathered was conducted in the UNCLASSIFIED environment for use in this research.

DTIC

Computer Programs; Architecture (Computers); Weapon Systems; Systems Integration; Software Development Tools; Software Engineering; Knowledge Based Systems

20080032247 Naval Postgraduate School, Monterey, CA USA

Developing a Conceptual Architecture for a Generalized Agent-based Modeling Environment (GAME)

Nguyen, Christian T; Mar 2008; 77 pp.; In English

Report No.(s): AD-A479981; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Agent-based technology is a relatively new, but rapidly proliferating decision technology. The relative immaturity of ABM software often requires significant programmer expertise in model representation and implementation. This limits potential users and their ability to utilize the software. We develop a high level conceptual architecture for an agent-based modeling environment which overcomes this limitation. This thesis defines a taxonomy of agents based on commonly accepted agent characteristics, reviews six of the most popular software platforms for agent-based model development, and maps their relationship to the taxonomy. Past modeling advances in the operations research and management science (OR/MS) domains indicate that a more generalized environment is possible. A conceptual architecture for a generalized agent-based modeling environment (GAME) based upon design principles from OR/MS systems was created that would overcome some, if not all, of these obstacles. The GAME architecture incorporates higher-level model representations separate from solver code, a library of transformation procedures, reusable model libraries and a robust language or equivalent interface for specifying experimental design procedures. Rapid technology development would allow for agent-based modeling software that subsequently benefits a much wider range of stakeholders than is currently the case. Finally, embedding GAME in an even higher-level integrated decision technology environment (IDTE) would facilitate the integration of computational and analytical modeling.

DTIC

Computer Programs; Architecture (Computers); Decision Support Systems; Mathematical Models

20080032654 Norwegian Defence Research Establishment, Norway

FFI Technology Development Center - Software Development

Andersen, Per Helge; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 249; In English; See also [20080032620](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

FFI's contribution to the IVS as a Technology Development Center focuses primarily on the development and validation of the GEOSAT software for a combined analysis at the observation level of data from VLBI, GPS, and SLR. This report shortly summarizes the latest improvements of the GEOSAT software. FFI is currently Analysis Center for IVS and ILRS, Technology Development Center for IVS, and Combination Research Center for IERS.

Author

Software Engineering; Program Verification (Computers); GEOSAT Satellites; Computer Programming; Very Long Base Interferometry; Computer Programs

20080032666 Geographical Survey Inst., Tsukuba, Japan

Tsukuba VLBI Correlator

Shigematsu, Hiromi; Iwata, Etsuro; Machida, Morito; Wada, Kozin; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 151-154; In English; See also [20080032620](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

This is a report of the activities at the Tsukuba VLBI Correlator in 2007.

Author

Correlators; Very Long Base Interferometry; Computer Systems Programs; Distributed Processing

62

COMPUTER SYSTEMS

Includes computer networks and distributed processing systems. For information systems see *82 Documentation and Information Science*. For computer systems applied to specific applications, see the associated category.

20080031615 NASA Johnson Space Center, Houston, TX, USA

Distributed Simulation for Space Exploration

Crues, Edwin Z.; April 05, 2006; 18 pp.; In English; SISO Spring 2006 SIW, 2-7 Apr. 2006, Huntsville, AL, USA; Original contains color illustrations; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031615>

This viewgraph presentation reviews the use of simulation and modeling in preparation for the planned exploration initiatives. The Exploration Systems Mission Directorate (EMSD) Integrated Modeling and Simulation (IM&S) team strategy encompasses a wide spectrum of simulation and modeling policies and technologies. One prominent technology is distributed simulation. The Distributed Simulation (DIS), a collaborative simulation project with international participation (US and Japan) is reviewed as an example of distributed simulation development. The Distributed Space Exploration Simulation (DSES) is another example of distributed simulation that is described

CASI

Models; Space Exploration; Distributed Processing; Computerized Simulation

20080032340 Stetna, Brunda, Garred, and Brucker, Aliso Viejo, CA, USA

Built-In-Test Diagnostic and Maintenance Support System and Process

Shabib, H. M., Inventor; Woods, R. D., Inventor; 22 Jun 04; 26 pp.; In English

Contract(s)/Grant(s): N001-40-0-C-M526

Patent Info.: Filed 22 Jun 04; US-Patent-Appl-SN-10-874-620

Report No.(s): PB2007-113311; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A diagnostic and maintenance support system and process to that performs tests on systems, collects Built-In-Test (BIT) log data, analyzes fault data, and recommends Shop Replaceable Units (SRUs). The system hardware may include a computer, an interface test adapter, and a cable set. A process performs a Discrete Fault Mask (DFM) algorithm to determine whether a single faulty SRU can be identified; a Combinational Fault Mask (CFM) algorithm to identify a list of potentially problematic SRU's if a matching bit is not found after the DFM algorithm is performed; and a source code segment stored within memory of the computer for performing a Reserved Fault Mask (RFM) algorithm to identify a list of potentially problematic SRU's if matching bits are not found between the retrieved fault signature and the list of CFM serial words representing ambiguous tests. The system further includes a Diagnostic Database stored within memory of the computer which includes a DFM Table, a CFM Table and a RSM Table. Additionally, the system includes a BIT Log, a Measurement Detail, a Support Menu, and Configuration user interface displaying output data and receiving input data.

NTIS

Support Systems; Systems Health Monitoring; Fault Detection; Maintenance; Systems Engineering

20080032461 NASA Goddard Space Flight Center, Greenbelt, MD, USA

NASA High-End Computing Program Website

Cohen, Jarrett S.; [2008]; 1 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NNG06HN01D; No Copyright; Avail.: Other Sources; Abstract Only

If you are a NASA-sponsored scientist or engineer, computing time is available to you at the High-End Computing (HEC) Program's NASA Advanced Supercomputing (NAS) Facility and NASA Center for Computational Sciences (NCCS). The

Science Mission Directorate will select from requests NCCS Portals submitted to the e-Books online system for awards beginning on May 1. Current projects set to explore on April 30 must have a request in e-Books to be considered for renewal
Derived from text

On-Line Systems; Supercomputers; Websites

20080032505 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

System for Interactive Molecular Dynamic Simulation in a Parallel Environment

RochaRodrigues, Eduardo; January 2008; 93 pp.; In Portuguese; Original contains color and black and white illustrations
Report No.(s): INPE-14832-TDI/1272; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A05](#), Hardcopy

This work presents a proposed implementation of a Molecular Dynamics (MD) interactive simulator. It employs the PyMPI environment, that extends the Python language for parallel execution by means of the MPI communication library. The ADKS was chosen as a case study. It is an interactive software for MD simulations aimed at defects in solid materials, such as fractures and grain boundaries. A distributed memory parallel machine composed of 5 biprocessor nodes was employed. In a first step, the ADKS simulation engine was parallelized by means of the MPI library and the partition of the simulation domain among processors. In order to optimize the computational performance, non blocking communication was employed. As a result, speedups very close to linear were obtained in the test cases. The parallel interactive simulations were modelled as a finite automata and implemented by means of the PyMPI environment. The simulation engine was integrated to this environment in such a way that its routines were made available as user commands. A new visualization module was integrated to the interactive simulation and executed in the master node, that runs the user interface. This module is based on the original ADKS one and displays the particles in a graphical window. The parallel performance of the simulation coupled to visualization was slightly lower than that of the stand alone simulation engine. This is due to the communication that is required to update the particle coordinates in the master node. Specific test cases were executed with visualization showing the feasibility of the proposed approach.

Author

Molecular Dynamics; Simulators; Parallel Processing (Computers); Computer Systems Performance; Systems Engineering

20080032546 NASA Stennis Space Center, Stennis Space Center, MS, USA

Developments in Test Facility and Data Networking for the Altitude Test Stand at the John C. Stennis Space Center, MS - A General Overview

Hebert, Phillip W., Sr.; June 23, 2008; 9 pp.; In English; 26th AIAA Aerodynamic Measurement Technology and Ground Testing Conference, 23-26 Jun. 2008, Seattle, WA, USA; Original contains color illustrations

Report No.(s): AIAA Paper 2008-4261; SSTI-8080-0021; No Copyright; Avail.: CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080032546>

May 2007, NASA's Constellation Program selected John C Stennis Space Center (SSC) near Waveland Mississippi as the site to construct an altitude test facility for the developmental and qualification testing of the Ares1 upper stage (US) engine. Test requirements born out of the Ares1 US propulsion system design necessitate exceptional Data Acquisition System (DAS) design solutions that support facility and propellant systems conditioning, test operations control and test data analysis. This paper reviews the new A3 Altitude Test Facility's DAS design requirements for real-time deterministic digital data, DAS technology enhancements, system trades, technology validation activities, and the current status of this system's new architecture. Also to be discussed will be current network technologies to improve data transfer.

Author

Altitude Tests; General Overviews; Test Facilities; Data Acquisition; Ares 1 Upper Stage; Control Systems Design; Communication Networks

20080032649 Main Astronomical Observatory, Kiev, Ukraine

IVS Analysis Center at Main Astronomical Observatory of National Academy of Sciences of Ukraine

Bolotin, Sergei; Yatskiv, Yaroslav; Lytvyn, Svitlana; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 218-219; In English; See also [20080032620](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

This report summarizes the activities of VLBI Analysis Center at the Main Astronomical Observatory of the National Academy of Sciences of Ukraine in 2007. The VLBI Analysis Center was established in 1994 by the Main Astronomical Observatory (MAO) of the National Academy of Sciences of Ukraine (NASU) as a working group of the Department of Space

Geodynamics of the MAO. In 1998 the group started its IVS membership as an IVS Analysis Center. The AC MAO is located in the Central office of the observatory in Kiev.

Author

Astronomical Observatories; Very Long Base Interferometry; Data Reduction

20080032651 Observatoire de Paris, France

Paris Observatory (OPAR) Data Center

Barache, Christophe; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 172-174; In English; See also [20080032620](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

This report summarizes the Paris Observatory (OPAR) Data Center activities in 2007. Included is information about functions, architecture, status, future plans and staff members of OPAR Data Center. The OPAR staff will continue to work with the IVS community and in close collaboration with the two other Primary Data Centers in order to provide public access to all Very Long Baseline Interferometry (VLBI) related data. To ensure better access and also make raw data available in the OPAR Data Center, we have acquired new disks to get 3 TB for data storage. Their installation is planned for the beginning of 2008, together with the implementation of the dserver package.

Author (revised)

Astronomical Observatories; Data Management; Information Systems; Architecture (Computers); Data Storage

63

CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also *54 Man/System Technology and Life Support*.

20080031130 Politehnica Univ., Bucharest, Romania

Pattern Recognition in Multispectral Satellite Images Using Concurrent Self-Organizing Modular Neural Networks

Neagoie, Victor-Emil; Ropot, Armand-Dragos; Sep 2006; 11 pp.; In English

Report No.(s): AD-A479800; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA479800>

No abstract available

Neural Nets; Pattern Recognition; Satellite Imagery

20080031602 NASA Goddard Space Flight Center, Greenbelt, MD USA

Evolvable Synthetic Neural System

Curtis, S. A., Inventor; 8 Apr 05; 22 pp.; In English; Original contains black and white illustrations

Patent Info.: Filed Filed 8 Apr 05; US-Patent-Appl-SN-11-109400; US 2005/0240542

Report No.(s): PB2007-104095; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031602>

An evolvable synthetic neural system includes an evolvable neural interface operably coupled to at least one neural basis function. Each neural basis function includes an evolvable neural interface operably coupled to a heuristic neural system to perform high-level functions and an autonomic neural system to perform low-level functions. In some embodiments, the evolvable synthetic neural system is operably coupled to one or more evolvable synthetic neural systems in a hierarchy.

Author

Artificial Intelligence; Neural Nets; Information Processing (Biology); Heuristic Methods; Systems Engineering

20080032386 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Artificial Muscles Based on Electroactive Polymers as an Enabling Tool in Biomimetics

Bar-Cohen, Y.; Proceedings of the Institution of Mechanical Engineers Part C-Journal of Mechanical Engineering Science; October 2007; Volume 221, Issue 10, pp. 1149-1156; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40871>; <http://dx.doi.org/10.1243/09544062JMES510>

Evolution has resolved many of nature's challenges leading to working and lasting solutions that employ principles of physics, chemistry, mechanical engineering, materials science, and many other fields of science and engineering. Nature's inventions have always inspired human achievements leading to effective materials, structures, tools, mechanisms, processes,

algorithms, methods, systems, and many other benefits. Some of the technologies that have emerged include artificial intelligence, artificial vision, and artificial muscles, where the latter is the moniker for electroactive polymers (EAPs). To take advantage of these materials and make them practical actuators, efforts are made worldwide to develop capabilities that are critical to the field infrastructure. Researchers are developing analytical model and comprehensive understanding of EAP materials response mechanism as well as effective processing and characterization techniques. The field is still in its emerging state and robust materials are still not readily available; however, in recent years, significant progress has been made and commercial products have already started to appear. In the current paper, the state-of-the-art and challenges to artificial muscles as well as their potential application to biomimetic mechanisms and devices are described and discussed.

Author

Electroactive Polymers; Biomimetics; Robotics; Robot Arms; Muscles

65

STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series analysis; and stochastic processes.

20080031171 NASA Glenn Research Center, Cleveland, OH, USA

Probabilistic Analysis of Space Shuttle Body Flap Actuator Ball Bearings

Oswald, Fred B.; Jett, Timothy R.; Predmore, Roamer E.; Zaretsky, Erwin V.; January 2008; 21 pp.; In English

Contract(s)/Grant(s): WBS 049788.04.06.03.06; Copyright; Avail.: Other Sources

A probabilistic analysis, using the 2-parameter Weibull-Johnson method, was performed on experimental life test data from space shuttle actuator bearings. Experiments were performed on a test rig under simulated conditions to determine the life and failure mechanism of the grease lubricated bearings that support the input shaft of the space shuttle body flap actuators. The failure mechanism was wear that can cause loss of bearing preload. These tests established life and reliability data for both shuttle flight and ground operation. Test data were used to estimate the failure rate and reliability as a function of the number of shuttle missions flown. The Weibull analysis of the test data for the four actuators on one shuttle, each with a 2-bearing shaft assembly, established a reliability level of 96.9 percent for a life of 12 missions. A probabilistic system analysis for four shuttles, each of which has four actuators, predicts a single bearing failure in one actuator of one shuttle after 22 missions (a total of 88 missions for a 4-shuttle fleet). This prediction is comparable with actual shuttle flight history in which a single actuator bearing was found to have failed by wear at 20 missions.

Author

Weibull Density Functions; Statistical Analysis; Life (Durability); Predictions; Ball Bearings; Wear; Lubrication

20080031505 NASA Langley Research Center, Hampton, VA, USA; National Inst. of Aerospace, Hampton, VA, USA

A New Concurrent Multiscale Methodology for Coupling Molecular Dynamics and Finite Element Analyses

Yamakov, Vesselin; Saether, Erik; Glaessgen, Edward H.; July 2008; 57 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 698259.02.07.07.03.01

Report No.(s): NASA/TM-2008-215328; L-19492; No Copyright; Avail.: CASI: [A04](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031505>

The coupling of molecular dynamics (MD) simulations with finite element methods (FEM) yields computationally efficient models that link fundamental material processes at the atomistic level with continuum field responses at higher length scales. The theoretical challenge involves developing a seamless connection along an interface between two inherently different simulation frameworks. Various specialized methods have been developed to solve particular classes of problems. Many of these methods link the kinematics of individual MD atoms with FEM nodes at their common interface, necessarily requiring that the finite element mesh be refined to atomic resolution. Some of these coupling approaches also require simulations to be carried out at 0 K and restrict modeling to two-dimensional material domains due to difficulties in simulating full three-dimensional material processes. In the present work, a new approach to MD-FEM coupling is developed based on a restatement of the standard boundary value problem used to define a coupled domain. The method replaces a direct linkage of individual MD atoms and finite element (FE) nodes with a statistical averaging of atomistic displacements in local atomic volumes associated with each FE node in an interface region. The FEM and MD computational systems are effectively independent and communicate only through an iterative update of their boundary conditions. With the use of statistical

averages of the atomistic quantities to couple the two computational schemes, the developed approach is referred to as an embedded statistical coupling method (ESCM). ESCM provides an enhanced coupling methodology that is inherently applicable to three-dimensional domains, avoids discretization of the continuum model to atomic scale resolution, and permits finite temperature states to be applied.

Author

Molecular Dynamics; Finite Element Method; Statistical Analysis; Multiscale Models

20080032272 Washington Univ., Seattle, WA USA

Ancestral Graph Markov Models

Richardson, Thomas; Spirtes, Peter; Apr 15, 2002; 88 pp.; In English

Contract(s)/Grant(s): DMS-9972008; DMS-9873442

Report No.(s): AD-A480171; UW-STAT-TR-375; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper introduces a class of graphical independence models that is closed under marginalization and conditioning but that contains all DAG independence models. This class of graphs, called maximal ancestral graphs, has two attractive features: there is at most one edge between each pair of vertices; every missing edge corresponds to an independence relation. These features lead to a simple parametrization of the corresponding set of distributions in the Gaussian case.

DTIC

Markov Processes; Graph Theory

66

SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20080032371 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Development of Improved, Hybrid, Parallel and Multiobjective Versions of the Generalized Extremal Optimization Method and its Application to the Design of Spatial Systems

Galski, Roberto Luiz; [2007]; 282 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14795-TDI/1238; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A13](#), Hardcopy

In Sousa (2002), the Generalized Extremal Optimization (GEO) algorithm was developed. GEO is a generalization that has extended the applicability of the Extremal Optimization (EO) meta-heuristic (Boettcher and Percus, 2001) to virtually any optimization problem. Both GEO and EO are inspired on the simplified model of the evolutive process developed by Bak and Sneppen (1993). As it happens with most new method, a reasonable amount of study must be done, in order to fully develop the potential of the original method. This Doctorate thesis has as its main objective to explore GEO s potential, performing deep studies aiming at obtaining more efficient versions and, at the same time, aiming at expanding its applicability. Inside this context, it is done the development of a parallel version of the GEO algorithm, named GEOPAR-1 and a performance analysis. The objective is to validate GEO s efficiency as algorithm and to allow its application in the optimized design of complex spatial systems where computational high performance is a necessity. Nowadays, it is common the usage of hybridization techniques to improve the optimization algorithms characteristics. In this Thesis, such techniques are applied to the development of hybrid versions of the GEO algorithm, where characteristics of other algorithms are incorporate in GEO in order to improve its efficiency when applied to problems in general or, at least, to improve its efficiency when applied to specific problems. Another field of study is multiobjective optimization. In this field, one result from the studies that were done is the development of a new multiobjective optimization algorithm, called M-GEO. In order to evaluate its performances, all algorithms developed in this Thesis are tested with several test functions commonly used in the optimization field. Moreover, in order to verify the real capacity of optimization of the developed versions, some of them are used to the optimization of real spatial systems: the thermal design of the radiators of INPE s Multimission Platform (In Portuguese, Plataforma Multimissao - PMM) and in the design of the initial configuration of a remote sensing satellite constellation.

Author

Design Optimization; Algorithms; Systems Engineering

THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology, set theory, group theory and number theory.

20080032312 Naval Research Lab., Washington, DC USA

Spatial Transformations in Graph Comprehension

Trickett, Susan B; Trafton, J G; Jan 2004; 5 pp.; In English

Report No.(s): AD-A480332; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Although it is apparent that people are able to make inferences from graphs, it is presently unclear how they do so, even from simple graphs. Current theories of graph comprehension are largely silent about the processes by which such inferences are made (e.g., Freedman and Shah, 2002; Pinker, 1990). The authors propose that people use spatial reasoning, in the form of spatial transformations (Trafton, Trickett, and Mintz, in press), to answer inferential questions. Spatial transformations are cognitive operations that a person performs on internal or external visualizations, such as graphs. They occur when people must mentally create or delete something (e.g., a line) on the image to facilitate problem solving, and may be related to hypothetical drawing (Shimojima and Fukaya, 2003). This paper investigates the use of spatial transformations when people need to make inferences from graphs.

DTIC

Graphs (Charts); Inference; Cognition

PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see *categories 71 through 77*. For related instrumentation see *35 Instrumentation and Photography*; for geophysics, astrophysics, or solar physics see *46 Geophysics, 90 Astrophysics, or 92 Solar Physics*.

20080030997 Brookhaven National Lab., Upton, NY USA

Future Plans at BNL: RHIC-II and eRHIC

Aronson, S.; Apr. 20, 2007; 10 pp.; In English

Report No.(s): DE2007-913078; BNL-79188-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

The development of future facilities relevant to the study of deep inelastic scattering at BNL is described.

NTIS

Inelastic Scattering; Research Facilities; Laboratories

20080030998 Brookhaven National Lab., Upton, NY USA; Thomas Jefferson National Accelerator Facility, Newport News, VA, USA

Relativistic Heavy Ion Collider (RHIC) Cryogenic System at Brookhaven National Laboratory: Review of the Modifications and Upgrades Since 2002 and Planned Improvements

Than, R.; Tuozzolo, J.; Sidi-Yekhlef, A.; Ganni, V.; Knudsen, P.; Jul. 2007; 12 pp.; In English

Report No.(s): DE2007-913073; BNL-77584-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

Brookhaven National Laboratory continues its multi-year program to improve the operational efficiency, reliability, and stability of the cryogenic system which also resulted in improved beam availability of the Relativistic Heavy Ion Collider (RHIC). This paper summarizes the work and changes made after each phase over the past four years to the present, as well as proposed future improvements. Power usage dropped from an initial 9.4 MW to the present 5.1 MW and is expected to drop below 5 MW after the completion of the remaining proposed improvements. The work proceeded in phases by balancing the Collider's schedule of operation, time required for the modifications and budget constraints. The main changes include process control, compressor oil removal and management, elimination of the use of cold compressors and two liquid helium storage tanks, insulation of the third liquid helium storage tank, compressor bypass flow reduction and the addition of a load turbine (Joule-Thompson expander) with associated heat exchangers at the cold end of the plant. Also, liquid helium pumps used for forced circulation of the sub-cooled helium through the magnet loops were eliminated by an accelerator supply flow reconfiguration. Planned future upgrades include the resizing of expanders 5 and 6 to increase their efficiencies.

NTIS

Cryogenics; Research Facilities; Laboratories; Nuclear Research

20080031002 Virginia Univ., Charlottesville, VA, USA

Controlling Helicity-Correlated Beam Asymmetries in a Polarized Electron Source

Paschke, K. D.; January 2007; 9 pp.; In English

Report No.(s): DE2007-912941; No Copyright; Avail.: National Technical Information Service (NTIS)

The control of helicity-correlated changes in the electron beam is a critical issue for the next generation of parity-violating electron scattering measurements. The underlying causes and methods for controlling these changes are reviewed with reference to recent operational experience at Jefferson Lab.

NTIS

Asymmetry; Electron Beams; Electron Sources

20080031003 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA

New Methods for Precision Moller Polarimetry

Gaskell, D.; Meekins, D. G.; Yan, C.; January 2007; 6 pp.; In English

Report No.(s): DE2007-912940; No Copyright; Avail.: Department of Energy Information Bridge

Precision electron beam polarimetry is becoming increasingly important as parity violation experiments attempt to probe the frontiers of the standard model. In the few GeV regime, Moller polarimetry is well suited to high-precision measurements, however is generally limited to use at relatively low beam currents (< 10 mA). We present a novel technique that will enable precision Moller polarimetry at very large currents, up to 100 mA.

NTIS

Electron Beams; Polarimetry; Beam Currents

20080031004 SRI International Corp., Menlo Park, CA, USA

Low-Frequency Electromagnetic Backscattering from Tunnels

Casey, K.; Pao, H. Y.; Jan. 19, 2007; 6 pp.; In English

Report No.(s): DE2007-912936; No Copyright; Avail.: National Technical Information Service (NTIS)

Low-frequency electromagnetic scattering from one or more tunnels in a lossy dielectric half-space is considered. The tunnel radii are assumed small compared to the wavelength of the electromagnetic field in the surrounding medium; a tunnel can thus be modeled as a thin scatterer, described by an equivalent impedance per unit length. We examine the normalized backscattering width for cases in which the air-ground interface is either smooth or rough.

NTIS

Backscattering; Electromagnetic Scattering; Low Frequencies

20080031005 Department of Energy, Washington, DC USA

Strange Quarks in the Nucleon Sea: Result from HAPPEX II

Aniol, K. A.; January 2007; 4 pp.; In English

Report No.(s): DE2007-912938; No Copyright; Avail.: National Technical Information Service (NTIS)

The structure of the nucleon is of fundamental interest. Almost all the non-dark-matter mass in the Universe is contained within the nucleon. The nucleon is unique among systems of ordinary matter in that most of its mass is not due to the masses of its constituents. For example, QCD calculations of nucleon mass propose that most of the nucleon's mass is due to the energy in the gluon fields. Such strong gluon fields are expected to give rise to significant numbers of virtual quark and antiquark pairs. Indeed, the importance of this sea of qq pairs has been demonstrated in the analysis of vN scattering. Since the nucleon contains no net strangeness, any effect of strange quarks on the structure of the nucleon should be attributable to the strange-quark sea. Hints of the importance of the strange quark sea to the mass of the nucleon or to the spin structure of the nucleon raise the question of whether static properties of the nucleon ground state, such as the electromagnetic form factors, also depend on the strength of the strange-quark sea.

NTIS

Nucleons; Quarks

20080031006 Fermi National Accelerator Lab., Batavia, IL, USA

Noise Performance of the DO Layer O Silicon Detector

Johnson, M.; January 2007; 9 pp.; In English

Report No.(s): DE2007-912921; FERMILAB-CONF-06-401-E; No Copyright; Avail.: National Technical Information Service (NTIS)

A new inner detector called Layer 0 has been added to the existing silicon detector for the DZero colliding beams

experiment. This detector has an all carbon fiber support structure that employs thin copper clad Kapton sheets embedded in the surface of the carbon fiber structure to improve the grounding of the structure and a readout system that fully isolates the local detector ground from the rest of the detector. Initial measurements show efficiencies greater than 90% and 0.3 ADC count common mode contribution to the signal noise.

NTIS

Silicon; Noise; Detectors; Cladding

20080031053 Chicago Univ., Chicago, IL USA

Compact System and Method for the Production of Long-Wavelength, Electromagnetic Radiation Extending Over the Terahertz Regime

Biedron, S. G., Inventor; Milton, S. V., Inventor; Lewellen, J. W., Inventor; 15 Jun 05; 8 pp.; In English

Contract(s)/Grant(s): ANL-W-31-109-ENG-38

Patent Info.: Filed Filed 15 Jun 05; US-Patent-Appl-SN-11-153-815

Report No.(s): PB2007-111539; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A compact system and method are provided for implementing the generation of electromagnetic radiation extending over mm-wavelength to sub-mm-wavelength or terahertz range. The generated electromagnetic radiation can be broadband or have a variable bandwidth. Electrons are accelerated to a chosen energy and undergo subsequent or simultaneous temporal or spatial compression. The degree of compression is chosen such that the electron beam pulse length is near to or less than that of the terahertz wavelength desired to be generated. The radiation is produced by one or combination of methods of synchrotron radiation or transition radiation.

NTIS

Electromagnetic Radiation; Electron Beams; Patent Applications

20080031181 Brookhaven National Lab., Upton, NY, USA

Status of the R&D Towards Electron Cooling of RHIC

Ben-Zvi, I.; Alduino, J.; Beavis, D.; Blaskiewicz, M.; Brennan, J.; Jun. 2007; 5 pp.; In English

Report No.(s): DE2007-910378; BNL-77339-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

The physics interest in a luminosity upgrade of RHIC requires the development of a cooling-frontier facility. Detailed calculations were made of electron cooling of the stored RHIC beams. This has been followed by beam dynamics simulations to establish the feasibility of creating the necessary electron beam. The electron beam accelerator will be superconducting Energy Recovery Linac (ERL). An intensive experimental R&D program engages the various elements of the accelerator, as described by 24 contributions to the 2007 PAC.

NTIS

Cooling; Electron Beams

20080031182 Brookhaven National Lab., Upton, NY, USA

Measurement of the Average Energy and Multiplicity of Prompt-Fission-Neutrons from (238)U(n,f) and (237)Np(n,f) from 1 to 200 MeV

Taieb, J.; Granier, T.; Ethvignot, T.; Devlin, M.; Haight, R. C.; January 2007; 6 pp.; In English

Report No.(s): DE2007-910376; BNL-78163-2007-CP; No Copyright; Avail.: National Technical Information Service (NTIS)

No abstract available

Fission; Neutrons; Uranium

20080031183 Brookhaven National Lab., Upton, NY USA; Case Western Reserve Univ., Cleveland, OH USA; National Inst. of Standards and Technology, Gaithersburg, MD USA; Tech-X Corp., Boulder, CO, USA

Status of Diamond Secondary Emission Enhanced Photocathode

Rao, T.; Ben-Zvi, I.; Chang, X.; Grimes, J.; Grover, R.; May 2007; 8 pp.; In English

Report No.(s): DE2007-910373; BNL-78118-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

The diamond secondary emission enhanced photocathode (SEEP) provides an attractive alternative for simple photo cathodes in high average current electron injectors. It reduces the laser power required to drive the cathode, simultaneously isolating the cathode and the FW cavity from each other, thereby protecting them from contamination and increasing their life time. In this paper, we present the latest results on the secondary electron yield using pulsed thermionic and photo cathodes

as primary electron sources, shaping the diamond using laser ablation and reactive ion etching as well as the theoretical underpinning of secondary electron generation and preliminary results of modeling.

NTIS

Diamonds; Electron Sources; Injectors; Photocathodes; Secondary Emission

20080031191 Brookhaven National Lab., Upton, NY, USA

Results from pp at 62.4 and 200 GeV with the BRAHMS Experiment

May 2007; 10 pp.; In English

Report No.(s): DE2007-910364; BNL-78044-2007-CP; No Copyright; Avail.: National Technical Information Service (NTIS)

Measurements of elementary pp collisions are essential for understanding heavy ion collisions. Results for pp collisions at 200 and 62.4 GeV are presented. At both energies NLO pQCD describes pion production well. The measured pion transverse single spin asymmetries are very large at 62.4 GeV and are reasonably well described by models relying on pQCD at transverse momenta larger than 1 GeV/c.

NTIS

Ionic Collisions; Particle Collisions; Pions

20080031193 Argonne National Lab., IL USA; Illinois Inst. of Tech., Chicago, IL, USA; Stanford Linear Accelerator Center, CA, USA

Proposed RF Breakdown Studies at the AWA

Antipov, S.; Conde, M.; Dolgashev, V.; Gai, W.; Power, J. G.; Mar. 21, 2007; 3 pp.; In English

Contract(s)/Grant(s): DE-AC02-76SF00515

Report No.(s): DE2007-901261; SLAC-PUB-12408; No Copyright; Avail.: Department of Energy Information Bridge

A study of breakdown mechanism has been initiated at the Argonne Wakefield Accelerator (AWA). Breakdown may include several factors such as local field enhancement, explosive electron emission, Ohmic heating, tensile stress produced by electric field, and others. The AWA is building a dedicated facility to test various models for breakdown mechanisms and to determine the roles of different factors in the breakdown. We plan to trigger breakdown events with a high-powered laser at various wavelengths (IR to UV) to determine the role of explosive electron emission in the breakdown process. Another experimental idea follows from the recent work on a Schottky-enabled photoemission in an RF photoinjector that allows us to determine in situ the field enhancement factor on a cathode surface. Monitoring the field enhancement factor before and after the breakdown can shed some light on a number of observations such as the crater formation process.

NTIS

Radio Frequencies; Electron Emission; Stress Distribution; Actuators; Tensile Stress

20080031197 California State Univ., Los Angeles, CA, USA

Physics of Gain Mechanisms in Self-Amplified Spontaneous Emission Free Electron Lasers

Rosenzweig, J.; Feb. 05, 2007; 26 pp.; In English

Contract(s)/Grant(s): DE-FG03-92ER40693

Report No.(s): DE2007-899029; No Copyright; Avail.: National Technical Information Service (NTIS)

A broad range of investigations into SASE FELs and high brightness beams were proposed 3 years ago at a preceding grant renewal point. We have accomplished the majority of the stated physics goals, and added other areas of investigation, extending well beyond the scope of the original proposal as the research developed and new opportunities came into view. We review the results in high brightness beam and beam-based radiation physics that have been obtained under this grants support in the following sections, by topic: Experiments on ultra-short beam creation and coherent radiation generation at UCLA designed and built chicane compressor at the BNL ATF. UCLA-performed SASE FEL experiments at VISA, also located at the ATF. Initial velocity bunching experiments at the UCLA Neptune Lab. Velocity bunching experiments performed at the LLNL PLEIADES inverse-Compton scattering experiment injector. Use of compressed ultra-short beams in ICS experiments. Development and use of high gradient permanent-magnet quadrupole-based final focus systems at PLEIADES, to create ultra-small beam spots for ICS and other applications. These topics will form the background for discussing progress in: computational and theoretical studies, student training, publications, and technology development. We report the progress

towards new experimental facilities (advanced injector and diagnostic development at SLAC and INFN), in the context the following section, as lays the groundwork for the discussion of proposed future experiments.

NTIS

Electron Beams; Free Electron Lasers; Spontaneous Emission

20080031202 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA

Origin of the Nuclear Equation of State at the Quark Level

Thomas, A. W.; January 2007; 6 pp.; In English

Report No.(s): DE2007-910561; No Copyright; Avail.: Department of Energy Information Bridge

There is a measure of debate within the nuclear community concerning the relevance of quark degrees of freedom in understanding nuclear structure. We briefly outline some of the key issues and review the impressive progress made recently within the framework of the quark-meson coupling model. In particular, we explain in quite general terms how the modification of the internal structure of hadrons in-medium leads naturally to three- and four-body forces, or equivalently to density dependent effective interactions.

NTIS

Equations of State; Nuclear Structure; Quarks

20080031539 Florida State Univ., Tallahassee, FL, USA

Searches for New Phenomena with Lepton Final States at the Tevatron

Adams, T.; January 2007; 6 pp.; In English

Report No.(s): DE2007-910487; FERMILAB-CONF-07-145-E; No Copyright; Avail.: National Technical Information Service (NTIS)

Numerous searches for new phenomena have been carried out using data from proton-antiproton collisions at Fermilab's Tevatron. Final states with leptons give signatures which are relatively unique and generally have small backgrounds. We present many of the latest results from the CDF and D0 collaborations from 0.4-1.2 fb.⁻¹ of data. Topics include supersymmetry, extra gauge bosons, Randall-Sundrum gravitons, excited electrons and neutral, long-lived particles.

NTIS

Leptons; Particle Accelerators; Particle Collisions; Proton-Antiproton Interactions

20080031545 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA

National High Magnetic Field Laboratory FEL Injector Design Consideration

Evtushenko, P.; Benson, S.; Douglas, D.; Neil, G. R.; January 2007; 3 pp.; In English

Report No.(s): DE2007-910458; No Copyright; Avail.: National Technical Information Service (NTIS)

A numerical study of beam dynamics was performed for two injector systems for the proposed National High Magnetic Field Laboratory at the Florida State University (FSU) Free Electron Laser (FEL) facility. The first considered a system consisting of a thermionic DC gun, two buncher cavities operated at 260 MHz and 1.3 GHz and two TESLA type cavities, and is very similar to the injector of the ELBE Radiation Source. The second system we studied uses a DC photogun (a copy of JLab FEL electron gun), one buncher cavity operated at 1.3 GHz and two TESLA type cavities. The study is based on PARMELA simulations and takes into account operational experience of both the JLab FEL and the Radiation Source ELBE. The simulations predict the second system will have a much smaller longitudinal emittance. For this reason the DC photo gun based injector is preferred for the proposed FSU FEL facility.

NTIS

Free Electron Lasers; Injectors; Magnetic Fields

20080031550 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA; Brookhaven National Lab., Upton, NY, USA

Nucleon Structure and Hyperon Form Factors from Lattice QCD

Lin, H.; Jul. 2007; 18 pp.; In English

Report No.(s): DE2007-910445; No Copyright; Avail.: National Technical Information Service (NTIS)

In this work, I report the latest lattice QCD calculations of nucleon and hyperon structure from chiral fermions in 2+1-flavor dynamical simulations. All calculations are done with a chirally symmetric fermion action, domain-wall fermions, for valence quarks. I begin with the latest lattice results on the nucleon structure, focusing on results from RBC/UKQCD using 2+1-flavor chiral fermion actions. We find the chiral-extrapolated axial coupling constant at physical pion mass point to be

1.23(5), consistent with experimental value. The renormalization constants for the structure functions are obtained from RI/MOM-scheme non-perturbative renormalization. We find first moments of the polarized and unpolarized nucleon structure functions at zero transfer momentum to be 0.133(13) and 0.203(23) respectively, using continuum chiral extrapolation. These are consistent with the experimental values, unlike previous calculations which have been 50% larger. We also have a prediction for the transversity, which we find to be 0.56(4). The twist-3 matrix element is consistent with zero which agrees with the prediction of the Wandzura-Wilczek relation. In the second half of this work, I report an indirect dynamical estimation of the strangeness proton magnetic moments using mixed actions. With the analysis of hyperon form factors and using charge symmetry, the strangeness of proton is found to be -0.066(26), consistent with the Adelaide-JLab Collaboration's result. The hyperon Sigma and Xi axial coupling constants are also performed for the first time in a lattice calculation, $g_{\Sigma\Sigma} = 0.441(14)$ and $g_{\Xi\Xi} = -0.277(11)$.

NTIS

Form Factors; Hyperons; Nucleons; Quantum Chromodynamics

20080031632 Brookhaven National Lab., Upton, NY, USA

Electron Cloud Observations and Cures in RHIC

Fischer, W.; Blaskiewicz, M.; Huang, H.; Hseuh, H. C.; Ptitsyn, V.; Mar. 2007; 5 pp.; In English

Report No.(s): DE2007-910365; BNL-78049-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

Since 2081 MIC has experienced electron cloud effects, which have limited the beam intensity. These include dynamic pressure rises - including pressure instabilities, tune shifts: electrons, a reduction of the stability threshold for bunches crossing the transition energy, and possibly slow emittance growth. We summarize the main observations in operation and dedicated experiments, as well as countermeasures including baking, NEG coated warm beam pipes, solenoids, bunch patterns, anti-grazing rings, pre-pumped cold beam pipes, and scrubbing.

NTIS

Clouds (Meteorology); Dynamic Pressure; Electron Clouds; Stability; Visual Observation

20080031637 Los Alamos National Lab., NM USA; California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

Plasma and Beam Production Experiments with HYBRIS, a Microwave-Assisted H-ion Source

Keller, R.; Kwan, J.; Hahto, S.; Regis, M.; Wallig, J.; January 2007; 7 pp.; In English

Report No.(s): DE2007-910594; No Copyright; Avail.: National Technical Information Service (NTIS)

A two-stage ion source concept had been presented a few years ago, consisting of a proven H-ion source and a 2.45-GHz Electron Cyclotron-Resonance (ECR) type ion source, here used as a plasma cathode. This paper describes the experimental development path pursued at Lawrence Berkeley National Laboratory, from the early concept to a working unit that produces plasma in both stages and creates a negative particle beam. Without cesiation applied to the second stage, the H-fraction of this beam is very low, yielding 75 micro-amperes of extracted ion beam current at best. The apparent limitations of this approach and envisaged improvements are discussed.

NTIS

Electron Beams; Hydrogen; Ion Sources; Microwaves; Plasma Diagnostics

20080031715 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA; Old Dominion Univ., Norfolk, VA, USA

Radiative Physics in Charmonium from Lattice QCD

Dudek, J. J.; Edwards, R. G.; Mathur, N.; Richards, D. G.; January 2006; 8 pp.; In English

Report No.(s): DE2007-911846; No Copyright; Avail.: National Technical Information Service (NTIS)

Charmonium is an attractive system for the application of lattice QCD methods owing to the possibility of computing with the physical quark mass in a reasonable time. While the sub-threshold spectrum has been considered in some detail in previous works, it is only very recently that further properties such as radiative transitions and two-photon decays have come to be calculated; herein we discuss this recent progress.

NTIS

Charm (Particle Physics); Mesons; Quantum Chromodynamics

20080031717 Karlsruhe Univ., Germany

Measurement of the W Boson Helicity in Top-Antitop Quark Events with the CDF II Experiment

Charwalek, T.; Oct. 30, 2006; 102 pp.; In English

Report No.(s): DE2007-911839; IEKP-KA/2006-14; No Copyright; Avail.: National Technical Information Service (NTIS)

In 1995 the top quark was discovered at the Tevatron proton-antiproton collider at Fermilab by the CDF and DO collaborations. It is the most massive known elementary particle and its mass is currently measured with a precision of about 1.3%. However, the measurements of several other top quark properties are still statistically limited, so the question remains whether the Standard Model of elementary particle physics successfully predicts these properties. This thesis addresses one interesting aspect of top quark decay, the helicity of the produced W boson. Until the start of the Large Hadron Collider (LHC) at CERN, the Tevatron with a center-of-mass energy of $\sqrt{s} = 1.96$ TeV is the only collider, where top quarks can be produced. In the Standard Model the top quark decays predominantly into a W boson and a b quark, with a branching ratio close to 100%. The V-A structure of the weak interaction of the Standard Model predicts that the W^+ bosons from the top quark decay $\rightarrow W^+b$ are dominantly either longitudinally polarized or left handed, while right handed W bosons are heavily suppressed and even forbidden in the limit of a massless b quark. Under the assumption of a massless b quark, for a top quark mass of 173 GeV/c² the Standard Model predicts the fraction F_0 of longitudinally polarized W bosons to be 0.7 and 0.3 for the fraction F_- of left handed W bosons, while the fraction F_+ of right handed W bosons is predicted to be zero. Since next-to-leading order corrections change these fractions only slightly, a significant deviation from the predicted value for F_0 or a nonzero value for F_+ could indicate new physics. Left-right symmetric models, for example, lead to a significant right handed fraction of W bosons in top decays. Such a right handed component (V+A coupling) would lead to a smaller left handed fraction, while F_0 would remain unchanged. Since the decay rate to longitudinal W bosons depends on the Yukawa coupling of the top quarks, the measurement of F_0 is sensitive to the mechanism of electroweak symmetry breaking. Alternative models can lead to an altered F_0 fraction. In this analysis the W helicity fractions are measured in a selected sample rich in tt events where one lepton, at least four jets, and missing transverse energy are required. All kinematic quantities describing the tt decay are determined. As a sensitive observable, we use the cosine of the decay angle θ^* , which is defined as the angle between the momentum of the charged lepton in the W boson rest frame and the W boson momentum in the top quark rest frame. The data used in this analysis were taken with the Collider Detector at Fermilab (CDF II) in the years 2002 - 2006 and correspond to an integrated luminosity of about 955 pb⁻¹.

NTIS

Bosons; Quarks; Hadrons; Kinematics; Particle Accelerators; Electroweak Interactions (Field Theory)

20080031718 Brookhaven National Lab., Upton, NY USA

EMMA Lattice Design

Berg, J. S.; Ruggiero, A.; Machida, S.; Koscielniak, S.; Jun. 2007; 5 pp.; In English

Report No.(s): DE2007-910927; BNL-78167-2007-CP; No Copyright; Avail.: National Technical Information Service (NTIS)

EMMA is a 10 to 20 MeV electron ring designed to test our understanding of beam dynamics in a relativistic linear non-scaling fixed field alternating gradient accelerator (FFAG). This paper describes the design of the EMMA lattice. We begin with a summary of the experimental goals that impact the lattice design, and then outline what motivated the choice for the basic lattice parameters, such as the type of cells, the number of cells, and the RF frequency. We next list the different configurations that we wish to operate the machine in so as to accomplish our experimental goals. Finally, we enumerate the detailed lattice parameters, showing how these parameters result from the various lattice configurations.

NTIS

Electron Accelerators; Crystal Lattices

20080031719 Brookhaven National Lab., Upton, NY USA

Conceptual Design Report. National Synchrotron Light Source II

Dec. 2006; 781 pp.; In English

Report No.(s): DE2007-910923; BNL-77977-2006-V1-V2; No Copyright; Avail.: National Technical Information Service (NTIS)

Brookhaven National Laboratory has prepared a conceptual design for a world class user facility for scientific research using synchrotron radiation. This facility, called the National Synchrotron Light Source II (NSLS-II), will provide ultra high brightness and flux and exceptional beam stability. It will also provide advanced insertion devices, optics, detectors, and robotics, and a suite of scientific instruments designed to maximize the scientific output of the facility. Together these will enable the study of material properties and functions with a spatial resolution of approximately 1 nm, an energy resolution of

approximately 0.1 meV, and the ultra high sensitivity required to perform spectroscopy on a single atom. The overall objective of the NSLS-II project is to deliver a research facility to advance fundamental science and have the capability to characterize and understand physical properties at the nanoscale, the processes by which nanomaterials can be manipulated and assembled into more complex hierarchical structures, and the new phenomena resulting from such assemblages. It will also be a user facility made available to researchers engaged in a broad spectrum of disciplines from universities, industries, and other laboratories.

NTIS

Light Sources; Radiation Sources; Synchrotron Radiation; Synchrotrons

20080031721 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA; Stanford Linear Accelerator Center, CA, USA

Simulation of the Microbunching Instability in Beam Delivery Systems for Free Electron Lasers

Pogorelov, I.; Qiang, J.; Ryne, R.; Venturini, M.; Zholents, A.; January 2007; 3 pp.; In English

Report No.(s): DE2007-910599; No Copyright; Avail.: National Technical Information Service (NTIS)

In this paper, we examine the growth of the microbunching instability in the electron beam delivery system of a free electron laser (FEL). We present the results of two sets of simulations, one conducted using a direct Vlasov solver, the other using a particle-in-cell code Impact-Z with the number of simulation macroparticles ranging up to 100 million. Discussion is focused on the details of longitudinal dynamics and on numerical values of uncorrelated (slice) energy spread at different points in the lattice. In particular, we assess the efficacy of laser heater in suppression of the instability, and look at the interplay between physical and numerical noise in particle-based simulations.

NTIS

Bunching; Free Electron Lasers; Stability; Electron Beams

20080031722 Groningen Rijksuniv., Netherlands

Mechanisms for Fatigue and Wear of Polysilicon Structural Thin Films

Alslem, D. H.; Oct. 2006; 162 pp.; In English

Report No.(s): DE2007-910596; No Copyright; Avail.: Department of Energy Information Bridge

Fatigue and wear in micron-scale polysilicon structural films can severely impact the reliability of microelectromechanical systems (MEMS). Despite studies on fatigue and wear behavior of these films, there is still an on-going debate regarding the precise physical mechanisms for these two important failure modes. Although macro-scale silicon does not fatigue, this phenomenon is observed in micron-scale silicon. It is shown that for polysilicon devices fabricated in the MUMPs foundry and SUMMiTTM process stress-lifetime data exhibits similar trends in ambient air, shorter lifetimes in higher relative humidity environments and no fatigue failure at all in high vacuum. Transmission electron microscopy of the surface oxides of the samples show an approximate four-fold thickening of the oxide at stress concentrations after fatigue failure, but no thickening after fracture in air or after fatigue cycling in vacuo. It is found that such oxide thickening and fatigue failure (in air) occurs in devices with initial oxide thicknesses of approximately 4-20 nm. Such results are interpreted and explained by a reaction layer fatigue mechanism; specifically, moisture-assisted subcritical cracking within a cyclic stress-assisted thickened oxide layer occurs until the crack reaches a critical size to cause catastrophic failure.

NTIS

Silicon Polymers; Thin Films; Wear

20080032326 Los Alamos National Lab., NM USA

Apparatus and Method for Temperature Correction and Expanded Count Rate of Inorganic Scintillation Detectors

Ianakiev, K. D., Inventor; Hsue, S. T., Inventor; Browne, M. C., Inventor; Audia, J. M., Inventor; 2 Jun 04; 20 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG-36

Patent Info.: Filed 2 Jun 04; US-Patent-Appl-SN-10-858-620

Report No.(s): PB2007-110529; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The present invention includes an apparatus and corresponding method for temperature correction and count rate expansion of inorganic scintillation detectors. A temperature sensor is attached to an inorganic scintillation detector. The inorganic scintillation detector, due to interaction with incident radiation, creates light pulse signals. A photoreceiver processes the light pulse signals to current signals. Temperature correction circuitry that uses a fast light component signal, a slow light

component signal, and the temperature signal from the temperature sensor to correct an inorganic scintillation detector signal output and expanded the count rate.

NTIS

Scintillation Counters; Temperature; Counting; Optical Correction Procedure

20080032475 Brookhaven National Lab., Upton, NY, USA; Consortium for the Exploitation of the Synchrotron Light Lab - (CELLS), Barcelona, Spain

Electron Cloud Observations and Cures in RHIC

Fischer, W.; Blaskiewicz, M.; Brennan, M.; Huang, H.; Hseuh, H. C.; Jun. 2007; 14 pp.; In English

Report No.(s): DE2007-913088; BNL-79227-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

Since 2001 RHIC has experienced electron cloud effects, which have limited the beam intensity. These include dynamic pressure rises - including pressure instabilities, tune shifts, a reduction of the stability threshold for bunches crossing the transition energy, and possibly slow emittance growth. We summarize the main observations in operation and dedicated experiments, as well as countermeasures including baking, NEG coated warm beam pipes, solenoids, bunch patterns, anti-grazing rings, pre-pumped cold beam pipes, scrubbing, and operation with long bunches.

NTIS

Clouds (Meteorology); Dynamic Pressure; Electron Clouds; Stability; Visual Observation

20080032476 Columbia Univ., New York, NY, USA

Measurement of Single Top QUark Production at D(0) Using a Matrix Element Method

Mitrevski, J.; January 2007; 280 pp.; In English

Report No.(s): DE2007-913191; No Copyright; Avail.: National Technical Information Service (NTIS)

;Contents: The Standard Model (The Constituents, Symmetries and Gauge Theories, QED, and QCD, Electroweak Interactions); Single Top Production (Single Top Event Signature, Polarization Effects, Single Top and the Search for Physics Beyond the Standard Model); Experimental Apparatus (Accelerator Chain, The D0 Detector), Object Reconstruction (Tracking, Primary Vertices, Calorimeter Preprocessing, Jets, Electrons, Muons, Missing Transverse Energy, b-Tagging Jets); The Analysis: Event Selection (Background Processes, Signal and Background Modeling, Data and Triggers, Event Selection, Correcting the Monte Carlo Model Efficiencies and Resolutions, Modeling the Trigger for Monte Carlo Events; Normalizing the W+jets and Multijets Backgrounds to Data, b-Tagging, Event Yields, Cross Checks of the Background Model); The Analysis: Matrix Element Technique (Matrix Element Technique Overview, Calculation of the Event Probability Density Functions, Normalization of the Probabilities, The Matrix Elements, Integration Details, Assignment Permutations, Object Transfer Functions, Single Top Discriminant, Cross-Check Samples); The Analysis: Extracting a Result (Systematic Uncertainties, Extracting a Measurement Using a Bayesian Approach, Generating Ensembles, Calibration of the Method, Expected Results).

NTIS

Matrix Methods; Quarks; Electroweak Interactions (Field Theory); Quantum Electrodynamics

20080032481 Fermi National Accelerator Lab., Batavia, IL, USA; Michigan State Univ., East Lansing, MI, USA

Measurement of the W + Jet Cross Section at CDF

Messina, A.; January 2007; 3 pp.; In English

Report No.(s): DE2007-912917; FERMILAB-CONF-06-544-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The study of jets produced in events containing a W bosons provides a useful test of Quantum Chromo-Dynamics (QCD) at high momentum transfers. Recently a lot of work has been invested to develop sophisticated Monte Carlo programs capable of handling more particle in the final state at the leading order (LO), or in some cases, next-to-leading order (NLO) in perturbative QCD. Measurements of W + jet cross sections are an important test of QCD and may be used to validate these new approaches. A good understanding of W + jet production is vital to reduce the uncertainty on the background to top pair production and to increase the sensitivity to higgs and new physics searches at the Tevatron and the LHC.

NTIS

Bosons; Quantum Chromodynamics; Particle Accelerators

20080032498 Lawrence Livermore National Lab., Livermore, CA USA

Fiber-Based, Spatially and Temporally Shaped Picosecond UV Laser for Advanced RF Gun Applications

Shverdin, M. Y.; Anderson, S. G.; Betts, S. M.; Gibson, D. J.; Hartemann, F. V.; Jun. 14, 2007; 5 pp.; In English
Report No.(s): DE2007-912680; UCRL-CONF-231791; No Copyright; Avail.: National Technical Information Service (NTIS)

The fiber-based, spatially and temporally shaped, picosecond UV laser system described here has been specifically designed for advanced rf gun applications, with a special emphasis on the production of high-brightness electron beams for free-electron lasers and Compton scattering light sources. The laser pulse can be shaped to a flat-top in both space and time with a duration of 10 ps at full width of half-maximum (FWHM) and rise and fall times under 1 ps. The expected pulse energy is 50 mJ at 261.75 nm and the spot size diameter of the beam at the photocathode is 2 mm. A fiber oscillator and amplifier system generates a chirped pump pulse at 1047 nm; stretching is achieved in a chirped fiber Bragg grating. A single multi-layer dielectric grating based compressor recompresses the input pulse to 250 fs FWHM and a two stage harmonic converter frequency quadruples the beam. Temporal shaping is achieved with a Michelson-based ultrafast pulse stacking device with nearly 100% throughput. Spatial shaping is achieved by truncating the beam at the 20% energy level with an iris and relay-imaging the resulting beam profile onto the photocathode. The integration of the system, as well as preliminary laser measurements will be presented.

NTIS

Electron Guns; Picosecond Pulses; Radio Frequencies; Ultraviolet Lasers

20080032592 Bromberg and Sunstein, LLP, Boston, MA, USA

Quantum Random Number Generator

Altepetter, J. B., Inventor; Jeffrey, E., Inventor; Kwiat, P. G., Inventor; 6 Jul 04; 10 pp.; In English

Contract(s)/Grant(s): DAAD19-03-1-0199; DAAD19-03-1-0282

Patent Info.: Filed Filed 6 Jul 04; US-Patent-Appl-SN-10-885 503

Report No.(s): PB2008-100101; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A method and apparatus for generating random numbers. Events characteristic of a random process are registered, and a particular time segment, from among a set of time segments, is identified based upon registration of an event within that time segment, and a value is associated based on the identified time segment. The events may be detections of a particle by a particle detector such as a photon detector. A random number is outputted based at least upon the associated value. Outputting of the random numbers may be followed by a whitening process. The source of particles may be driven to provided various specified probability distributions of values.

NTIS

Patent Applications; Quantum Numbers; Radiation Counters; Random Numbers

20080032608 Argonne National Lab., Idaho Falls, ID, USA

Design and Preliminary Monte Carlo Calculations of an Active Compton Suppressed LaBr₃(Ce) Detector system for TRU Assay in Remote-Handled Wastes. 10th International Symposium on Radiation Physics

Kulisek, J. A.; Hartwell, J. K.; McIlwain, M. E.; Gardner, R. P.; Sep. 2006; 5 pp.; In English

Report No.(s): DE2007-911650; INL/CON-06-11176; No Copyright; Avail.: Department of Energy Information Bridge

Recent studies indicate LaBr₃(Ce) scintillation detectors have desirable attributes, such as room temperature operability, which may make them viable alternatives as primary detectors (PD) in a Compton suppression spectrometer (CSS) used for remote-handled transuranic (RH-TRU) waste assay. A CSS with a LaBr₃(Ce) PD has been designed and its expected performance evaluated using Monte Carlo analysis. The unique design of this unit minimizes the amount of 'dead' material between the PD and the secondary guard detector. The analysis results indicate that this detector will have a relatively high Compton-suppression capability, with greater suppression ability for large angle-scattered photons in the PD.

NTIS

Assaying; Compton Effect; Conferences; Monte Carlo Method; Scintillation Counters; Spectrometers

71
ACOUSTICS

Includes sound generation, transmission, and attenuation. For noise pollution see *45 Environment Pollution*. For aircraft noise see also *02 Aerodynamics* and *07 Aircraft Propulsion and Power*.

20080031113 NASA Langley Research Center, Hampton, VA, USA

Vibroacoustic Response of Residential Housing due to Sonic Boom Exposure: A Summary of two Field Tests

Klos, Jacob; Buehrle, Ralph; Sullivan, Brenda; Gavin, Joseph; Salamone, Joseph; Haering, Edward A., jr.; Miller, Denise M.; July 28, 2008; 12 pp.; In English; Noise-Con 2008, 28-31 Jul. 2008, Dearborn, MI, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 984754.02.07.07.18.02; Copyright; Avail.: CASI: [A03](#), Hardcopy

Two experiments have been performed to measure the vibroacoustic response of houses exposed to sonic booms. In 2006, an old home in the base housing area of Edwards Air Force Base, built around 1960 and demolished in 2007, was instrumented with 288 transducers. During a 2007 follow-on test, a newer home in the base housing area, built in 1997, was instrumented with 112 transducers. For each experiment, accelerometers were placed on walls, windows and ceilings in bedrooms of the house to measure the vibration response of the structure. Microphones were placed outside and inside the house to measure the excitation field and resulting interior sound field. The vibroacoustic response of each house was measured for sonic boom amplitudes spanning from 2.4 to 96 Pa (0.05 to 2 lbf/sq ft). The boom amplitudes were systematically varied using a unique dive maneuver of an F/A-18 airplane. In total, the database for both houses contains vibroacoustic response data for 154 sonic booms. In addition, several tests were performed with mechanical shaker excitation of the structure to characterize the forced response of the houses. The purpose of this paper is to summarize all the data from these experiments that are available to the research community, and to compare and contrast the vibroacoustic behavior of these two dissimilar houses.

Author

Acoustics; Sound Fields; Sonic Booms; Vibrational Stress; Accelerometers; Walls

20080031114 NASA Langley Research Center, Hampton, VA, USA

Measured Rattle Threshold of Residential House Windows

Sizov, Natalia; Schultz, Troy; Hobbs, Christopher; Klos, Jacob; July 28, 2008; 9 pp.; In English; Noise-Con 2008, 28-31 Jul. 2008, Dearborn, MI, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNL05AA04Z; WBS 984754.20.07.07.18.02; No Copyright; Avail.: CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031114>

Window rattle is a common indoor noise effect in houses exposed to low frequency noise from such sources as railroads, blast noise and sonic boom. Human perception of rattle can be negative that is a motivating factor of the current research effort to study sonic boom induced window rattle. A rattle study has been conducted on residential houses containing windows of different construction at a variety of geographic locations within the USA. Windows in these houses were excited by a portable, high-powered loudspeaker and enclosure specifically designed to be mounted on the house exterior to cover an entire window. Window vibration was measured with accelerometers placed on different window components. Reference microphones were also placed inside the house and inside of the loudspeaker box. Swept sine excitation was used to identify the vibration threshold at which the response of the structure becomes non-linear and begins to rattle. Initial results from this study are presented and discussed. Future efforts will continue to explore the rattle occurrence in windows of residential houses exposed to sonic booms.

Author

Sonic Booms; Vibration; Low Frequencies; Enclosure; Excitation; Microphones

20080031727 Idaho National Engineering Lab., Idaho Falls, ID, USA

Hearing Protection Evaluation for the Combat Arms Earplug at Idaho National Laboratory

Lovejoy, J.; Mar. 01, 2007; 21 pp.; In English

Contract(s)/Grant(s): DE-AC07-99ID-13727

Report No.(s): DE2007-911945; INL/EXT-07-12320; No Copyright; Avail.: National Technical Information Service (NTIS)

The Idaho National Laboratory (INL) is managed by Battelle Energy Alliance, LLC (BEA) for the Department of Energy. The INL Protective Security Forces (Pro Force) are involved in training exercises that generate impulse noise by small arms fire. Force-on-force (FOF) training exercises that simulate real world scenarios require the Pro Force to engage the opposition force (OPFOR) while maintaining situational awareness through verbal communications. The Combat Arms earplug was studied to determine if it provides adequate hearing protection in accordance with the requirements of MIL-STD-1474C/D.

The Combat Arms earplug uses a design that allows continuous noise through a critical orifice while effectively attenuating high-energy impulse noise. The earplug attenuates noise on a non linear scale, as the sound increases the attenuation increases. The INL studied the effectiveness of the Combat Arms earplug with a Bruel & Kjaer (B&K) head and torso simulator used with a selection of small arms to create impulse sound pressures. The Combat Arms earplugs were inserted into the B&K head and torso ears, and small arms were then discharged to generate the impulse noise.

NTIS

Combat; Ear Protectors; Fires; Impulses

20080032565 NASA Glenn Research Center, Cleveland, OH, USA

A Process for Assessing NASA's Capability in Aircraft Noise Prediction Technology

Dahl, Milo D.; July 2008; 34 pp.; In English; 14th Aeroacoustics Conference, 5-7 May 2008, Vancouver, BC, Canada; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 984754.02.07.03.17.02

Report No.(s): NASA/TM-2008-215268; AIAA Paper 2008-2813; E-16538; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080032565>

An acoustic assessment is being conducted by NASA that has been designed to assess the current state of the art in NASA's capability to predict aircraft related noise and to establish baselines for gauging future progress in the field. The process for determining NASA's current capabilities includes quantifying the differences between noise predictions and measurements of noise from experimental tests. The computed noise predictions are being obtained from semi-empirical, analytical, statistical, and numerical codes. In addition, errors and uncertainties are being identified and quantified both in the predictions and in the measured data to further enhance the credibility of the assessment. The content of this paper contains preliminary results, since the assessment project has not been fully completed, based on the contributions of many researchers and shows a select sample of the types of results obtained regarding the prediction of aircraft noise at both the system and component levels. The system level results are for engines and aircraft. The component level results are for fan broadband noise, for jet noise from a variety of nozzles, and for airframe noise from flaps and landing gear parts. There are also sample results for sound attenuation in lined ducts with flow and the behavior of acoustic lining in ducts.

Author

Aerodynamic Noise; Noise Prediction; Acoustic Ducts; Jet Aircraft Noise; Aircraft Noise; Acoustic Attenuation

20080032609 NASA Glenn Research Center, Cleveland, OH, USA

Scalability of Localized Arc Filament Plasma Actuators

Brown, Clifford A.; July 2008; 21 pp.; In English; AIAA Aeroacoustics Conference 2008, 5-7 May 2008, Vancouver, BC, Canada; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 984754.02.07.03.17.03

Report No.(s): NASA/TM-2008-215278; AIAA Paper 2008-3043; E-16539; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080032609>

14. ABSTRACT Temporal flow control of a jet has been widely studied in the past to enhance jet mixing or reduce jet noise. Most of this research, however, has been done using small diameter low Reynolds number jets that often have little resemblance to the much larger jets common in real world applications because the flow actuators available lacked either the power or bandwidth to sufficiently impact these larger higher energy jets. The Localized Arc Filament Plasma Actuators (LAFPA), developed at the Ohio State University (OSU), have demonstrated the ability to impact a small high speed jet in experiments conducted at OSU and the power to perturb a larger high Reynolds number jet in experiments conducted at the NASA Glenn Research Center. However, the response measured in the large-scale experiments was significantly reduced for the same number of actuators compared to the jet response found in the small-scale experiments. A computational study has been initiated to simulate the LAFPA system with additional actuators on a large-scale jet to determine the number of actuators required to achieve the same desired response for a given jet diameter. Central to this computational study is a model for the LAFPA that both accurately represents the physics of the actuator and can be implemented into a computational fluid dynamics solver. One possible model, based on pressure waves created by the rapid localized heating that occurs at the actuator, is investigated using simplified axisymmetric simulations. The results of these simulations will be used to determine the validity of the model before more realistic and time consuming three-dimensional simulations are conducted to ultimately determine the scalability of the LAFPA system.

Author

Actuators; Noise Reduction; Fluid Jets; Jet Aircraft Noise; High Reynolds Number; Computational Fluid Dynamics

73
NUCLEAR PHYSICS

Includes nuclear particles; and reactor theory. For space radiation see *93 Space Radiation*. For atomic and molecular physics see *72 Atomic and Molecular Physics*. For elementary particle physics see *77 Physics of Elementary Particles and Fields*. For nuclear astrophysics see *90 Astrophysics*.

20080031640 Idaho National Engineering Lab., Idaho Falls, ID, USA

Nuclear Reactor/Hydrogen Process Interface Including the HyPEP Model

Sherman, S. R.; May 01, 2007; 9 pp.; In English

Contract(s)/Grant(s): DE-AC07-99ID-13727

Report No.(s): DE2007-912461; INL/CON-07-12488; No Copyright; Avail.: Department of Energy Information Bridge

The Nuclear Reactor/Hydrogen Plant interface is the intermediate heat transport loop that will connect a very high temperature gas-cooled nuclear reactor (VHTR) to a thermochemical, high-temperature electrolysis, or hybrid hydrogen production plant. A prototype plant called the Next Generation Nuclear Plant (NGNP) is planned for construction and operation at the Idaho National Laboratory in the 2018-2021 timeframe, and will involve a VHTR, a high-temperature interface, and a hydrogen production plant. The interface is responsible for transporting high-temperature thermal energy from the nuclear reactor to the hydrogen production plant while protecting the nuclear plant from operational disturbances at the hydrogen plant. Development of the interface is occurring under the DOE Nuclear Hydrogen Initiative (NHI) and involves the study, design, and development of high-temperature heat exchangers, heat transport systems, materials, safety, and integrated system models. Research and development work on the system interface began in 2004 and is expected to continue at least until the start of construction of an engineering-scale demonstration plant.

NTIS

Hydrogen; Nuclear Reactors

20080031648 Idaho National Engineering Lab., Idaho Falls, ID, USA

Growth and Expansion of the International Criticality Safety Benchmark Evaluation Project and the Newly Organized International Reactor Physics Experiment Evaluation Project

Briggs, J. B.; Scott, L.; Rugama, Y.; Satori, E.; May 01, 2007; 9 pp.; In English

Contract(s)/Grant(s): DE-AC07-99ID-13727

Report No.(s): DE2007-912441; INL/CON-06-11655; No Copyright; Avail.: National Technical Information Service (NTIS)

Since ICNC 2003, the International Criticality Safety Benchmark Evaluation Project (ICSBEP) has continued to expand its efforts and broaden its scope. Criticality-alarm / shielding type benchmarks and fundamental physics measurements that are relevant to criticality safety applications are not only included in the scope of the project, but benchmark data are also included in the latest version of the handbook. A considerable number of improvements have been made to the searchable database, DICE and the criticality-alarm / shielding benchmarks and fundamental physics measurements have been included in the database. There were 12 countries participating on the ICSBEP in 2003. That number has increased to 18 with recent contributions of data and/or resources from Brazil, Czech Republic, Poland, India, Canada, and China. South Africa, Germany, Argentina, and Australia have been invited to participate. Since ICNC 2003, the contents of the International Handbook of Evaluated Criticality Safety Benchmark Experiments have increased from 350 evaluations (28,000 pages) containing benchmark specifications for 3070 critical or subcritical configurations to 442 evaluations (over 38,000 pages) containing benchmark specifications for 3957 critical or subcritical configurations, 23 criticality-alarm-placement / shielding configurations with multiple dose points for each, and 20 configurations that have been categorized as fundamental physics measurements that are relevant to criticality safety applications in the 2006 Edition of the ICSBEP Handbook. Approximately 30 new evaluations and 250 additional configurations are expected to be added to the 2007 Edition of the Handbook. Since ICNC 2003, a reactor physics counterpart to the ICSBEP, The International Reactor Physics Experiment Evaluation Project (IRPhEP) was initiated. Beginning in 1999, the IRPhEP was conducted as a pilot activity by the by the Organization of Economic Cooperation and Development (OECD) Nuclear Energy Agency (NEA) Nuclear Science Committee (NSC). The project was endorsed as an official activity of the NSC in June of 2003. The IRPhEP is patterned after its predecessor, the ICSBEP, but focuses on other integral measurements such as buckling, spectral characteristics, reactivity effects, reactivity coefficients, kinetics measurements, reaction-rate and power distributions, nuclide compositions and other miscellaneous types of measurements in addition to the critical configuration.

NTIS

Nuclear Reactors; Reactor Physics; Safety

20080031728 Idaho National Engineering Lab., Idaho Falls, ID, USA

Novel Silicon Carbide Detector for Active Inspections

Jones, J. L.; Blackburn, B. W.; Ruddy, F. H.; Seidel, J. G.; Flammang, R. W.; Mar. 01, 2007; 5 pp.; In English

Contract(s)/Grant(s): DE-AC07-99ID-13727

Report No.(s): DE2007-911937; INL/CON-07-12143; No Copyright; Avail.: Department of Energy Information Bridge

The need to address increasingly challenging inspection requirements (such as large volume objects, very fast inspection throughputs, potentially significant shielding, etc.) for such items as nuclear materials and explosives will require the use of active interrogation technologies. While these active technologies can successfully address these challenges by inducing unique, temporal signatures, the inspection environment will also induce overall background signals that can be orders of magnitude larger than the induced signatures. Detectors that can successfully operate in these types of customized, inspection environments (pulsed and continuous) and successfully extract induced signature data are clearly needed and will effectively define the limitations of any active inspection system. A novel silicon carbide detector is now being investigated to successfully address both neutron- and photon/bremsstrahlung-type inspection applications. While this paper describes this detector and highlights efforts related to neutron inspection, it will focus on its neutron and gamma-ray/photon detection performance in neutron- and bremsstrahlung-type inspection applications.

NTIS

Inspection; Neutrons; Silicon Carbides

20080032324 Gauthier and Connors, LLP., Boston, MA, USA

Spatial-Phase Locking of Energy Beams for Determining Two-Dimensional Location and Beam Shape

Hastings, J. T., Inventor; Goodberlet, J. G., Inventor; Zhang, F., Inventor; Smith, H. I., Inventor; 17 May 05; 11 pp.; In English

Contract(s)/Grant(s): DARPA-DAAD19-99-1-0280

Patent Info.: Filed Filed 17 May 05; US-Patent-Appl-SN-11-130-892

Report No.(s): PB2007-110531; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A method or system of spatial-phase locking a beam used in maskless lithography provides a fiducial grid with a single spatial-period, the fiducial grid being rotated at an angle with respect to a direction of scanning the beam; detects a signal generated in response to the beam being incident upon the fiducial grid; determines frequency components of the detected signal; and determines a two-dimensional location of the beam from phases of two determined fundamental frequency component. The method or system further determines a size of the beam from relative amplitudes of the determined fundamental and harmonic frequency components and/or determine a shape of the beam from relative amplitudes of the determined fundamental and harmonic frequency components. The method or system corrects a deflection of the beam in response to the determined two-dimensional location, and/or adjusts the size of the beam in response to the determined size, and/or adjusts the shape of the beam in response to the determined shape. If the method or system spatial-phase locks a plurality of beams used in maskless lithography, a fiducial grid with a varying spatial-period is utilized. In the plural beam method or system, the frequency components for each beam are determined using frequency-division multiplexing.

NTIS

Phase Locked Systems; Electron Beams; Position (Location); Shapes

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OPTICS

Includes light phenomena and the theory of optical devices; for specific optical devices see also *35 Instrumentation and Photography*. For lasers see *36 Lasers and Masers*.

20080031194 Sandia Corp., Livermore, CA, USA

Linac Coherent Light Source (LCLS) Bunch-Length Monitor Using Coherent Radiation

Wu, J.; Emma, P.; Mar. 21, 2007; 3 pp.; In English

Contract(s)/Grant(s): DE-AC02-76SF00515

Report No.(s): DE2007-901258; SLAC-PUB-12121; No Copyright; Avail.: Department of Energy Information Bridge

The Linac Coherent Light Source (LCLS) is a SASE xray Free-Electron Laser (FEL) based on the final kilometer of the Stanford Linear Accelerator. One of the most critical diagnostic devices is the bunch length monitor (BLM), which is to be

installed right after each compressor utilizing coherent radiation from the last bending magnet. We describe the components and the optical layout of such a BLM. Based on the setup geometry, we discuss some issues about the coherent radiation signal.
NTIS

Bunching; Coherent Light; Coherent Radiation; Free Electron Lasers; Light Sources; Linear Accelerators

20080031695 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Recent Developments in the Alignment and Test Plans for the James Webb Space Telescope Integrated Science Instrument Module

Ohl, Raymond; March 29, 2008; 1 pp.; In English; Capital Science 2008, 29-30 Mar. 2008, Arlington, VA, USA; No Copyright; Avail.: Other Sources; Abstract Only

The James Webb Space Telescope (JWST) is a 6.6m diameter, segmented, deployable telescope for cryogenic IR space astronomy (approximately 40K). The JWST Observatory architecture includes the Optical Telescope Element (OTE) and the Integrated Science Instrument Module (ISIM) element that contains four science instruments (SI) including a Guider. The SIs and Guider are mounted to a composite metering structure with outer dimensions of 2.1 x 2.2 x 1.9m. The SI and Guider units are integrated to the ISIM structure and optically tested at NASA/Goddard Space Flight Center as an instrument suite using an OTE SIMulator (OSIM). OSIM is a high-fidelity, cryogenic JWST telescope simulator that features a approximately 1.5m diameter powered mirror. The SIs are aligned to the structure's coordinate system under ambient, clean room conditions using laser tracker and theodolite metrology. Temperature-induced mechanical SI alignment and structural changes are measured using a photogrammetric measurement system at ambient and cryogenic temperatures. OSIM is aligned to the ISIM mechanical coordinate system at the cryogenic operating temperature via internal mechanisms and feedback from alignment sensors in six degrees of freedom. SI performance, including focus, pupil shear and wavefront error, is evaluated at the operating temperature using OSIM. We present an updated plan for the assembly and ambient and cryogenic optical alignment, test and verification of the ISIM element.

Author

James Webb Space Telescope; Alignment; Performance Tests; Instruments; Optical Properties

20080032219 Lawrence Livermore National Lab., Livermore, CA USA; California Univ., Berkeley, CA, USA

Compact Imaging Spectrometer Utilizing Immersed Gratings (PAT-APPL-11-066-370)

Chrisp, M. P., Inventor; Lerner, S. A., Inventor; Kuzmenko, P. J., Inventor; Bennett, C. L., Inventor; 25 Feb 05; 6 pp.; In English

Contract(s)/Grant(s): DE-W-7405-ENG-48

Patent Info.: Filed Filed 25 Feb 05; US-Patent-Appl-SN-11-066 370

Report No.(s): PB2008-100435; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A compact imaging spectrometer with an immersive diffraction grating that compensates optical distortions. The imaging spectrometer comprises an entrance slit for transmitting light, a system for receiving the light and directing the light, an immersion grating, and a detector array. The entrance slit, the system for receiving the light, the immersion grating, and the detector array are positioned wherein the entrance slit transmits light to the system for receiving the light and the system for receiving the light directs the light to the immersion grating and the immersion grating receives the light and directs the light through an optical element to the detector array.

NTIS

Gratings (Spectra); Imaging Spectrometers; Patent Applications; Spectrometers

20080032253 Jenkins, Wilson, Taylor and Hunt, P.A., Durham, NC, USA

Device for Wavelength-Selective Imaging

Frangioni, J. V., Inventor; 22 May 03; 13 pp.; In English

Contract(s)/Grant(s): DE-FG02-01ER6-3188

Patent Info.: Filed Filed 22 May 03; US-Patent-Appl-SN-10-517-280

Report No.(s): PB2007-113297; No Copyright; Avail.: CASI: [A03](#), Hardcopy

An imaging device captures both a visible light image and a diagnostic image, the diagnostic image corresponding to emissions from an imaging medium within the object. The visible light image (which may be color or grayscale) and the diagnostic image may be superimposed to display regions of diagnostic significance within a visible light image. A number of imaging media may be used according to an intended application for the imaging device, and an imaging medium may have wavelengths above, below, or within the visible light spectrum. The devices described herein may be advantageously packaged

within a single integrated device or other solid state device, and/or employed in an integrated, single-camera medical imaging system, as well as many non-medical imaging systems that would benefit from simultaneous capture of visible-light wavelength images along with images at other wavelengths.

NTIS

Display Devices; Imaging Techniques; Patent Applications; Light (Visible Radiation)

20080032256 Fish and Richardson, P.C., Minneapolis, MN, USA

Scanning Optical Devices and Systems

Favalora, G. E., Inventor; Chun, W., Inventor; Cossairt, O. S., Inventor; Dorval, R. K., Inventor; 15 Feb 05; 14 pp.; In English
Contract(s)/Grant(s): 70NAAB3H028

Patent Info.: Filed Filed 15 Feb 05; US-Patent-Appl-SN-11-058-016

Report No.(s): PB2007-113296; No Copyright; Avail.: CASI: [A03](#), Hardcopy

In general, in one aspect, the invention features an optical system which forms a light field by providing components of the light field in a series of frames to an image space. The optical system includes a spatial light modulator, a projection lens assembly configured to image the spatial light modulator to the image space for each of a plurality of optical paths, and a scanning optical component configured to direct light from the spatial light modulator through the projection lens to the image space, wherein during operation the scanning optical component directs light corresponding to successive frames along each of the plurality of optical paths through the projection lens assembly.

NTIS

Optical Equipment; Optical Scanners; Patent Applications

20080032318 Snekk and Wilmer LLP, Costa Mesa, CA, USA

Stimulated Rate Optical Power Measurement in a Fiber Optic Gyroscope

Bowser, M. P., Inventor; 2 Jun 04; 8 pp.; In English

Patent Info.: Filed Filed 2 Jun 04; US-Patent-Appl-SN-10-859-822

Report No.(s): PB2007-110540; No Copyright; Avail.: CASI: [A02](#), Hardcopy

Fiber optic gyroscopes having integrated power measurement capabilities and related methods and apparatus. More particularly, fiber optic gyroscopes having an integrated method for determining the optical power by applying an electronic stimulated rate internal to the closed loop digital electronics of the gyroscopes and monitoring the counts out per second (COPS) using each gyroscope's counts output signal. Knowing a COPS value, the optical power can be determined by dividing a constant K by the COPS value, i.e. $\text{Optical Power} = K/\text{COPS}$. The value of K is specific to each gyroscope, and can be calculated or measured.

NTIS

Fiber Optics; Gyroscopes; Interferometers; Optical Measurement

20080032320 Fitch Event Tabin and Flannery, Chicago, IL, USA

Optical Scanning Assembly

Cossairt, O. S., Inventor; Thomas, M., Inventor; Dorval, R. K., Inventor; 7 Jun 05; 27 pp.; In English

Contract(s)/Grant(s): NIST-70NANB3H3028

Patent Info.: Filed Filed 7 Jun 05; US-Patent-Appl-SN-11-146-749

Report No.(s): PB2007-110538; No Copyright; Avail.: CASI: [A03](#), Hardcopy

An image scanning assembly comprising at least two optics wherein at least one of the optics is movable relative to the other. An embodiment may be used to scan images for a 3D display.

NTIS

Optical Scanners; Assemblies

20080032323 Illinois Univ., Urbana-Champaign, IL, USA

Phase Locked Microdischarge Array and AC, RF or Pulse Excited Microdischarge

Eden, J. G., Inventor; Gao, J., Inventor; Kim, S. O., Inventor; 22 Apr 04; 10 pp.; In English

Contract(s)/Grant(s): F49620-00-1-0372

Patent Info.: Filed Filed 22 Apr 04; US-Patent-Appl-SN-10-829-666

Report No.(s): PB2007-110533; No Copyright; Avail.: CASI: [A02](#), Hardcopy

The invention is directed to a method and apparatus for phase-locking microdischarge device arrays and an ac, rf, or

pulse-excited microdischarge. The invention provides output from a non-laser optical source that is a phase-locked array of microdischarges formed of microdischarge cavities containing discharge filler and excitation electrodes. In exemplary embodiments, entire arrays of microdischarge device optical emitters that are not lasers can be fabricated into a surface area having a largest dimension smaller than the coherence length of at least one of the emissions produced by the individual elements. In other embodiments, arrays of microdischarge devices configured in a Fresnel pattern constitute a lens suitable for both producing and focusing light.

NTIS

Phase Locked Systems; Optical Equipment; Discharge; Phased Arrays

20080032334 Center for Night Vision and Electro-Optics, Fort Belvoir, VA, USA

Method for Selecting Laser Output Wavelength

Nettleton, J. E., Inventor; 8 Jul 04; 5 pp.; In English

Patent Info.: Filed 8 Jul 04; US-Patent-Appl-SN-10-885-802

Report No.(s): PB2007-113326; No Copyright; Avail.: CASI: [A01](#), Hardcopy

The device of the present invention includes a laser source which produces a laser output, an optical parametric oscillator optically connected in series to a laser source wherein the optical parametric oscillator has a predetermined polarization that can be changed and the polarization of the optical parametric oscillator can be changed such that the laser output is altered to a predetermined wavelength. The laser designator and range finder according to the invention is centered on the use of an OPO crystal in the lasing process of the laser designator. The laser designator and range finder is based on the concept that the laser pulse is highly polarized and can be efficiently converted to the eye safe 1.5 microns wavelength by changing the polarization of the laser output so that an eye safe laser output is generated. This is done either via inserting a half wave plate and rotating it without moving the OPO crystal or via inserting an Electro-Optical crystal that is capable of generating a half wave with the appropriate voltage applied.

NTIS

Laser Outputs; Wavelengths

20080032383 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Optical Vortices with Large Orbital Momentum: Generation and Interference

Savchenkov, Anatoliy A.; Matsko, Andrey B.; Grudin, Ivan; Savchenkova, Ekaterina A.; Strekalov, Dmitry; Maleki, Lute; Optics Express; April 3, 2006; Volume 14, No. 7; 10 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40877>

We demonstrate a method for generation of beams of light with large angular momenta. The method utilizes whispering gallery mode resonators that transform a plane electromagnetic wave into high order Bessel beams. Interference pattern among the beams as well as shadow pictures induced by the beams are observed and studied.

Author

Light Beams; Angular Momentum; Vortices; Shadowgraph Photography; Whispering Gallery Modes

20080032414 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Observing Exoplanets in the Mid-Ultraviolet

Heap, Sara; June 23, 2008; 1 pp.; In English; SPIE 2008: Astronomical Instrumentation, 23-28 Jun. 2008, Marseille, France; No Copyright; Avail.: Other Sources; Abstract Only

There are good reasons for pushing the spectral range of observation to shorter wavelengths than currently envisaged for terrestrial planet-finding missions utilizing with a 4-m, diffraction-limited, optical telescope: (1) The angular resolution is higher, so the image of an exoplanet is better separated from that of the much brighter star. (2) The exozodiacal background per resolution element is smaller, so exposure times are reduced for the same incident flux. (3) Most importantly, the sensitivity to the ozone biomarker is increased by several hundred-fold by access to the ozone absorption band at 250-300 nm. These benefits must be weighed against challenges arising from the faintness of exoplanets in the mid-UV. We will evaluate both the technical and cost challenges including image quality of large telescopes, advanced mirror coatings and innovative designs for enhanced optical throughput, and CCD detectors optimized for 250-400 nm.

Author

Extrasolar Planets; Planet Detection; Telescopes; Optical Properties; Design Analysis; Costs; Technology Assessment; Spectral Sensitivity; Design Optimization

20080032462 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Laser Frequency Stabilization and Control through Offset Sideband Locking to Optical Cavities

Thorpe, James I.; Livas, J.; Numata, K.; [2008]; 13 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): NNH06CC03B; Copyright; Avail.: Other Sources

We describe a class of techniques whereby a laser frequency can be stabilized to a fixed optical cavity resonance with an adjustable offset, providing a wide tuning range for the central frequency. These techniques require only minor modifications to the standard Pound-Drever-Hall locking techniques and have the advantage of not altering the intrinsic stability of the frequency reference. In a laboratory investigation the sideband techniques were found to perform equally well as the standard, non-tunable Pound-Drever-Hall technique, each providing more than four decades of frequency noise suppression over the free-running noise. An application of a tunable system as a pre-stabilization stage in a phase-lock loop is also presented with the combined system achieving a frequency noise suppression of nearly twelve orders of magnitude.

Author

Laser Stability; Frequency Stability; Optical Resonance; Cavity Resonators; Frequency Ranges; Locking; Sidebands

20080032495 National Energy Technology Lab., Morgantown, WV, USA

Solids Fraction Measurement with a Reflective Fiber Optic Probe

Yue, P. C.; Ludlow, J. C.; Shadel, L. J.; January 2007; 6 pp.; In English

Report No.(s): DE2007-912704; No Copyright; Avail.: National Technical Information Service (NTIS)

A method has been developed to extract solids fraction information from a reflective fiber optic probe. The commercially available reflective fiber optic probe was designed to measure axial particle velocity (both up and down directions). However, the reflected light intensity is related to particle size and particle concentration. A light reflection model is used to relate the reflected light intensity to solids fraction. In this model we assumed that the reflected light intensity is a fixed fraction, k_1 , of the total light intensity lost in penetration of a particle layer. Also, the solids fraction, $(1-a)$, is related to particle concentration, N , in the light path by $N = k_2 (1-a)$, where a is the void fraction. The values of k_1 and k_2 are determined from measurements made in a packed bed condition. The method allowed rapid characterization of local velocity and unambiguous solids fraction requiring only simple calibration of reflection light intensity packed beds at to determine effective number of layers and particle specific scattering.

NTIS

Fiber Optics; Solids; Specular Reflection

75

PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

20080032499 Lawrence Livermore National Lab., Livermore, CA USA

Edge Simulation Laboratory Progress and Plans

Cohen, R. H.; Jun. 06, 2007; 6 pp.; In English

Report No.(s): DE2007-912676; No Copyright; Avail.: National Technical Information Service (NTIS)

The Edge Simulation Laboratory (ESL) is a project to develop a gyrokinetic code for MFE edge plasmas based on continuum (Eulerian) techniques. ESL is a base-program activity of OFES, with an allied algorithm research activity funded by the OASCR base math program. ESL OFES funds directly support about 0.8 FTE of career staff at LLNL, a postdoc and a small fraction of an FTE at GA, and a graduate student at UCSD. In addition the allied OASCR program funds about 12 FTE each in the computations directorates at LBNL and LLNL. OFES ESL funding for LLNL and UCSD began in fall 2005, while funding for GA and the math team began about a year ago. ESLs continuum approach is a complement to the PIC-based methods of the CPES Project, and was selected (1) because of concerns about noise issues associated with PIC in the high-density-contrast environment of the edge pedestal, (2) to be able to exploit advanced numerical methods developed for fluid codes, and (3) to build upon the successes of core continuum gyrokinetic codes such as GYRO, GS2 and GENE. The ESL project presently has three components: TEMPEST, a full-f, full-geometry (singlenull divertor, or arbitrary-shape closed flux surfaces) code in E, m (energy, magnetic-moment) coordinates; EGK, a simple-geometry rapid-prototype code, presently af; and the math component, which is developing and implementing algorithms for a next-generation code. Progress would be accelerated if we could find funding for a fourth, computer science, component, which would develop software

infrastructure, provide user support, and address needs for data handling and analysis. We summarize below the status and plans for the three funded activities.

NTIS

Plasmas (Physics); Simulation

20080032606 Argonne National Lab., Idaho Falls, ID, USA

Atmospheric-Pressure Plasma Process and Applications

Kong, P.; Sep. 2006; 16 pp.; In English

Report No.(s): DE2007-911196; INL/CON-06-11092; No Copyright; Avail.: Department of Energy Information Bridge

This paper provides a general discussion of atmospheric-pressure plasma generation, processes, and applications. There are two distinct categories of atmospheric-pressure plasmas: thermal and nonthermal. Thermal atmospheric-pressure plasmas include those produced in high intensity arcs, plasma torches, or in high intensity, high frequency discharges. Although nonthermal plasmas are at room temperatures, they are extremely effective in producing activated species, e.g., free radicals and excited state atoms. Thus, both thermal and nonthermal atmospheric pressure plasmas are finding applications in a wide variety of industrial processes, e.g. waste destruction, material recovery, extractive metallurgy, powder synthesis, and energy conversion. A brief discussion of recent plasma technology research and development activities at the Idaho National Laboratory is included.

NTIS

Atmospheric Pressure; Plasma Physics; Plasmas (Physics)

20080032614 Idaho National Engineering Lab., Idaho Falls, ID, USA

Plasma Processing of Hydrocarbon. Electric Power 2007

Kong, P. C.; Detering, B. A.; Grandy, J. D.; Zuck, L. D.; May 2007; 12 pp.; In English

Report No.(s): DE2007-911914; INL/CON-06-11945; No Copyright; Avail.: National Technical Information Service (NTIS)

The Idaho National Laboratory (INL) developed several patented plasma technologies for hydrocarbon processing. The INL patents include nonthermal and thermal plasma technologies for direct natural gas to liquid conversion, upgrading low value heavy oil to synthetic light crude, and to convert refinery bottom heavy streams directly to transportation fuel products. Proof of concepts has been demonstrated with bench scale plasma processes and systems to convert heavy and light hydrocarbons to higher market value products. This paper provides an overview of three selected INL patented plasma technologies for hydrocarbon conversion or upgrade.

NTIS

Hydrocarbons; Plasmas (Physics)

76

SOLID-STATE PHYSICS

Includes condensed matter physics, crystallography, and superconductivity. For related information see also 33 *Electronics and Electrical Engineering*; and 36 *Lasers and Masers*.

20080031009 Lawrence Livermore National Lab., Livermore, CA USA; Missouri Univ., Rolla, MO, USA

Vacuum Insulator Studies for the Dielectric Wall Accelerator

Harris, J. R.; Chen, Y. J.; Blackfield, D.; Sanders, D. M.; Caporaso, G. J.; Jun. 12, 2007; 5 pp.; In English

Report No.(s): DE2007-912678; UCRL-CONF-231709; No Copyright; Avail.: Department of Energy Information Bridge

As part of our ongoing development of the Dielectric Wall Accelerator, we are studying the performance of multilayer high-gradient insulators. These vacuum insulating structures are composed of thin, alternating layers of metal and dielectric, and have been shown to withstand higher gradients than conventional vacuum insulator materials. This paper describes these structures and presents some of our recent results.

NTIS

Dielectrics; Gradients; Insulators; Vacuum; Walls

20080031010 Idaho National Engineering Lab., Idaho Falls, ID, USA

Irradiation of Metallic Fuels with Rare Earth Additions for Actinide Transmutation in the Advanced Test Reactor. Experiment Description for AFC-2A and AFC-2B

Hayes, S. L.; Mar. 01, 2007; 20 pp.; In English

Contract(s)/Grant(s): DE-AC07-99ID-13727

Report No.(s): DE2007-912470; INL/EXT-06-11707; No Copyright; Avail.: Department of Energy Information Bridge

The U.S. Advanced Fuel Cycle Initiative (AFCI), now within the broader context of the Global Nuclear Energy Partnership (GNEP), seeks to develop and demonstrate the technologies needed to transmute the long-lived transuranic actinide isotopes contained in spent nuclear fuel into shorter-lived fission products, thereby dramatically decreasing the volume of material requiring disposal and the long-term radio-toxicity and heat load of high-level waste sent to a geologic repository. One important component of the technology development is actinide-bearing metallic transmutation fuel forms containing plutonium, neptunium, americium (and possibly curium) isotopes. The proposed AFC-2A and AFC-2B irradiation experiments are a continuation of the metallic fuel test series in progress in the ATR. This report documents the experiment description and test matrix of the proposed experiments and the Post Irradiation Examination (PIE) and fabrication schedule.

NTIS

Advanced Test Reactors; Irradiation; Metal Fuels; Nuclear Fuels; Spent Fuels; Transmutation

20080031011 Brookhaven National Lab., Upton, NY, USA

Accelerating Polarized Protons to 250 GeV

Bai, M.; Ahrens, L.; Alekseev, G.; Alessi, J.; Beebe-Wang, J.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910391; BNL-77501-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

The Relativistic Heavy Ion Collider (RHIC) as the first high energy polarized proton collider was designed to provide polarized proton collisions at a maximum beam energy of 250 GeV. It has been providing collisions at a beam energy of 100 GeV since 2001. Equipped with two full Siberian snakes in each ring, polarization is preserved during the acceleration from injection to 100 GeV with careful control of the betatron tunes and the vertical orbit distortions. However, the intrinsic spin resonances beyond 100 GeV are about a factor of two stronger than those below 100 GeV making it important to examine the impact of these strong intrinsic spin resonances on polarization survival and the tolerance for vertical orbit distortions. Polarized protons were accelerated to the record energy of 250 GeV in RHIC with a polarization of 46% measured at top energy in 2006. The polarization measurement as a function of beam energy also shows some polarization loss around 136 GeV, the first strong intrinsic resonance above 100 GeV. This paper presents the results and discusses the sensitivity of the polarization survival to orbit distortions.

NTIS

Distortion; Proton Beams; Protons

20080031012 Brookhaven National Lab., Upton, NY, USA

Simulations of RHIC Coherent Stabilities due to Wakefield and Electron Cooling

Wang, G.; Blaskiewicz, M.; Jun. 2007; 5 pp.; In English

Report No.(s): DE2007-910390; BNL-77351-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

The Electron cooling beam has both coherent and incoherent effects to the circulating ion beam. The incoherent longitudinal cooling could reduce the ion beam energy spread and hence cause 'over-cooling' of the ion beam. Depending on the beam densities and cooling length, the coherent interaction between the ion and electron beam could either damp or anti-damp the ion coherent motions. Using the tracking codes, TRANFT, the threshold for 'over-cooling' has been found and compared with theoretical estimation. The transverse coherent effect of electron cooling has been implemented into the codes and its effect for the bunched ion beam is shown.

NTIS

Circulation; Cooling; Ion Beams; Simulation; Stability

20080031013 Brookhaven National Lab., Upton, NY, USA

Absolute Measurement of the Polarization of High Energy Proton Beams at RHIC

Makdisi, Y.; Bravar, A.; Bunce, G.; Gill, R.; Huang, H.; Jun. 2007; 5 pp.; In English

Report No.(s): DE2007-910389; BNL-77350-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

The spin physics program at the Relativistic Heavy Ion Collider (RHIC) requires knowledge of the beam polarization to better than 5%. Such a goal is made the more difficult by the lack of knowledge of the analyzing power of high energy nuclear

physics processes. To overcome this, a polarized hydrogen jet target was constructed and installed at one intersection region in RHIC where it intersects both beams and utilizes the precise knowledge of the jet atomic hydrogen beam polarization to measure the analyzing power in proton-proton elastic scattering in the Nuclear Coulomb Interference (CNI) region at the prescribed RHIC proton beam energy. The reverse reaction is used to assess the absolute beam polarization. Simultaneous measurements taken with fast high statistics polarimeters that measure the p-Carbon elastic scattering process also in the CNI region use the jet results to calibrate the latter. In this presentation, the status of the polarized jet target mechanics, operation, detector systems, and data analysis results are described. The statistical accuracies as well as the systematic uncertainties will be discussed.

NTIS

Proton Beams; Targets

20080031014 Brookhaven National Lab., Upton, NY, USA

Emittance Compensation for Magnetized Beams

Kewisch, J.; Chang, X.; January 2007; 6 pp.; In English

Report No.(s): DE2007-910388; BNL-77349-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

Emittance compensation is a well established technique for minimizing the emittance of an electron beam from a RF photo-cathode gun. Longitudinal slices of a bunch have a small emittance, but due to the longitudinal charge distribution of the bunch and time dependent RF fields they are not focused in the same way, so that the direction of their phase ellipses diverges in phase space and the projected emittance is much larger. Emittance compensation reverses the divergence. At the location where the slopes of the phase ellipses coincide the beam is accelerated, so that the space charge forces are reduced. For magnetized beams (where the angular momentum is non-zero) such emittance compensation is not sufficient because variations in the slice radius lead to variations in the angular speed and therefore to an increase of emittance in the rotating game. We describe a method and tools for a compensation that includes the beam magnetization.

NTIS

Electron Beams; Electron Guns; Emittance; Magnetization; Particle Accelerators

20080031015 Brookhaven National Lab., Upton, NY, USA

Low Emittance Electron Beams for the RHIC Electron Cooler

Kewisch, J.; Chang, X.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910387; BNL-77348-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

An electron cooler, based on an Energy Recovery Linac (ERL) is under development for the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory. This will be the first electron cooler operating at high energy with bunched beams. In order to achieve sufficient cooling of the ion beams the electrons have to have a charge of 5 nC and a normalized emittance less than 4 p. This paper presents the progress in optimizing the injector and the emittance improvements from shaping the charge distribution in the bunch.

NTIS

Coolers; Cooling; Electron Beams; Emittance

20080031016 Brookhaven National Lab., Upton, NY, USA

Merger System Optimization in BNL's High Current R&D ERL

Kayran, D.; Litvinenko, V. N.; Jun. 2007; 5 pp.; In English

Report No.(s): DE2007-910386; BNL-77347-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

A super-conducting RF R&D Energy recovery linac (ERL) is under construction at Brookhaven National Laboratory (BNL). This ERL will be used as a test facility to study issues relevant to high-current, high-brightness beams. One of the goals is to demonstrate an electron beam with high charge per bunch (- 5 nC) and extremely low normalized emittance (- 5 mm-mad) at an energy of 20 MeV. In contrast with operational high-brightness linear electron accelerators, all presently operating ERLs have order of magnitude larger emittances for the same charge per bunch. One reason for this emittance growth is that the merger system mixes transverse and longitudinal degrees of freedom, and consequently violates emittance compensation conditions. A merger system based on zigzag scheme resolves this problem. In this paper we discuss performance of the present design of the BNL R&D ERL injector with a zigzag merger.

NTIS

Electron Beams; High Current; Injectors; Linear Accelerators; Particle Accelerators

20080031017 Brookhaven National Lab., Upton, NY, USA

Optics of a Two-Pass ERL as an Electron Source for a Non-Magnetized RHIC-II Electron Cooler

Kayran, D.; Ben-Zvi, I.; Calaga, R.; Chang, X.; Kewisch, J.; Jun. 2007; 5 pp.; In English

Report No.(s): DE2007-910385; BNL-77346-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

Non-magnetized electron cooling of RHIC requires an electron beam energy of 54.3 MeV, electron charge per bunch of 5 nC, normalized rms beam emittance of 4 mmrad, and rms energy spread of 4×10^{-4} . In this paper we describe a lattice of a two-pass SRF energy recovery linac (ERL) and results of a PARMELA simulation that provides electron beam parameters satisfying RHIC electron cooling requirements.

NTIS

Coolers; Cooling; Electron Beams; Electron Sources; Particle Accelerators

20080031018 Brookhaven National Lab., Upton, NY, USA

Ferrite-Lined HOM Absorber for the E-Cool ERL

Hahn, H.; Hammons, L.; Naik, D.; Jun. 2007; 5 pp.; In English

Report No.(s): DE2007-910384; BNL-77345-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

An R&D Energy Recovery Linac (ERL) intended as step towards electron-cooling of RHIC-II is being constructed at this laboratory. The center piece of the project is the experimental 5-cell 703.75 MHz superconducting ECX cavity. Successful operation will depend on effective HOM suppression, and it is planned to achieve HOM damping exclusively with room temperature ferrite absorbers. A ferrite-lined pillbox test model with dimensions reflecting the operational unit was assembled and attached to the 5-cell copper cavity. The cavity resonances of the lowest dipole and monopole modes and their damping due to the ferrite were determined.

NTIS

Cavity Resonators; Cooling; Ferrites

20080031019 Brookhaven National Lab., Upton, NY, USA; Tech-X Corp., Boulder, CO, USA; Joint Inst. for Nuclear Research, Dubna, Russian Federation

Electron Cooling in the Presence of Undulator Fields

Fedotov, A. V.; Ben-Zvi, I.; Kayran, D.; Litvinenko, V. N.; Pozdeyev, E.; Jun. 2007; 5 pp.; In English

Report No.(s): DE2007-910383; BNL-77344-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

The design of the higher-energy cooler for Relativistic Heavy Ion Collider (RHIC) recently adopted a nonmagnetized approach which requires a low temperature electron beam. However, to avoid significant loss of heavy ions due to recombination with electrons in the cooling section, the temperature of the electron beam should be high. These two contradictory requirements are satisfied in the design of the RHIC cooler with the help of the undulator fields. The model of the friction force in the presence of an undulator field was benchmarked vs direct numerical simulations with an excellent agreement. Here, we discuss cooling dynamics simulations with a helical undulator, including recombination suppression and resulting luminosities.

NTIS

Cooling; Particle Accelerators; Simulation

20080031020 Johns Hopkins Univ., Baltimore, MD, USA

Discovery and Measurement of Excited B Hadrons at the Collider Detector at Fermilab

Pursley, J. M.; Aug. 2007; 310 pp.; In English

Report No.(s): DE2007-913190; No Copyright; Avail.: National Technical Information Service (NTIS)

;Partial Contents: Introduction; Theoretical Motivation; Experimental Apparatus; Data and Monte Carlo Samples; Measurements; Systematic Error Analysis; Summary; Hadronic Two Displaced Track SVT Trigger; Analysis Quality Requirements; Bibliography.

NTIS

Hadrons; Actuators; High Energy Interactions

20080031035 Brookhaven National Lab., Upton, NY, USA

High-Energy Electron Cooling Based on Realistic Six Dimensional Distribution of Electrons

Fedotov, A. V.; Ben-Zvi, I.; Kayran, D.; Pozdeyev, E.; Sidorin, A.; Jun. 2007; 5 pp.; In English

Report No.(s): DE2007-910381; BNL-77342-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

The high-energy electron cooling system for RHIC-II is unique compared to standard coolers. It requires bunched electron

beams. Electron bunches are produced by an Energy Recovery Linac (ERL), and cooling is planned without longitudinal magnetic field. To address unique features of the RHIC cooler, a generalized treatment of cooling force was introduced in BETACOOE code which allows us to calculate friction force for an arbitrary distribution of electrons. Simulations for RHIC cooler based on electron distribution from ERL are presented.

NTIS

Cooling; Electron Beams; Electron Bunching; Electrons; Storage Rings (Particle Accelerators)

20080031057 Brookhaven National Lab., Upton, NY, USA

RHIC Plans Towards Higher Luminosity

Fedotov, A. V.; Jun. 2007; 7 pp.; In English

Report No.(s): DE2007-910382; BNL-77343-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

The Relativistic Heavy Ion Collider (RHIC) is designed to provide luminosity over a wide range of beam energies and species, including heavy ions, polarized protons, and tric beam collisions. In the first seven years of operation there has been a rapid increase in the achieved peak and average luminosity, substantially exceeding design values. Work is presently underway to achieve the Enhanced Design parameters. Planned major upgrades include the Electron Beam Ion Source (EBIS), RHIC-11, and construction of an electron-ion collider (eRHIC). We review the expected RHIC upgrade performance. Electron cooling and its impact on the luminosity both for heavy ions and protons are discussed in detail.

NTIS

Cooling; Heavy Ions; Luminosity; Protons

20080031058 Brookhaven National Lab., Upton, NY, USA

Multipacting Analysis of a Quarter Wave Choke Joint Used for Insertion of a Demountable Cathode into a SRF Photoinjector

Burrill, A.; Ben-Zvi, I.; Cole, M.; Rathke, J.; Kneisel, P.; Jun. 2007; 5 pp.; In English

Report No.(s): DE2007-910380; BNL-77341-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

The multipacting phenomena in accelerating structures and coaxial lines are well documented and methods of mitigating or suppressing it are understood. The multipacting that occurs in a quarter wave choke joint designed to mount a cathode insertion stalk into a superconducting RF photoinjector has been analyzed via calculations and experimental measurements and the effect of introducing multipacting suppression grooves into the structure is analyzed. Several alternative choke joint designs are analyzed and suggestions made regarding future choke joint development. Furthermore, the problems encountered in cleaning the choke joint surfaces, factors important in changes to the secondary electron yield, are discussed and evaluated. This design is being implemented on the BNL 1.3 GHz photoinjector, previously used for measurement of the quantum efficiency of bare Nb, to allow for the introduction of other cathode materials for study, and to verify the design functions properly prior to constructing our 703 MHz photoinjector with a similar choke joint design.

NTIS

Cathodes; Radio Frequencies; Superconductivity

20080031059 Brookhaven National Lab., Upton, NY, USA

Challenges ENcountered During the Processing of the BNL ERL 5 Cell Accelerating Cavity

Burrill, A.; Ben-Zvi, I.; Calaga, R.; Hahn, H.; Litvinenko, V.; Jun. 2007; 5 pp.; In English

Report No.(s): DE2007-910379; BNL-77340-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

One of the key components for the Energy Recovery Linac being built by the Electron cooling group in the Collider Accelerator Department is the 5 cell accelerating cavity which is designed to accelerate 2 MeV electrons from the gun up to 15-20 MeV, allow them to make one pass through the ring and then decelerate them back down to 2 MeV prior to sending them to the dump. This cavity was designed by BNL and fabricated by AES in Medford, NY. Following fabrication it was sent to Thomas Jefferson Lab in VA for chemical processing, testing and assembly into a string assembly suitable for shipment back to BNL for integration into the ERL. The steps involved in this processing sequence will be reviewed and the deviations from processing of similar SRF cavities will be discussed. The lessons learned from this process are documented to help future projects where the scope is different from that normally encountered.

NTIS

Cavities; Electron Beams; Linear Accelerators; Particle Accelerators

20080031071 Brookhaven National Lab., Upton, NY, USA

Simulations of the AGS MMPS Storing Energy in Capacitor Banks

Marnieris, I.; Badea, V. S.; Bonati, R.; Roser, T.; Sandberg, J.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910414; BNL-77541-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

The Brookhaven AGS Main Magnet Power Supply (MMPS) is a thyristor control supply rated at 5500 Amps, +/-9000 Volts. The peak magnet power is 50 MWatts. The power supply is fed from a motor generator manufactured by Siemens. The generator is 3 phase 7500 Volts rated at 50 MVA. The peak power requirements come from the stored energy in the rotor of the motor generator. The motor generator is about 45 years old, made by Siemens and it is not clear if companies will be manufacturing similar machines in the future. We are therefore investigating different ways of storing energy for future AGS MMPS operations. This paper will present simulations of a power supply where energy is stored in capacitor banks. Two dc to dc converters will be presented along with the control system of the power section. The switching elements will be IGCT's made by ABB. The simulation program used is called PSIM version 6.1. The average power from the local power authority into the power supply will be kept constant during the pulsing of the magnets at +1-50 MW. The reactive power will also be kept constant below 1.5 MVAR. Waveforms will be presented.

NTIS

Capacitors; Energy Storage; Linear Accelerators; Particle Accelerators; Simulation

20080031072 Brookhaven National Lab., Upton, NY, USA

Online Nonlinear Chromaticity Correction Using Off-Momentum Tune Response Matrix

Luo, Y.; Fischer, W.; Tepikian, S.; Trbojevic, D.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910413; BNL-77538-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

In this article, we propose a method for the online nonlinear chromaticity correction at store in the Relativistic Heavy Ion Collider (RHIC). With 8 arc sextupole families in each RHIC ring, the nonlinear chromaticities can be minimized online by matching the off-momentum tunes onto the wanted tunes given by the linear chromaticities. The Newton method is used for this multi-dimensional nonlinear optimization, where the off-momentum tune response matrix with respect to sextupole strength changes is adopted. The off-momentum tune response matrix can be calculated with the online accelerator optics model or directly measured with the real beam. In this article, the correction algorithm for the RHIC is presented. Simulations are also carried out to verify the method. The preliminary results from the beam experiments taken place in the RHIC 2007 Au run are reviewed.

NTIS

Algorithms; Color; Correction; Momentum; Nonlinearity

20080031073 Brookhaven National Lab., Upton, NY, USA

Dynamic Aperture Evaluation at the Current Working Point for RHIC Polarized Proton Operation

Luo, Y.; Bai, M.; Beebe-Wang, J.; Fischer, W.; Jain, A.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910412; BNL-77537-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

With the updated multipole magnet field errors in the interaction region, detailed dynamic aperture studies are carried out around the current RHIC polarized proton working point.

NTIS

Apertures; Errors; Multipoles; Particle Acceleration; Protons

20080031074 Brookhaven National Lab., Upton, NY, USA

Beam-Based Sextupole Polarity Verification in the RHIC/

Luo, Y.; Satogata, T.; Cameron, P.; Dellapenna, A.; Trbojevic, D.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910411; BNL-77536-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

This article presents a beam-based method to check RHIC arc sextupole polarities using local horizontal orbit three-bumps at injection energy. We use 11 bumps in each arc, each covering two SFs (focusing sextupoles) and one SD (defocusing sextupole). If there are no wrong sextupole polarities, the tune shifts from bump to bump and the tune shift patterns from arc to arc should be similar. Wrong sextupole polarities can be easily identified from mismatched signs or amplitudes of tune shifts from bump to bump and/or from arc to arc. Tune shifts in both planes during this study were tracked with a high-resolution baseband tunemeter (BBQ) system. This method was successfully used to the sextupole polarity check in RHIC Blue and Yellow rings in the RHIC 2006 and 2007 runs.

NTIS

Particle Accelerators; Polarity; Defocusing

20080031075 Brookhaven National Lab., Upton, NY, USA

Measurement and Correction of Third Resonance Driving Term in the RHIC

Luo, Y.; Bai, M.; Calaga, R.; Bengtsson, J.; Fischer, W.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910410; BNL-77535-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

To further improve the luminosity in polarized proton operation of the Relativistic Heavy Ion Collider, correction of the horizontal two-third resonance at store is desirable. The long-lasting coherent beam oscillations, produced by the AC dipole, are used to measure 3Q_x's resonance driving term through the analysis of turn-by-turn beam position data with the algorithm outlined by J. Bengtsson. The resonance driving term h_{30000c} can be compensated with the 12 arc chromatic sextupole families. In this article, we will review the technique of h_{30000c} resonance driving term's measurement and correction with AC dipole excitation in the RHIC, followed by the preliminary beam experiment results from the RHIC 2006 polarized proton run.

NTIS

Luminosity; Particle Accelerators; Protons

20080031076 Brookhaven National Lab., Upton, NY, USA

Status of R&D Energy Recovery LINAC at Brookhaven National Laboratory

Litvinenko, V.; Alduino, J.; Beavis, D.; Ben-Zvi, I.; Blaskiewicz, M.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910409; BNL-77534-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

In this paper we present status and plans for the 20-MeV R&D energy recovery linac (ERL), which is under construction at Collider Accelerator Department at BNL. The facility is based on high current (up to 0.5 A of average current) super-conducting 2.5 MeV RF gun, single-mode super-conducting 5-cell RF linac and about 20-m long return loop with very flexible lattice. The R&D ERL, which is planned for commissioning in early 2009, aims to address many outstanding questions relevant for high current, high brightness energy-recovery linacs.

NTIS

Linear Accelerators; Particle Accelerators

20080031077 Brookhaven National Lab., Upton, NY, USA

Dispersion Tolerance Calculation for NSLS-II

Lin, F.; Guo, W.; Krinsky, S.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910408; BNL-77532-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

In this paper we discuss the effect on the emittance of the residual dispersion in the insertion devices. The dispersion in the straights could be generated by the lattice error, trim dipole, and insertion device. The effect on the emittance is examined, and the dispersion tolerances are given for the NSLS-II.

NTIS

Light Sources; Particle Accelerators

20080031078 Brookhaven National Lab., Upton, NY, USA; Indiana Univ., Bloomington, IN, USA

Investigation of Residual Vertical Intrinsic Resonances with Dual Partial Siberian Snakes in the AGS

Lin, F.; Lee, S. Y.; Ahrens, L. A.; Bai, M.; Brown, K. A.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910407; BNL-77531-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

Two partial helical dipole snakes were found to be able to overcome all imperfection and intrinsic spin resonances provided that the vertical betatron tunes were maintained in the spin tune gap near the integer 9. Recent vertical betatron tune scan showed that the two weak resonances at the beginning of the acceleration cycle may be the cause of polarization loss. This result has been confirmed by the vertical polarization profile measurement, and spin tracking simulations. Possible cure of the remaining beam polarization is discussed.

NTIS

Particle Accelerators; Snakes

20080031079 Brookhaven National Lab., Upton, NY, USA

Study of the RHIC BPM SMA Connector Failure Problem

Liaw, C. J.; Sikora, R.; Schroeder, R.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910406; BNL-77530-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

About 730 BPMs are mounted on the RHIC CQS and Triplet super-conducting magnets. Semi-rigid coaxial cables are

used to bring the electrical signal from the BPM feedthroughs to the outside flanges at the ambient temperature. Every year around 10 cables will lose their signals during the operation. The connection usually failed at the warm end of the cable. The problems were either the solder joint failed or the center conductor retracted out of the SMA connector. Finite element analyses were performed to understand the failure mechanism of the solder joint. The results showed that (1) The SMA center conductor can separate from the mating connector due to the thermal retraction. (2) The maximum thermal stress at the warm end solder joint can exceed the material strength of the Pb371Sn63 solder material and (3) The magnet ramping frequency (-10 Hz), during the machine startup, can possibly resonate the coaxial cable and damage the solder joints, especially when a fracture is initiated. Test results confirmed that by using the silver bearing solder material (a higher strength material) and by crimping the cable at the locations close to the SMA connector (to prevent the center conductor from retracting) can effectively resolve the connector failure problem.

NTIS

Beams (Radiation); Connectors; Failure; Monitors; Particle Accelerators

20080031080 Brookhaven National Lab., Upton, NY, USA

Overcoming Depolarizing Resonances in the AGS with Two Helical Partial Siberian Snakes

Huang, H.; Ahrens, L.; Bai, M.; Brown, K. A.; Gardner, C.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910405; BNL-77529-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

Dual partial snake scheme has provided polarized proton beams with 1.5×10^{11} intensity and 65% polarization for the Relativistic Heavy Ion Collider (RHIC) spin program. To overcome the residual polarization loss due to horizontal resonances in the Brookhaven Alternating Gradient Synchrotron (AGS), a new string of quadrupoles have been added. The horizontal tune can then be set in the spin tune gap generated by the two partial snakes, such that horizontal resonances can also be avoided. This paper presents the accelerator setup and preliminary results.

NTIS

Depolarization; Proton Beams; Snakes

20080031081 Brookhaven National Lab., Upton, NY, USA

Diagnostics of BNL ERL

Pozdeyev, E.; Ben-Zvi, I.; Cameron, P.; Drees, A.; Gassner, D.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910419; BNL-77548-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

The ERL Prototype project is currently under development at the Brookhaven National Laboratory. The ERL is expected to demonstrate energy recovery of high intensity beams with a current of up to a few hundred milliamps, while preserving the emittance of bunches with a charge of a few nanocoulombs produced by a high current SRF gun. To successfully accomplish this task the machine will include beam diagnostics that will be used for accurate characterization of the three dimensional beam phase space at the injection and recirculation energies, transverse and longitudinal beam matching, orbit alignment, beam current measurement, and machine protection. This paper outlines requirements on the ERL diagnostics and describes its setup and modes of operation.

NTIS

Diagnosis; Linear Accelerators; Beam Currents

20080031082 Brookhaven National Lab., Upton, NY, USA

Touschek Lifetime Calculations and Simulations for NSLS-II

Montag, C.; Bengtsson, J.; Nash, B.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910417; BNL-77545-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

The beam lifetime in most medium energy synchrotron radiation sources is limited by the Touschek effect, which describes the momentum transfer from the transverse into the longitudinal direction due to binary collisions between electrons. While an analytical formula exists to calculate the resulting lifetime, the actual momentum acceptance necessary to perform this calculation can only be determined by tracking. This is especially the case in the presence of small vertical apertures at insertion devices. In this case, nonlinear betatron coupling leads to beam losses at these vertical aperture restrictions. In addition, a realistic model of the storage ring is necessary for calculation of equilibrium beam sizes (particularly in the vertical direction) which are important for a self-consistent lifetime calculation.

NTIS

Electron Beams; Particle Accelerators; Simulation; Storage Rings (Particle Accelerators); Synchrotron Radiation

20080031083 Brookhaven National Lab., Upton, NY, USA

Ion Trapping and Cathode Bombardment by Trapped Ions in DC Photoguns

Pozdeyev, E.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910418; BNL-77546-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

DC photoguns are used to produce high-quality, high intensity electron beams for accelerator driven applications. Ion bombardment is believed to be the major cause of degradation of the photocathode efficiency. Additionally to ions produced in the accelerating cathode-anode gap, the electron beam can ionize the residual gas in the transport line. These ions are trapped transversely within the beam and can drift back to the accelerating gap and can contribute to the bombardment rate of the cathode. This paper proposes a method to reduce the flow of ions produced in the beam transport line and drifting back to the cathode anode gap by introducing a positive potential barrier that repels the trapped ions. The reduced ion bombardment rate and increased life time of photocathodes will reduce the downtime required to service photoinjectors and associated costs.

NTIS

Cathodes; Electron Beams; Ion Irradiation; Particle Accelerators

20080031084 Brookhaven National Lab., Upton, NY, USA

Low Gamma(t) Injection Lattice for Polarized Protons in RHIC

Montag, C.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910416; BNL-77544-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

Polarized protons are injected into the Relativistic Heavy Ion Collider (RHIC) just above transition energy. When installation of a cold partial Siberian snake in the AGS required lowering the injection energy by $\Delta\gamma = 0.56$, the transition energy in RHIC had to be lowered accordingly ensure proper longitudinal matching. This paper presents lattice modifications implemented to lower the transition energy by $\Delta\gamma(\text{sub } t) = 0.8$.

NTIS

Injection; Nucleon-Nucleon Interactions; Particle Accelerators; Protons

20080031085 Brookhaven National Lab., Upton, NY, USA

Study of Electron-Proton Beam-Beam Interaction in eRHIC

Hao, Y.; Litvinenko, V. N.; Montag, C.; Pozdeyev, E.; Ptitsyn, V.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910404; BNL-77528-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

Beam-beam effects present one of major factors limiting the luminosity of colliders. In the linac-ring option of eRHIC design, an electron beam accelerated in a superconducting energy recovery linac collides with a proton beam circulating in the RHIC ring. There are some features of beam-beam effects, which require careful examination in linac-ring configuration. First, the beam-beam interaction can induce specific head-tail type instability of the proton beam referred to as kink instability. Thus, beam stability conditions should be established to avoid proton beam loss. Also, the electron beam transverse disruption by collisions has to be evaluated to ensure beam quality is good enough for the energy recovery pass. In addition, fluctuations of electron beam current and/or electron beam size, as well as transverse offset, can cause proton beam emittance growth. The tolerances for those factors should be determined and possible countermeasures should be developed to mitigate the emittance growth. In this paper, a soft Gaussian strong-strong simulation is used to study all of mentioned beam-beam interaction features and possible techniques to reduce the emittance growth.

NTIS

Beam Interactions; Emittance; Particle Accelerators; Simulation

20080031086 Brookhaven National Lab., Upton, NY, USA

Near-Integer Working Point for Polarized Protons in the Relativistic Heavy Ion Collider

January 2007; 5 pp.; In English

Report No.(s): DE2007-910415; BNL-77543-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

To achieve the RHIC polarized proton enhanced luminosity goal of $150.10(30)\text{cm}^{-2}\text{sec}^{-1}$ on average in stores at 250 GeV, the luminosity needs to be increased by a factor of 3 compared to what was achieved in 2006. Since the number of bunches is already at its maximum of 111, limited by the injection kickers and the experiments' time resolution, the luminosity can only be increased by either increasing the bunch intensity and/or reducing the beam emittance. This leads to a larger beam-beam tunes parameter. Operations during 2006 has shown that the beam-beam interaction is already dominating the

luminosity lifetime. To overcome this limitation, a near-integer working point is under study. We will present recent results of these studies.

NTIS

Integers; Particle Accelerators; Protons

20080031087 Brookhaven National Lab., Upton, NY, USA; European Organization for Nuclear Research, Geneva, Switzerland; Ecole Polytechnique Federale de Lausanne, Switzerland

Transverse Beam Transfer Functions of Colliding Beams in RHIC

Fischer, W.; Blaskiewicz, M.; Calaga, R.; Cameron, P.; Luo, Y.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910403; BNL-77526-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

We use transverse beam transfer functions to measure tune distributions of colliding beams in RHIC. The tune has a distribution due to the beam-beam interaction, nonlinear magnetic fields -- particularly in the interaction region magnets, and non-zero chromaticity in conjunction with momentum spread. The measured tune distributions are compared with calculations.

NTIS

Transfer Functions; Beam Interactions

20080031186 Brookhaven National Lab., Upton, NY, USA

Complete Scheme of Ionization Cooling for a Muon Collider

Palmer, R. B.; Berg, J. S.; Fernow, R. C.; Gallardo, J. C.; Kirk, H. G.; Jun. 2007; 5 pp.; In English

Report No.(s): DE2007-910370; BNL-78088-2007-CP; No Copyright; Avail.: National Technical Information Service (NTIS)

A complete scheme for production and cooling a muon beam for three specified muon colliders is presented. Parameters for these muon colliders are given. The scheme starts with the front end of a proposed neutrino factory that yields bunch trains of both muon signs. Emittance exchange cooling in slow helical lattices reduces the longitudinal emittance until it becomes possible to merge the trains into single bunches, one of each sign. Further cooling in all dimensions is applied to the single bunches in further slow helical lattices. Final transverse cooling to the required parameters is achieved in 50 T solenoids using high TC superconductor at 4 K. Preliminary simulations of each element are presented.

NTIS

Cooling; Ionization; Muons; Particle Accelerators

20080031187 Brookhaven National Lab., Upton, NY, USA

Working Group 1 Summary for the 2006 FFAG Workshop at KURRI

Berg, J. S.; Jan. 2007; 6 pp.; In English

Report No.(s): DE2007-910369; BNL-78085-2007-CP; No Copyright; Avail.: National Technical Information Service (NTIS)

This paper summarizes the workshop presentations at the 2006 FFAG Workshop at KURRI related to FFAG use for muons. The particular topics covered were harmonic number jump acceleration, ionization cooling, PRISM and muon phase rotation, tracking and error analysis, and our understanding of scaling and non-scaling FFAGs.

NTIS

Gradients; Muons; Accelerators

20080031188 Brookhaven National Lab., Upton, NY, USA

Harmonic Number Jump in a Ring with Cavities Distributed Everywhere

Berg, J. S.; Jan. 2007; 10 pp.; In English

Report No.(s): DE2007-910368; BNL-78084-2007-CP; No Copyright; Avail.: National Technical Information Service (NTIS)

One of the primary motivations for using fixed field alternating gradient accelerators (FFAGs) is their ability to accelerate rapidly, since the magnetic fields do not need to be varied. However, one must then face the difficulty that the time of flight in an FFAG depends strongly on the particle energy. Traditionally, this is dealt with by varying the RF frequency. The rate at which one can vary the RF frequency is limited, and a cavity and power source which have a rapidly varying RF frequency are costly. One solution to this is harmonic number jump acceleration (Alessandro G. Ruggiero, Phys. Rev. ST Accel. Beams 9, 100101 (2006)), where the RF frequency is fixed. The RF frequency is chosen so that each turn has an integer number of

RF periods, but that integer number is different on each turn. When accelerating rapidly, a large number of cavities is often required. This paper will show that in general, the time of flight can only be an integer number of RF periods for all turns at one position in the ring. It will then compute how well one can do when cavities are distributed everywhere in the ring. The paper will show some examples, and will discuss possible applications for this technique.

NTIS

Cavities; Gradients

20080031189 Brookhaven National Lab., Upton, NY, USA

Methods for Addressing the Problem of the Dependence of the Time of Flight on Transverse Amplitude in Linear Non-Scaling FFAGs

Berg, J. S.; Jan. 2007; 8 pp.; In English

Report No.(s): DE2007-910367; BNL-78083-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

Because the time of flight in a linear non-scaling FFAG depends on the transverse amplitude, motion in the longitudinal plane will be different for different transverse particle amplitudes. This effect, if not considered, will lead the failure of a substantial portion of the beam to be accelerated. I will first briefly review this effect. Then I will outline some techniques for addressing the problems created by the effect. In particular, I will discuss partially correcting the chromaticity and increasing the energy gain per cell. I will discuss potential problems with another technique, namely the introduction of higher harmonic cavities.

NTIS

Gradients; Accelerators; Correction; Failure

20080031190 Uppsala Univ., Uppsala, Sweden

Resonant Inelastic X-ray Scattering of Rare-Earth and Copper Systems

Kvashnina, K.; January 2006; 194 pp.; In English

Report No.(s): DE2007-910327; No Copyright; Avail.: National Technical Information Service (NTIS)

The rare earth elements have unique and important impact on technology. The unfilled f shell of rare earth elements gives them special properties, which are used to develop many new materials such as phosphors, magnetic and magnetostrictive materials and hydrogen storage materials. The rare earth materials represent a very big field of research that has undergone a rapid growth with the application of several experimental techniques and important theoretical aspects. Rontgens discovery of X-rays in 1895 became central to the development of modern physics. It has subsequently influenced fields as chemical physics, nuclear physics, biophysics and led the development of techniques such as Auger, Raman, X-ray photoelectron spectroscopy, X-ray diffraction, Protein Crystallography, X-ray lithography.

NTIS

Copper; Inelastic Scattering; Rare Earth Elements; X Ray Scattering

20080031540 Fermi National Accelerator Lab., Batavia, IL, USA

FermiGrid

Yocum, D. R.; Berman, E.; Canal, P.; Chadwick, K.; Hesselroth, T.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910480; FERMILAB-CONF-07-125-CD; No Copyright; Avail.: Department of Energy Information Bridge

As one of the founding members of the Open Science Grid Consortium (OSG), Fermilab enables coherent access to its production resources through the Grid infrastructure system called FermiGrid. This system successfully provides for centrally managed grid services, opportunistic resource access, development of OSG Interfaces for Fermilab, and an interface to the Fermilab dCache system. FermiGrid supports virtual organizations (VOs) including high energy physics experiments (USCMS, MINOS, D0, CDF, ILC), astrophysics experiments (SDSS, Au-ger, DES), biology experiments (GADU, Nanohub) and educational activities.

NTIS

High Energy Interactions; Astrophysics

20080031541 Fermi National Accelerator Lab., Batavia, IL, USA

Electron Cloud in the Fermilab Booster

Ng, K. Y.; January 2007; 4 pp.; In English

Report No.(s): DE2007-910470; FERMILAB-CONF-07-140-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

Simulations of the Fermilab Booster reveal a substantial electron-cloud buildup both inside the unshielded combined-

function magnets and the beam pipes joining the magnets, when the second-emission yield (SEY) is larger than approximately 1.6. The implication of the electron-cloud effects on space charge and collective instabilities of the beam is discussed.

NTIS

Electron Clouds; Space Charge; Simulation

20080031544 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA

JLAB High-Current CW Cryomodules for ERL and FEL Applications

Rimmer, R. A.; Bundy, R.; Cheng, G.; Ciovati, G.; Daly, E. F.; January 2007; 3 pp.; In English

Report No.(s): DE2007-910460; No Copyright; Avail.: National Technical Information Service (NTIS)

We describe the activities underway at JLab to develop new CW cryomodules capable of transporting up to Ampere-levels of beam currents for use in ERLs and FELs. Goals include an efficient cell shape, high packing factor for efficient real-estate gradient and very strong HOM damping to push BBU thresholds up by two or more orders of magnitude compared to existing designs. Cavity shape, HOM damping and ancillary components are optimized for this application. Designs are being developed for low-frequency (750 MHz), Ampere-class compact FELs and for high-frequency (1.5 GHz), 100 mA configurations. These designs and concepts can easily be scaled to other frequencies. We present the results of conceptual design studies, simulations and prototype measurements. These modules are being developed for the next generation ERL based high power FELs but may be useful for other applications such as high energy light sources, electron cooling, electron-ion colliders, industrial processing etc.

NTIS

Beam Currents; Continuous Radiation; Free Electron Lasers; High Current; Linear Accelerators

20080031546 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA

Beat Frequency RF Modulator for Generation of Low Repetition Rate Electron Microbunches for the CEBAF Polarized Source

Musson, J.; Grames, J.; Hansknecht, J.; Kazimi, R.; Poelker, M.; January 2007; 3 pp.; In English

Report No.(s): DE2007-910457; No Copyright; Avail.: National Technical Information Service (NTIS)

Fiber-based drive lasers now produce all of the spin-polarized electron beams at CEBAF/Jefferson Lab. The flexibility of these drive lasers, combined with the existing three-beam CEBAF photoinjector Chopper, provides a means to implement a beat frequency technique to produce long time intervals between individual electron microbunches (tens of nanoseconds) by merely varying the nominal 499 MHz drive laser frequency by < 20%. This submission describes the RF Laser modulator that uses a divider and heterodyne scheme to maintain coherence with the accelerator Master Oscillator (MO), while providing delay resolution in increments of 2ns. Some possible uses for such a beam are discussed as well as intended future development.

NTIS

Beat Frequencies; Lasers; Light Modulation; Linear Accelerators; Modulators; Oscillators; Particle Accelerators; Radiation Sources; Radio Frequencies; Radio Waves

20080031547 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA

Generation and Control of High Precision Beams at Lepton Accelerators

Chao, Y.; January 2007; 6 pp.; In English

Report No.(s): DE2007-910450; No Copyright; Avail.: National Technical Information Service (NTIS)

Parity violation experiments require precision manipulation of helicity-correlated beam coordinates on target at the nm/nrad-level. Achieving this unprecedented level of control requires a detailed understanding of the particle optics and careful tuning of the beam transport to keep anomalies from compromising the design adiabatic damping. Such efforts are often hindered by machine configuration and instrumentation limitations at the low energy end. A technique has been developed at CEBAF including high precision measurements, Mathematica-based analysis for obtaining corrective solutions, and control hardware/software developments for realizing such level of control at energies up to 5 GeV.

NTIS

Leptons; Linear Accelerators; Particle Accelerators

20080031548 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA; Brookhaven National Lab., Upton, NY USA; Argonne National Lab., IL USA; Joint Inst. for Nuclear Research, Dubna, Russian Federation

Design Studies of High-Luminosity Ring-Ring Electron-Ion Collider at CEBAF

Bogacz, A.; Brindza, P.; Bruell, A.; Cardman, L.; Delayen, J.; January 2007; 3 pp.; In English

Report No.(s): DE2007-910449; No Copyright; Avail.: National Technical Information Service (NTIS)

Experimental studies of fundamental structure of nucleons require an electron-ion collider of a center-of-mass energy up to 90 GeV at luminosity up to 10^{35} cm⁻²s⁻¹ with both beams polarized. A CEBAF-based collider of 9 GeV electrons/positrons and 225 GeV ions is envisioned to meet this science need and as a next step for CEBAF after the planned 12 GeV energy upgrade of the fixed target program. A ring-ring scheme of this collider developed recently takes advantage of the existing polarized electron CW beam from the CEBAF and a green-field design of an ion complex with electron cooling. We present a conceptual design and report design studies of this high-luminosity collider.

NTIS

Linear Accelerators; Luminosity; Nucleons; Particle Accelerators

20080031549 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA; Peking Univ., Beijing, China

Energy Recovery Transport Design for PKU FEL

Wang, G.; Chao, Y.; Zhao, K.; Lu, X.; Zhuang, J.; January 2007; 3 pp.; In English

Report No.(s): DE2007-910448; No Copyright; Avail.: Department of Energy Information Bridge

A SRF linac based free electron laser user facility is under developed at Peking University. Energy recovery Linac technology was chosen for increase of average electron beam current, hence, increase of the free electron laser power. In this paper we present a conceptual design of beam transport line which satisfies requirement of ERL. A chicane consisting of four identical bend magnets is selected for path length adjustment up to - 18 degree. R56 of both arcs of the beam line is adjustable for full bunch compression.

NTIS

Beam Currents; Electron Beams; Energy Transfer; Free Electron Lasers; Linear Accelerators

20080031553 Brookhaven National Lab., Upton, NY, USA

Analysis and Simulation of Main Magnet Transmission Line Effect

Zhang, W.; Marnieris, I.; Sandberg, J.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910433; BNL-77668-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

A main magnet chain forms a pair of transmission lines. Pulse-reflection-caused voltage and current differentiation throughout the magnet chain can have adverse effect on main magnet field quality. This effect is associated with magnet system configuration, coupling efficiency, and parasitic parameters. A better understanding of this phenomenon will help us in new design and existing system upgrade. In this paper, we examine the transmission line effect due to different input functions as well as configuration, coupling, and other parameters.

NTIS

Magnetic Fields; Magnets; Simulation; Transmission Lines

20080031554 Brookhaven National Lab., Upton, NY, USA

Simplified Approach to Analyze and Model Inductive Voltage Adder

Zhang, W.; Eng, W.; Pai, C.; Sandberg, J.; Tan, Y.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910432; BNL-77667-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

We have recently developed a simplified model and a set of simple formulas for inductive voltage adder design. This model reveals the relationship of output waveform parameters and hardware designs. A computer simulation has demonstrated that parameter estimation based on this approach is accurate as compared to an actual circuit. This approach can be used in early stages of project development to assist feasibility study, geometry selection in engineering design, and parameter selection of critical components. In this paper, we give the deduction of a simplified model. Among the estimation formulas we present are those for pulse rise time, system impedance, and number of stages. Examples are used to illustrate the advantage of this approach. This approach is also applicable to induction LINAC design.

NTIS

Electric Potential; Linear Accelerators; Computerized Simulation

20080031555 Brookhaven National Lab., Upton, NY, USA

Large Scale Distributed Parameter Model of Main Magnet System and Frequency Decomposition Analysis

Zhang, W.; Marnieris, I.; Sandberg, J.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910431; BNL-77666-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

Large accelerator main magnet system consists of hundreds, even thousands, of dipole magnets. They are linked together under selected configurations to provide highly uniform dipole fields when powered. Distributed capacitance, insulation resistance, coil resistance, magnet inductance, and coupling inductance of upper and lower pancakes make each magnet a complex network. When all dipole magnets are chained together in a circle, they become a coupled pair of very high order complex ladder networks. In this study, a network of more than thousand inductive, capacitive or resistive elements are used to model an actual system. The circuit is a large-scale network. Its equivalent polynomial form has several hundred degrees. Analysis of this high order circuit and simulation of the response of any or all components is often computationally infeasible. We present methods to use frequency decomposition approach to effectively simulate and analyze magnet configuration and power supply topologies.

NTIS

Decomposition; Frequencies; Magnets; Particle Accelerators; Supplying

20080031556 Brookhaven National Lab., Upton, NY, USA

Progress in Tune, Coupling, and Chromaticity Measurement and Feedback during RHIC Run 7

Cameron, P.; Cupolo, J.; Dawson, W. C.; Degen, C.; Penna, A. D.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910430; BNL-77664-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

The authors report on progress in tune, coupling, and chromaticity measurement and feedback, and discuss the relevance of the results to LHC commissioning. The focus of this paper is on unexpected difficulties encountered during the ongoing Run7.

NTIS

Color; Feedback; Particle Accelerators

20080031557 Brookhaven National Lab., Upton, NY, USA

Observation of Experimental Background in RHIC Polarized Proton Run 2006

Zhang, S. Y.; Trbojevic, D.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910429; BNL-77564-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

The beam-gas has affected STAR background in RHIC proton Run 2005, but not in Run 2006. With higher beam intensity in Run 2008, the beam-gas effect at STAR may be of concern. The ratio of ZDC background and coincident rate seems to be useful in proton runs in evaluating the experimental background.

NTIS

Particle Accelerators; Protons

20080031558 Brookhaven National Lab., Upton, NY, USA

Proton Beam Emittance Growth at RHIC

Zhang, S. Y.; Ptitsyn, V.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910428; BNL-77563-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

With significant beam intensity improvement in RHIC polarized proton runs in 2005 and 2006, the emittance growth becomes a luminosity limiting factor. The beam emittance growth has a dependence on the dynamic pressure rise, which in RHIC proton runs is mainly caused by the electron cloud. The beam instability is usually absent, and the emittance growth rate is much slower than the ones caused by the head-tail instability. It is suspected that the emittance growth is caused by the electron cloud below the instability threshold.

NTIS

Emittance; Particle Accelerators; Proton Beams; Protons

20080031634 Brookhaven National Lab., Upton, NY, USA

Uniform Beam Distributions at the Target of the NSRL Beam Transfer Line

Tsoupas, N.; Ahrens, L.; Brown, K.; Chiang, I.; Gardner, C. J.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910427; BNL-77560-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

Uniform irradiation of biological or material samples with charged particle beams is desired by experimenters because

it reduces radiation dose errors. In this paper we present results of uniform beams produced in the NASA SPACE Radiation Laboratory (NSRL) at the Brookhaven National Laboratory (BNL) by a method which was developed theoretically and was proven experimentally at BNL. A similar method which requires collimation of the beam, and also lacks the flexibility of the present method to produce beam various beam sizes at the target, was patented in the year 1988. The present method of producing uniform beam distributions on a plane transverse to the direction of the beam, is based on purely magnetic focusing of the beam and requires no collimation of the beam or any other type of beam interaction with materials. It can also generate uniform beam distributions of various sizes. The method is favorably compared with alternative methods of producing uniform beam distributions and can be applied to the whole energy spectrum of the charged particle beams that are delivered by the BNL Booster synchrotron.

NTIS

Charged Particles; Dosage; Errors; Irradiation; Particle Beams; Targets

20080031635 Brookhaven National Lab., Upton, NY, USA

Design of Beam Transfer Lines for the NSLS II

Tsoupas, N.; Shaftan, T.; Rose, J.; Pinayev, I.; Heese, R.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910426; BNL-77559-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

The NSLS-II light source which is a proposed facility to be built at Brookhaven National Laboratory utilizes two synchrotron accelerator rings: the booster and the Storage ring (SR). Designing the NSLS-II injector we considered two options for the booster layout, where the rings either (a) share the same tunnel, but placed at different horizontal planes or (b) booster is located in a separate building. The booster which accepts beam from the linac, accelerates the electron beam to an energy of 3.0 GeV and the beam is extracted to the Booster to Storage Ring (BtS) transport line which transports the beam and injects it into the SR ring. The design procedure for each of the two options of the BtS line and other details about the optics and the magnetic elements of the line are presented in this paper.

NTIS

Light Sources; Particle Accelerators; Storage Rings (Particle Accelerators); Synchrotrons

20080031723 Brookhaven National Lab., Upton, NY, USA

Design of a Thin Quadrupole to be Used in the AGS Synchrotron

Tsoupas, N.; Ahrens, L.; Alforque, R.; Bai, M.; Brown, K.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910425; BNL-77558-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

The Alternating Gradient Synchrotron (AGS) employs two partial helical snakes to preserve the polarization of the proton beam during acceleration. In order to compensate for the focusing effect of the partial helical snakes on the beam optics in the AGS during acceleration of the beam, we introduced eight quadrupoles in straight sections of the AGS at the proximity of the partial snakes. At injection energies, the strength of each quad is set at a high value, and is ramped down to zero as the effect of the snakes diminishes by the square of beam's rigidity. Four of the eight compensation quadrupoles had to be placed in very short straight sections -30 cm in length, therefore the quadrupoles had to be thin with an overall length of less than 30 cm. In this paper we will discuss: (a) the mechanical and magnetic specifications of the 'thin' quadrupole, (b) the method to minimize the strength of the dodecapole harmonic, (c) the method to optimize the thickness of the laminations that the magnet iron is made, (d) mechanical tolerances of the magnet, (e) comparison of the measured and calculated magnetic multipoles of the quadrupole.

NTIS

Gradients; Particle Accelerators; Quadrupoles; Synchrotrons

20080032235 Brookhaven National Lab., Upton, NY, USA

Acceleration of Electrons with the Racetrack Non-scaling FFAG for e-RHIC

Trbojevic, D.; Berg, S. J.; Ben-Zvi, I.; Blaskiewicz, M.; Litvinenko, V.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910423; BNL-77555-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

The future relativistic electron hadron collider: e-RHIC requires acceleration of electrons to 10 GeV. In the case that the superconducting linac is selected for acceleration, an energy recovery scheme is required. We propose to study a possibility of using the non-scaling Fixed-Field Gradient-Accelerator (NS-FFAG) for different energies. The beam will be accelerated by the superconducting linac at the top of the sine function, brought back to the front of the linac by the non-scaling FFAG and repeating this few times until the total energy of 20 GeV is reached. After collisions the beam is brought back by the

nonscaling FFAG and decelerated (on the lower RF phase) in the same sequence but in the reverse order. Conventional and non-conventional beam dynamic issues will be discussed, like the transit time matching effect and the time of flight adjustments.

NTIS

Electrons; Gradients; Hadrons; Particle Accelerators

20080032241 Lawrence Livermore National Lab., Livermore, CA USA; California Univ., Berkeley, CA, USA

Electron Beam Diagnostic for Profiling High Power Beams

Elmer, J. W., Inventor; Palmer, T. A., Inventor; Teruya, A. T., Inventor; 22 Jun 05; 9 pp.; In English

Contract(s)/Grant(s): W-7405-ENG-48

Patent Info.: Filed 22 Jun 05; US-Patent-Appl-SN-11-159-978

Report No.(s): PB2007-113299; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A system for characterizing high power electron beams at power levels of 10 kW and above is described. This system is comprised of a slit disk assembly having a multitude of radial slits, a conducting disk with the same number of radial slits located below the slit disk assembly, a Faraday cup assembly located below the conducting disk, and a start-stop target located proximate the slit disk assembly. In order to keep the system from over-heating during use, a heat sink is placed in close proximity to the components discussed above, and an active cooling system, using water, for example, can be integrated into the heat sink. During use, the high power beam is initially directed onto a start-stop target and after reaching its full power is translated around the slit disk assembly, wherein the beam enters the radial slits and the conducting disk radial slits and is detected at the Faraday cup assembly. A trigger probe assembly can also be integrated into the system in order to aid in the determination of the proper orientation of the beam during reconstruction. After passing over each of the slits, the beam is then rapidly translated back to the start-stop target to minimize the amount of time that the high power beam comes in contact with the slit disk assembly. The data obtained by the system is then transferred into a computer system, where a computer tomography algorithm is used to reconstruct the power density distribution of the beam.

NTIS

Electron Beams; Patent Applications; Slits

20080032242 Brookhaven National Lab., Upton, NY, USA

RHIC Challenges for Low Energy Operations

Satogata, T.; Ahrens, L.; Bai, M.; Brennan, J. M.; Bruno, D.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910421; BNL-77553-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

There is significant interest in RHIC heavy ion collisions motivated by a search for the QCD phase transition critical point. The lowest energies are well below the nominal RHIC gold injection. There are several challenges that face RHIC operations in this regime, including longitudinal acceptance, magnet field quality, lattice control, and luminosity monitoring. We report on the status of work to address these challenges, including results from beam tests of low energy RHIC operations with protons and gold.

NTIS

Particle Accelerators; Quantum Chromodynamics; Phase Transformations; Ionic Collisions

20080032243 Brookhaven National Lab., Upton, NY, USA

Collective Effects in the RHIC-II Electron Cooler

Pozdeyev, E.; Ben-Zvi, I.; Fedotov, A.; Kayran, D.; Litvinenko, V.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910420; BNL-77549-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

Electron cooling at RHIC-II upgrade imposes strict requirements on the quality of the electron beam at the cooling section. Beam current dependent effects such as the space charge, wake fields, CSR in bending magnets, trapped ions, etc., will tend to spoil the beam quality and decrease the cooling efficiency. In this paper, we estimate the defocusing effect of the space charge at the cooling section and describe our plan to compensate the defocusing space charge force by focusing solenoids. We also estimate the energy and emittance growth caused by wake fields. Finally, we discuss ion trapping in the electron cooler and consider different techniques to minimize the effect of ion trapping.

NTIS

Coolers; Particle Accelerators

20080032244 Brookhaven National Lab., Upton, NY, USA

Muon Acceleration with the Racetrack FFAG

Trbojevic, D.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910422; BNL-77554-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

Muon acceleration for muon collider or neutrino factory is still in a stage where further improvements are likely as a result of further study. This report presents a design of the racetrack non-scaling Fixed Field Alternating Gradient (NS-FFAG) accelerator to allow fast muon acceleration in small number of turns. The racetrack design is made of four arcs: two arcs at opposite sides have a smaller radius and are made of closely packed combined function magnets, while two additional arcs, with a very large radii, are used for muon extraction, injection, and RF accelerating cavities. The ends of the large radii arcs are geometrically matched at the connections to the arcs with smaller radii. The dispersion and both horizontal and vertical amplitude functions are matched at the central energy.

NTIS

Gradients; Muons; Particle Acceleration

20080032317 Dorsey and Whitney, LLP, Denver, CO, USA

Liquid Crystal Waveguide having Refractive Shapes for Dynamically Controlling Light

Anderson, M. H., Inventor; Rommel, S. D., Inventor; Davis, S. R., Inventor; 12 Oct 04; 55 pp.; In English

Contract(s)/Grant(s): NSF-0319386

Patent Info.: Filed 12 Oct 04; US-Patent-Appl-SN-10-963-946

Report No.(s): PB2007-110542; No Copyright; Avail.: CASI: [A04](#), Hardcopy

Liquid crystal waveguides for dynamically controlling the refraction of light. Generally, liquid crystal materials may be disposed within a waveguide in a cladding proximate or adjacent to a core layer of the waveguide. In one example, portions of the liquid crystal material can be induced to form refractive or lens shapes in the cladding that interact with a portion (e.g. evanescent) of light in the waveguide so as to permit electronic control of the refraction/bending, focusing, or defocusing of light as it travels through the waveguide. In one example, a waveguide may be formed using one or more patterned or shaped electrodes that induce formation of such refractive or lens shapes of liquid crystal material, or alternatively, an alignment layer may have one or more regions that define such refractive or lens shapes to induce formation of refractive or lens shapes of the liquid crystal material. In another example, such refractive or lens shapes of liquid crystal material may be formed by patterning or shaping a cladding to define a region or cavity to contain liquid crystal material in which the liquid crystal materials may interact with the evanescent light.

NTIS

Liquid Crystals; Refractivity; Shapes; Waveguides; Light Modulators

20080032346 Brookhaven National Lab., Upton, NY, USA

Snake Depolarizing Resonance Study in RHIC

Bai, M.; Cameroon, P.; Luccio, A.; Huang, H.; Ptitsyn, V.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910392; BNL-77502-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

Snake depolarizing resonances due to the imperfect cancellation of the accumulated perturbations on the spin precession between snakes were observed at the Relativistic Heavy Ion Collider (RHIC). This paper reports the measured resonance spectrum as well as the results of resonance crossing.

NTIS

Particle Accelerators; Ionic Collisions; Depolarization; Nuclear Reactions; Resonance

20080032472 Brookhaven National Lab., Upton, NY, USA

Multipurpose Coherent Instability Simulation Code

Blaskiewicz, M.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910393; BNL-77503-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

A multipurpose coherent instability simulation code has been written, documented, and released for use. TRANFT (tran-eff-tee) uses fast Fourier transforms to model transverse wakefields, transverse detuning wakes and longitudinal wakefields in a computationally efficient way. Dual harmonic RF allows for the study of enhanced synchrotron frequency spread. When coupled with chromaticity, the theoretically challenging but highly practical post head-tail regime is open to

study. Detuning wakes allow for transverse space charge forces in low energy hadron beams, and a switch allowing for radiation damping makes the code useful for electrons.

NTIS

Computerized Simulation; Damping

20080032474 Fermi National Accelerator Lab., Batavia, IL, USA; Los Alamos National Lab., NM USA
Experimental Demonstration of Beam-Beam Compensation by Tevatron Electron Lenses and Prospects for the LHC
Shiltsev, V.; Alexahin, Y.; Kamerdzhev, V.; Kuznetsov, G.; Zhang, X. L.; January 2007; 6 pp.; In English
Report No.(s): DE2007-913195; FERMILAB-CONF-07-221-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

Electromagnetic long-range and head-on interactions of high intensity proton and antiproton beams are significant sources of beam loss and lifetime limitations in the Tevatron Collider Run II (2001-present). We present observations of the beam-beam phenomena in the Tevatron and results of relevant beam studies. We analyze the data and various methods employed in high energy physics (HEP) operation, predict the performance for planned luminosity upgrades and discuss ways to improve it.

NTIS

Electron Optics; Lenses; Particle Accelerators

20080032479 Brookhaven National Lab., Upton, NY, USA; Tech-X Corp., Boulder, CO, USA; California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

High-Order Modeling of an ERL for Electron Cooling in the RHIC Luminosity Upgrade Using MARYLIE/IMPACT
Ranjbar, V.; Paul, K.; Abell, D. T.; Ben-Zvi, I.; Kewisch, J.; Jul. 2007; 5 pp.; In English
Report No.(s): DE2007-913086; BNL-77353-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

Plans for the RHIC luminosity upgrade call for an electron cooling system that will place substantial demands on the energy, current, brightness, and beam quality of the electron beam. In particular, the requirements demand a new level of fidelity in beam dynamics simulations. New developments in MARYLIE/IMPACT have improved both the spacecharge computations for beams with large aspect ratios and the beam dynamic computations for rf cavities. We present the results of beam dynamics simulations that include the effects of space charge and nonlinearities, and aim to assess the tolerance for errors and nonlinearities on current designs for a super-conducting ERL.

NTIS

Cooling; Luminosity

20080032482 Brookhaven National Lab., Upton, NY, USA

Unique Features in Magnet Designs for R&D Energy Recovery LINAC at BNL

Meng, W.; Jain, A.; Ganetis, G.; Kayran, D.; Litvinenko, V. N.; January 2007; 5 pp.; In English

Report No.(s): DE2007-913082; BNL-79225-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

In this paper we describe the unique features and analysis techniques used on the magnets for a R&D Energy Recovery Linac (ERL) under construction at the Collider Accelerator Department at BNL. The R&D ERL serves as a test-bed for future BNL ERLs, such as an electron-cooler-ERL at RHIC and a future 20 GeV ERL electron-hadron at eRHIC. Here we present select designs of various dipole and quadrupole magnets which are used in Z-bend merging systems and the returning loop, 3-D simulations of the fields in aforementioned magnets, particle tracking analysis, and the magnet's influence on beam parameters. We discuss an unconventional method of setting requirements on the quality of magnetic field and transferring them into measurable parameters as well as into manufacturing tolerances. We compare selected simulation with results of magnetic measurements.

NTIS

Linear Accelerators; Magnetic Measurement; Magnets; Particle Accelerators

20080032568 Brookhaven National Lab., Upton, NY, USA; Fermi National Accelerator Lab., Batavia, IL, USA; California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA; Stanford Linear Accelerator Center, CA, USA

Experiments with a DC wire in RHIC

Fischer, W.; Calaga, R.; Abreu, N.; Robert-Demolaize, G.; Kim, H. J.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910402; BNL-77525-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

A DC wire has been installed in RHIC to explore the long-range beam-beam effect, and test its compensation. We report

on experiments that measure the effect of the wire's electro-magnetic field on the beam's lifetime and tune distribution, and accompanying simulations.

NTIS

Wire; Direct Current

20080032570 Brookhaven National Lab., Upton, NY, USA; European Organization for Nuclear Research, Geneva, Switzerland; High Energy Accelerator Research Organization, Ibaraki, Japan

Small Angle Crab Compensation for LHC IR Upgrade

Calaga, R.; Dorda, U.; Tomas, R.; Zimmerman, F.; Akai, K.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910398; BNL-77516-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

A small angle crab scheme is being considered for the LHC luminosity upgrade. In this paper we present a 400MHz superconducting cavity design and discuss the pertinent RF challenges. We also present a study on the beam-beam performance and proton-beam emittance growth in the presence of crab compensation, with RF noise sources.

NTIS

Cavities; Luminosity; Superconductivity; Superconductors (Materials)

20080032571 Brookhaven National Lab., Upton, NY, USA; Consortium for the Exploitation of the Synchrotron Light Lab - (CELLS), Barcelona, Spain

Electron Cloud Observations and Cures in RHIC

Fischer, W.; Blaskiewicz, M.; Brennan, M.; Huang, H.; Hsuh, H. C.; January 2007; 7 pp.; In English

Report No.(s): DE2007-910401; BNL-77524-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

Since 2001 RHIC has experienced electron cloud effects, which have limited the beam intensity. These include dynamic pressure rises - including pressure instabilities, tune shifts, a reduction of the stability threshold for bunches crossing the transition energy, and possibly incoherent emittance growth. We summarize the main observations in operation and dedicated experiments, as well as countermeasures including baking, NEG coated warm beam pipes, solenoids, bunch patterns, anti-grazing rings, pre-pumped cold beam pipes, scrubbing, and operation with long bunches.

NTIS

Clouds (Meteorology); Dynamic Pressure; Electron Clouds; Particle Accelerators; Visual Observation

20080032572 Brookhaven National Lab., Upton, NY, USA; European Organization for Nuclear Research, Geneva, Switzerland

BPM Calibration Independent LHC Optics Correction

Calaga, R.; Tomas, R.; Zimmerman, F.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910399; BNL-77517-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

The tight mechanical aperture for the LHC imposes severe constraints on both the beta and dispersion beating. Robust techniques to compensate these errors are critical for operation of high intensity beams in the LHC. We present simulations using realistic errors from magnet measurements and alignment tolerances in the presence of BPM noise. Correction reveals that the use of BPM calibration and model independent observables are key ingredients to accomplish optics correction. Experiments at RHIC to verify the algorithms for optics correction are also presented.

NTIS

Calibrating; Correction; Linear Accelerators; Monitors

20080032573 Brookhaven National Lab., Upton, NY, USA

Summary of the RHIC Performance during the FY07 Heavy Ion Run

Drees, A.; Ahrens, L.; Alessi, J.; Bai, M.; Beebe-Wang, J.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910400; BNL-77522-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

We present an overview of the changes that increased the instantaneous luminosity, luminosity lifetime and integrated luminosity of RHIC Au-Au operations during Run- 7 even though the goal of 60% time at store could not be reached.

NTIS

Ionic Collisions; Luminosity; Particle Accelerators

20080032575 Brookhaven National Lab., Upton, NY, USA

RHIC Power Supplies-Failure Statistics for runs 4, 5, and 6

Bruno, D.; Ganetis, G.; Heppner, G.; Louie, W.; Sandberg, J.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910397; BNL-77514-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

The two rings in the Relativistic Heavy Ion Collider (RHIC) require a total of 933 power supplies to supply current to highly inductive superconducting magnets. Failure statistics for the RHIC power supplies will be presented for the last three RHIC runs. The failures of the power supplies will be analyzed. The statistics associated with the power supply failures will be presented. Comparisons of the failure statistics for the last three RHIC runs will be shown. Improvements that have increased power supply availability will be discussed. Further improvements to increase the availability of the power supplies will also be discussed.

NTIS

Failure; Supplying

20080032576 Brookhaven National Lab., Upton, NY, USA

Overview of the AGS Cold Snake Power Supplies and the new RHIC Sextupole Power Supplies

Bruno, D.; Ganetis, G.; Louie, W.; Sandberg, J.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910396; BNL-77513-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

The two rings in the Relativistic Heavy Ion Collider (RHIC) were originally constructed with 24 sextupole power supplies, 12 for each ring. Before the start of Run 7, 24 new sextupole power supplies were installed, 12 for each ring. Individual sextupole power supplies are now each connected to six sextupole magnets. A superconducting snake magnet and power supplies were installed in the Alternating Gradient Synchrotron (AGS) and commissioned during RHIC Run 5, and used operationally in RHIC Run 6. The power supply technology, connections, control systems and interfacing with the Quench Protection system for both these systems will be presented.

NTIS

Gradients; Snakes; Supplying; Synchrotrons

20080032577 Brookhaven National Lab., Upton, NY, USA

RHIC Spin Flipper

Bai, M.; Luccio, A.; Pile, P.; Makdisi, Y.; Roser, T.; January 2007; 5 pp.; In English

Report No.(s): DE2007-910394; BNL-77505-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

This paper proposes a new design of spin flipper for RHIC to obtain full spin flip with the spin tune staying at half integer. The traditional technique of using an rf dipole or solenoid as spin flipper to achieve full spin flip in the presence of full Siberian snake requires one to change the snake configuration to move the spin tune away from half integer I-31. This is not practical for an operational high energy polarized proton collider like RHIC where beam lifetime is sensitive to small betatron tune change. The design of the new spin flipper as well as numerical simulation's are presented.

NTIS

Protons; Direct Numerical Simulation; Particle Spin

20080032578 Brookhaven National Lab., Upton, NY, USA

Stochastic Cooling of High Energy Bunched Beams

Blaskiewicz, M.; Brennan, J. M.; Severino, F.; January 2007; 7 pp.; In English

Report No.(s): DE2007-910395; BNL-77508-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

Stochastic cooling of 100 GeV/nucleon bunched beams has been achieved in the Relativistic Heavy Ion Collider (RHIC). The physics and technology of the longitudinal cooling system are discussed, and plans for a transverse cooling system are outlined.

NTIS

Bunching; Cooling; Particle Accelerators; Stochastic Processes

PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also 72 *Atomic and Molecular Physics*, 73 *Nuclear Physics*, and 25 *Inorganic, Organic and Physical Chemistry*.

20080030999 Brookhaven National Lab., Upton, NY USA; Tokyo Univ., Japan; Tsukuba Univ., Japan
Thermodynamics of Two-Flavor Lattice QCD With an Improved Wilson Quark Action at Non-Zero Temperature and Density

Maezawa, Y.; Aoki, S.; Ejiri, S.; Hatsuda, T.; Ishii, N.; Jul. 2007; 6 pp.; In English

Report No.(s): DE2007-913071; BNL-79144-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

No abstract available

Quantum Chromodynamics; Quarks; Thermodynamics

20080031552 Brookhaven National Lab., Upton, NY, USA
Setup and Performance of the RHIC Injector Accelerators for the 2007 Run with Gold Ions

Ahrens, L.; Alessi, J.; January 2006; 5 pp.; In English

Report No.(s): DE2007-910434; No Copyright; Avail.: Department of Energy Information Bridge

Gold ions for the 2007 run of the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory (BNL) are accelerated in the Tandem, Booster and AGS prior to injection into RHIC. The setup and performance of this chain of accelerators is reviewed with a focus on improvements in the quality of beam delivered to RHIC. In particular, more uniform stripping foils between Booster and AGS, and a new bunch merging scheme in AGS have provided beam bunches with reduced longitudinal emittance for RHIC.

NTIS

Gold; Injectors; Ions; Particle Accelerators

20080031716 Scuola Normale Superiore, Pisa, Italy; Fermi National Accelerator Lab., Batavia, IL, USA
First Observation of the $B(\text{sup O})(\text{sub s})$ yields $K(\text{sup +})K(\text{sup -})$ Decay Mode, and Measurement of the $B(\text{sup O})$ and $B(\text{sup O})(\text{sub s})$ Mesons Decay-Rates into Two-Body, Charmless Final States at CDF

Nov. 30, 2006; 258 pp.; In English

Report No.(s): DE2007-911840; No Copyright; Avail.: National Technical Information Service (NTIS)

The decays of b-hadrons are a fertile ground to investigate the flavor sector of the Standard Model and to look for first signals for new physics in the years preceding the Large Hadron Collider operations. In particular, the phenomenology of non-leptonic charmless two-body decays of b-mesons offers rich opportunities for increasing our understanding of the CP violation, i. e., the lack of symmetry of physical processes when all spatial coordinates are inverted and particles are replaced by their antiparticles. The precise measurements obtained recently at dedicated e+e- colliders already provided demonstration of the central role of these decay modes. Charmless hadronic b-meson decays proceed through an unique interplay of electroweak and low-energy strong interactions, allowing observation of CP-violating effects within and beyond the Standard Model. The problem is that, currently, no completely reliable theoretical prediction of decay rates is available, for most of them, because of the presence of strong interactions in nonperturbative regime, which introduce significant uncertainties in the predicted amplitudes. Several phenomenological models provide different predictions, none of them properly accounting for all observed decay-rates. This makes the interpretation of experimental observations difficult, since any discrepancy between predictions and measurements may be ascribed either to improper treatment of hadronic uncertainties, or to contributions of amplitudes not expected in the Standard Model.

NTIS

Decay Rates; Mesons; Standard Model (Particle Physics); Charm (Particle Physics); Particle Decay; Phenomenology; Hadrons; Quantum Chromodynamics

20080031720 Muons, Inc., Batavia, IL, USA; Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Simulations of Parametric-Resonance Ionization Cooling

Newsham, D.; Sah, R.; Bogaca, A.; Chao, Y. C.; Derbenev, Y.; January 2007; 3 pp.; In English

Contract(s)/Grant(s): DE-FG02-04ER84016

Report No.(s): DE2007-910919; No Copyright; Avail.: National Technical Information Service (NTIS)

Parametric-resonance ionization cooling (PIC) is a muon-cooling technique that is useful for low-emittance muon

colliders. This method requires a well-tuned focusing channel that is free of chromatic and spherical aberrations. In order to be of practical use in a muon collider, it also necessary that the focusing channel be as short as possible to minimize muon loss due to decay. G4Beamline numerical simulations are presented of a compact PIC focusing channel in which spherical aberrations are minimized by using design symmetry.

NTIS

Cooling; Ionization; Simulation; Muons

20080032480 Brookhaven National Lab., Upton, NY, USA

Realistic Non-Linear Model and Field Quality Analysis in RHIC Interaction Region

Beebe-Wang, J.; Jain, A.; Jul. 2007; 5 pp.; In English

Report No.(s): DE2007-913084; BNL-77506-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

The existence of multipole components in the dipole and quadrupole magnets is one of the factors limiting the beam stability in the RHIC operations. So, a realistic nonlinear model is crucial for understanding the beam behavior and to achieve the ultimate performance in RHIC. A procedure is developed to build a non-linear model using the available multipole component data obtained from measurements of RHIC magnets. We first discuss the measurements performed at different stages of manufacturing of the magnets in relation to their current state in RHIC. We then describe the procedure to implement these measurement data into tracking models, including the implementation of the multipole feed down effect due to the beam orbit offset from the magnet center. Finally, the field quality analysis in the RHIC interaction regions (IR) is presented.

NTIS

Magnets; Nonlinearity; Stability; Beams (Radiation); Magnetic Fields

81

ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20080030984 NASA Marshall Space Flight Center, Huntsville, AL, USA

NASA's Agency-wide Strategy for Environmental Regulatory Risk Analysis and Communication

Duda, Kristen; Scroggins, Sharon; May 05, 2008; 1 pp.; In English; Joint Services Environmental Management Training Conference and Exposition(JSEM), 5-8 May 2008, Denver, CO, USA; No Copyright; Avail.: Other Sources; Abstract Only

NASA's mission is to pioneer the future in space exploration, scientific discovery, and aeronautics research. To help enable existing and future programs to pursue this mission, NASA has established the Principal Center for Regulatory Risk Analysis and Communication (RRAC PC) to proactively identify, analyze, and communicate environmental regulatory risks to the NASA community. The RRAC PC is chartered to evaluate the risks posed to NASA Programs and facilities by environmentally related drivers. The RRAC PC focuses on emerging environmental regulations, as well as risks related to operational changes that can trigger existing environmental requirements. Changing regulations have the potential to directly affect program activities. For example, regulatory changes can restrict certain activities or operations by mandating changes in how operations may be done or limiting where or how certain operations can take place. Regulatory changes also can directly affect the ability to use certain materials by mandating a production phase-out or restricting usage applications of certain materials. Such changes can result in NASA undertaking material replacement efforts. Even if a regulation does not directly affect NASA operations, U.S. and international regulations can pose program risks indirectly through requirements levied on manufacturers and vendors of components and materials. For example, manufacturers can change their formulations to comply with new regulatory requirements. Such changes can require time-consuming and costly requalification certification for use in human spaceflight programs. The RRAC PC has implemented several strategies for proactively managing regulatory change to minimize potential adverse impacts to NASA Programs and facilities. This presentation highlights the lessons learned through establishing the RRAC PC, the process by which the RRAC PC monitors and distributes information about emerging regulatory requirements, and the cross-Agency cooperation that is vital to supporting NASA's mission.

Author

NASA Programs; Regulations; Environment Management; Risk Assessment

20080031133 NASA Johnson Space Center, Houston, TX, USA

Test Solicitation and Selection Process for Human Systems

Labuda, Laura; Kenedy, Kriss, et al.; February 05, 2006; 7 pp.; In English; Habitation 2006, 6-8 Feb. 2006, Orlando, FL, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: [A02](#), Hardcopy
ONLINE: <http://hdl.handle.net/2060/20080031133>

This document is a series of flowcharts that reviews the process for solicitation and selection of candidates for human systems tests.

CASI

Selection; Evaluation; Human Beings

20080032489 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Toward a Systematic Approach for Selection of NASA Technology Portfolios

Weisbin, Charles R.; Rodriguez, Guillermo; Alberto, Elfes; Smith, Jeffrey H.; Systems Engineering; December 2004; Volume 7, Issue 4, pp. 285-302; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40872>; <http://dx.doi.org/10.1002/sys.20010>

There is an important need for a consistent analytical foundation supporting the selection and monitoring of R&D tasks that support new system concepts that enable future NASA missions. This capability should be applicable at various degrees of abstraction, depending upon whether one is interested in formulation, development, or operations. It should also be applicable to a single project, a program comprised of a group of projects, an enterprise typically including multiple programs, and the overall agency itself. Emphasis here is on technology selection and new initiatives, but the same approach can be generalized to other applications, dealing, for example, with new system architectures, risk reduction, and task allocation among humans and machines. The purpose of this paper is to describe one such approach, which is in its early stages of implementation within NASA programs, and to discuss several illustrative examples.

Author

NASA Programs; Research and Development; Technology Assessment; Cost Effectiveness

20080032637 NVI, Inc., Greenbelt, MD, USA

Coordinating Center Report

Behrend, Dirk; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 13 - 15; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

This report summarizes the activities of the IVS Coordinating Center during the year 2007 and forecasts activities planned for the year 2008. The activities that were supported during 2007 include: support of the Directing Board, maintaining web pages, email lists, and web-based archive files, published the 2006 annual report, and three newsletters, generated and maintained a master observing schedule for 2007, and coordinated meetings.

CASI

Schedules; Very Long Base Interferometry

20080032721 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

An Integrated Approach for Business Process Management and System Simulation and Its Application in Project Management

Roberto Nascimento Travassos, Paulo; [2007]; 179 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14819-TDI/1259; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A09](#), Hardcopy

This work presents the fundamentals of an innovative approach aiming at the integration and standardization of simulation and automatic management of process models. These techniques, although already well known and used in process management, are traditionally applied in this area in an autonomous and complementary way during its model development life cycle, whereas the proposed approach aims at the creation of concepts and procedures to allow a complete unification of model representation, the simulation and the automatic management of the models created using the approach. The main goal of this work is to present the approach and to show that it can be used to develop different application systems for Business Process Management in general, as well as to demonstrate its use in Project Management.

Author

Industrial Management; Project Management; Management Planning; Management Systems

DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer program documentation see *61 Computer Programming and Software*.

20080031062 General Accounting Office, Washington, DC USA

Defense Acquisitions: Assessments of Selected Weapon Programs

Sullivan, Michael J; Mullins, Brian; Bowman, Ridge C; Franco, Quindi C; Lea, Matthew B; Best, David B; Denomme, Thomas J; Fairbairn, Bruce; Gallegos, Arthur; Graveline, William R; Mar 2008; 206 pp.; In English

Report No.(s): AD-A479603; GAO-08-467SP; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA479603>

Since fiscal year 2000, DOD has significantly increased the number of major defense acquisition programs and its overall investment in them. Major Unfortunately, during this same time period, acquisition outcomes did not improve. Based on our analysis, total acquisition costs for the fiscal year 2007 portfolio of major defense acquisition programs increased 26 percent from first estimates, whereas the 2000 portfolio increased by 6 percent. Likewise, development costs for fiscal year 2007 programs increased by 40 percent from first estimates, compared to 27 percent for fiscal year 2000 programs. In most cases, programs also failed to deliver capabilities when promised often forcing warfighters to spend additional funds on maintaining legacy systems. Our analysis shows that current programs are experiencing an average delay of 21-months in delivering initial capabilities to the warfighter, a 5-month increase over fiscal year 2000 programs. Of the 72 weapon programs we assessed this year, no program had proceeded through system development meeting the best practices standards for mature technologies, stable design, and mature production processes all prerequisites for achieving planned cost, schedule, and performance outcomes. Eighty-eight percent of the programs in this assessment began system development without fully maturing critical technologies according to best practices. Ninety-six percent of the programs had not met best practice standards for demonstrating mature technologies and design stability before entering the more costly system demonstration phase. Finally, no programs we assessed had all of their critical manufacturing processes in statistical control when they entered production, and most programs were not even collecting data to do so. Also, programs assessed this year did not improve on the level of knowledge attained at critical junctures from those assessed in 2005.

DTIC

Data Acquisition; Defense Program; Weapon Systems

20080031068 Defense Technical Information Center, Fort Belvoir, VA USA

A Delicate Balance: National Security vs. Public Access

Klein, Bonnie; Schwalb, Sandy; Mar 2005; 7 pp.; In English

Report No.(s): AD-A479922; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA479922>

In the aftermath of September 11, 2001, the Defense Technical Information Center (DTIC-<http://www.dtic.mil>) found itself in the spotlight as journalists, academics and policy-makers sounded the alarm on both sides of the issue of public access to scientific and technical government information; namely, too much access and not enough access. This article explains the issues, policies, decisions and processes that led to the withdrawal of some government information from public release.

DTIC

Security; Warning Systems

20080032212 Fish and Richardson, P.C., Minneapolis, MN, USA

Selection and Use of NonStatistical Translation Components in a Statistical Machine Translation Framework

Och, F. J., Inventor; 15 Apr 05; 10 pp.; In English

Contract(s)/Grant(s): DARPA-N66001-00-1-8914

Patent Info.: Filed Filed 15 Apr 05; US-Patent-Appl-SN-11-107 304

Report No.(s): PB2008-100419; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A system with a nonstatistical translation component integrated with a statistical translation component engine. The same corpus may be used for training the statistical engine and also for determining when to use the statistical engine and when to use the translation component. This training may use probabilistic techniques. Both the statistical engine and the translation

components may be capable of translating the same information, however the system determines which component to use based on the training. Retraining can be carried out to add additional components, or when after additional translator training.
NTIS

Machine Translation; Patent Applications; Translating

20080032221 Congressional Research Service, Washington, DC, USA

Restructuring EPA's (Environmental Protection Agency's) Libraries: Background and Issues for Congress. CRS Report for Congress (Updated June 15, 2007)

Bearden, D. M.; Esworthy, R.; Jun. 15, 2007; 6 pp.; In English

Report No.(s): PB2008-100461; CRS-RS22533-REV; No Copyright; Avail.: CASI: [A02](#), Hardcopy

Near the end of the 109th Congress, some Members raised questions about the closing of several libraries administered by the Environmental Protection Agency (EPA), expressing concerns about the continued availability of the agency's collections. Library professional associations and public interest groups raised similar questions about access to this information. EPA reported that the closings were part of its efforts to restructure its libraries in response to the agency's transition from walk-in services to electronic dissemination of information, as a result of the increasing use of the Internet to access its collections. In response to the concerns about the library closings, EPA announced a temporary moratorium in January 2007, prohibiting further changes to its library services while the agency continued digitizing its collections. Interest in the library closings has continued into the 110th Congress. Although Members and Committees of Congress have addressed the closings in letters to EPA and in hearings, Congress has not addressed the matter so far in appropriations bills or other legislation. This report summarizes EPA's plan to restructure its libraries, examines relevant issues, and discusses congressional action in response to the agency's plan.

NTIS

Closures; Environment Protection; Federal Budgets; Libraries; United States

20080032227 Chemonics International, Inc., Washington, DC, USA

Afghanistan RAMP (Rebuilding Agricultural Markets) in Afghanistan. Geographic Information System (GIS) Applications for Mapping RAMP Activities and Impacts

Khatouri, M.; Dec. 12, 2003; 21 pp.; In English

Contract(s)/Grant(s): AID-306-C-00-03-00502-01

Report No.(s): PB2007-114173; No Copyright; Avail.: National Technical Information Service (NTIS)

This trip report describes the tasks associated with a scoping mission for the use of the Geographic Information System (GIS) by RAMP in Afghanistan, conducted from November 18 to December 12, 2003 at the project office in Kabul. The main objective of this activity was to assist RAMP in the integration of the GIS as a tool to improve planning, management, and dissemination of program activities and results. The major tasks associated with this trip included: Background reviews of the RAMP objectives and expected results within the context of the development of the GIS. Initial determination of how RAMP could use the GIS tool to enhance planning and management of program activities. Design an approach for the integration of RAMP data with a spatial dimension into GIS for improved spatial and temporal analysis of project interventions, results, and impacts.

NTIS

Afghanistan; Agriculture; Economic Development; Geographic Information Systems; Market Research

20080032523 NASA Goddard Space Flight Center, Greenbelt, MD, USA

NASA's Earth Science Data Systems: A 'Bit of History' and Observations

Ramapriyan, H. K.; May 06, 2008; 25 pp.; In English; Cyberinfrastructure for Environmental Observations, Analysis, and Forecasting: A cyberinformatics Forum, 5-7 May 2008, Boulder, Co, USA; Original contains color illustrations; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080032523>

NASA has significantly improved its Earth Science Data Systems over the last two decades. Open data policy and inexpensive (or free) availability of data has promoted data usage by broad research and applications communities. Flexibility, accommodation of diversity, evolvability, responsiveness to community feedback are key to success.

Derived from text

Data Systems; Earth Sciences; Feedback

20080032586 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Data Provenance: Theory and Application to Image Processing

Braga, Juliana Cristina; [2007]; 112 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14212-TDI/1113; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A06](#), Hardcopy

The provenance is a complementary data documentation. It contains a description of ‘how’, ‘when’, ‘where’, and ‘why’ the data were obtained and ‘who’ obtained it. The provenance includes not only the origin of the data but also the description of the processes that produce them (algorithms and their respective parameters). Data provenance might be very helpful in image processing to reproduce images, save disk space, increase speed transmission, protect the copyright and retrieve images. To take advantage of image provenance, it must be managed by computer systems. Its management includes the creation, storage, publication, retrieval and handling of provenance in an automatic and integrated way. Motivated by the advantages of provenance and the challenges of its management, the goal of our work was: to propose a model for the structure and storage of data provenance in order to guide its implementation; to implement a prototype for data provenance management; and to test this prototype in image processing. This prototype was integrated with the URLib digital library. The preliminary tests have shown the feasibility and efficiency of the proposed data provenance management system.

Author (revised)

Data Management; Data Storage; Image Processing; Prototypes; Information Systems

20080032595 Government Accountability Office, Washington, DC, USA

Information Technology: Census Bureau Needs to Improve Its Risk Management of Decennial Systems

Oct. 2007; 46 pp.; In English

Report No.(s): PB2008-100165; GAO-08-79; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Automation and information technology (IT) are expected to play a critical role in the 2010 decennial census. The Census Bureau plans to spend about \$3 billion on automation and technology that are to improve the accuracy and efficiency of census collection, processing, and dissemination. The Bureau is holding what it refers to as a Dress Rehearsal, during which it plans to conduct operational testing that includes the decennial systems. In view of the importance of IT acquisitions to the upcoming census, GAO was asked to (1) determine the status and plans for four key IT acquisitions, including schedule and cost, and (2) assess whether the Bureau is adequately managing associated risks. To achieve its objectives, GAO analyzed acquisition documents and the projects’ risk management activities and compared these activities to industry standards.

NTIS

Census; Data Processing; Management Planning; Management Systems; Risk Management; Schedules

20080032597 Government Accountability Office, Washington, DC, USA

Tax Administration: The Internal Revenue Service Can Improve Its Management of Paper Case Files

Sep. 2007; 29 pp.; In English

Report No.(s): PB2008-100170; GAO-07-1160; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Proper paper case file management is a significant issue for the Internal Revenue Service (IRS) because its staff investigate and close millions of case files every year. In addition, IRS employees depend heavily on case files when pursuing enforcement actions. GAO was asked to review IRS’s case file storage, tracking, and documentation processes to determine whether IRS has (1) an effective process to ensure that paper case files can be located timely and (2) sufficient data to assess the performance of its paper case file processes. To review these processes, GAO interviewed staff who request case files and case file managers. IRS does not have an effective process to ensure that paper case files can be located within the requesters’ time frames. Missing case files can result in lost revenue, create unnecessary taxpayer burden, and make case files unavailable for other units such as quality review groups or advisory groups. IRS has acknowledged its historic difficulties in locating and retrieving case files. Records management officials have recently instituted some performance measures, but these measures do not specifically address paper case files. IRS program managers also have not developed performance measures or data to determine how well paper case files are managed to achieve performance targets. Program managers do not know who has overall responsibility for case file management so performance information cannot be developed across IRS’s compliance programs. GAO identified some potential improvements that IRS can consider, but IRS will need to determine which improvements are the most cost effective.

NTIS

Project Management; Records Management; Revenue

20080032601 Federal Reserve System, Washington, DC, USA

Operational Problems and Aggregate Uncertainty in the Federal Funds Market

Klee, E.; January 2007; 33 pp.; In English

Report No.(s): PB2008-100581; FRS-2007-49; No Copyright; Avail.: National Technical Information Service (NTIS)

This paper uses operational problems at commercial banks in sending Fedwire payments as a proxy for aggregate uncertainty in end-of-day Fed account positions and then examines funds market behavior on those days. The results suggest that increased uncertainty is associated with a deviation of the federal funds rate from the FOMC's target rate, the magnitude depending on the severity of the difficulty, the payment volume of the affected participant, and the time of day. Moreover, discount window borrowing picks up on days with operational difficulties. These effects are generally transitory, and markets revert back to previous levels the next day.

NTIS

Aggregates; Commerce; Operational Problems

20080032701 Humphreys Engineer Center Support Activity, Alexandria, VA, USA

Knowledge-Based Condition Survey Inspection (KBCSI) Framework and Procedure

Uzarski, D. R., Inventor; Grussing, M. N., Inventor; 9 Jul 04; 17 pp.; In English

Patent Info.: Filed 9 Jul 04; US-Patent-Appl-SN-10-886 609

Report No.(s): PB2008-100095; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A knowledge-based condition survey inspection (KBCSI) framework and procedure for use with an engineering management system (EMS) that tailors types of condition survey inspections (CSIs) and inspection intervals to empirically-established life cycles of component-sections. Embodiments of the invention facilitate proactive life cycle management, scheduling appropriate types of CSIs only when needed. The frequency and type of inspection is tailored to items important to a facility manager, such as the importance to the operation of individual component-sections and their individual life cycle, not the overall life cycle of a system or facility. Further, additional useful information is available from the data collected to maintain embodiments of the KBCSI framework so that meaningful 'What-If' analysis may be performed in support of decision makers. By tailoring CSIs to needs rather than an arbitrary inspection schedule designed to only catch deficiencies, significant life cycle cost savings are realized.

NTIS

Engineering Management; Knowledge Based Systems; Management Systems; Patent Applications; Surveys

83

ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

20080031680 Government Accountability Office, Washington, DC, USA

Information Technology: Agencies Need to Establish Comprehensive Policies to Address Changes to Projects' Cost, Schedule, and Performance Goals

July 2008; 59 pp.; In English; Original contains black and white illustrations

Report No.(s): GAO-08-925; No Copyright; Avail.: CASI: [A04](#), Hardcopy

The federal government plans to spend about \$70 billion on information technology (IT) projects during fiscal year 2008. Consequently, it is important that projects be managed effectively to ensure that public resources are wisely invested. At times, a project's cost, schedule, and performance goals -- known as its baseline -- are modified to reflect changed development circumstances. These changes -- called a rebaselining -- can be done for valid reasons, but can also be used to mask cost overruns and schedule delays. GAO was asked to (1) determine the extent of and the primary reasons for IT project rebaselining and (2) determine whether federal agencies have sound policies for rebaselining projects. To do this, GAO surveyed the managers of a random sample of 180 projects selected from the 778 major IT projects the 24 major agencies plan to invest in during fiscal year 2008. GAO also compared agencies rebaselining policies to best practices.

Derived from text

Costs; Information Systems; Policies; Schedules; Financial Management; Procurement Management; Government Procurement

LAW, POLITICAL SCIENCE AND SPACE POLICY

Includes aviation law; space law and policy; international law; international cooperation; and patent policy.

20080032252 Army War Coll., Carlisle Barracks, PA USA

U.S. Strategic Communication: Getting It Right

Gerhart, Kenneth R; Mar 12, 2008; 33 pp.; In English

Report No.(s): AD-A480180; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The USA is engaged in open conflict in Iraq, Afghanistan, and other places around the world in its effort to combat terrorist insurgents. Its hard power is unequalled. But its use of soft power in the everyday ideological battlefield of the mind is unimpressive, suffering from a lack of organization and unity of effort. Effective integration of words and action across the foreign policy spectrum is still lacking despite the release of the 2007 U.S. National Strategy for Public Diplomacy and Strategic Communication. The U.S. Government is simply not organized to perform effective strategic communication. Attempts to direct this effort have been unproductive because of the absence of an overarching policy combined with an independent center with a director who answers directly to the President. Furthermore, the principal USA entity capable of influencing foreign audiences is preoccupied with maintaining its firewall and journalistic integrity as it broadcasts the news it chooses. This SRP elaborates on the issues of strategic communication and recommends ways to strengthen this component of national security.

DTIC

International Relations; Foreign Policy

20080032270 General Accounting Office, Washington, DC USA

Homeland Security. Federal Efforts are Helping to Address Some Challenges Faced by State and Local Fusion Centers

Larence, Eileen R; Apr 17, 2008; 21 pp.; In English

Report No.(s): AD-A480157; GAO-08-636T; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Why GAO Did This Study. Following the September 11 terrorist attacks, state and local governments formed fusion centers, collaborative efforts to detect, prevent, investigate, and respond to criminal or terrorist activity. Recognizing that the centers are a critical mechanism for sharing information, the federal government including the Department of Homeland Security (DHS), Department of Justice (DOJ), and the Program Manager for the Information Sharing Environment (PM-ISE), which has primary responsibility for government wide information sharing is taking steps to partner with fusion centers. This testimony focuses on (1) the characteristics of fusion centers as of September 2007 and (2) federal efforts to help alleviate challenges centers identified. This testimony is based on GAO's October 2007 report on 58 fusion centers and related federal efforts to support them as well as updated information GAO obtained in March 2008 by reviewing plans describing selected federal efforts and attending the second annual national fusion center conference. What GAO Recommends. While this testimony contains no new recommendations, GAO has recommended that the federal government define and articulate its long-term fusion center role and whether it expects to provide resources to help ensure their sustainability. PM-ISE agreed with the recommendation and is in the process of implementing it.

DTIC

Security; Countermeasures

20080032271 Army War Coll., Carlisle Barracks, PA USA

Detering and Dissuading in Space: A Systems Approach

Fox, Scott M; Mar 18, 2008; 33 pp.; In English

Report No.(s): AD-A480178; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Space capabilities have improved life in the USA and around the world, enhanced security, protected lives and the environment, sped information flow, served as an engine for economic growth, and revolutionized the way people view their place in the world. In fact, the need to ensure those vital space capabilities are available has never been greater. This paper examines the importance space capabilities play in military and civil activities. It evaluates the concepts of dissuasion and deterrence, identifying the importance of each in a new defense policy spectrum. It addresses space control operations, the means used to ensure friendly access to necessary space capabilities and to deny the same to an adversary. Finally, the paper proposes a systems approach to the characterization of the operational environment. Dissuasion and deterrence play vital roles preventing potential adversaries from challenging our space capabilities, and a systems approach to space control policies and

actions provides valuable insight into the second- and third-order effects that result in the highly volatile, uncertain, complex, and ambiguous security environment of the 21st century.

DTIC

Aerospace Systems; Military Operations; Civil Defense; Policies

88

SPACE SCIENCES (GENERAL)

Includes general research topics related to the natural space sciences. For specific topics in space sciences see *categories 89 through 93*.

20080030992 NASA Marshall Space Flight Center, Huntsville, AL, USA

A New Polar Magnetic Index of Geomagnetic Activity and its Application to Monitoring Ionospheric Parameters

Lyatsky, Wladislav; Khazanov, George V.; May 27, 2008; 1 pp.; In English; American Geophysical Union 2008 Joint Assembly, 27-30 May 2008, Fort Lauderdale, FL, USA; No Copyright; Avail.: Other Sources; Abstract Only

For improving the reliability of Space Weather prediction, we developed a new, Polar Magnetic (PM) index of geomagnetic activity, which shows high correlation with both upstream solar wind data and related events in the magnetosphere and ionosphere. Similarly to the existing polar cap PC index, the new, PM index was computed from data from two near-pole geomagnetic observatories; however, the method for computing the PM index is different. The high correlation of the PM index with both solar wind data and events in Geospace environment makes possible to improve significantly forecasting geomagnetic disturbances and such important parameters as the cross-polar-cap voltage and global Joule heating in high latitude ionosphere, which play an important role in the development of geomagnetic, ionospheric and thermospheric disturbances. We tested the PM index for 10-year period (1995-2004). The correlation between PM index and upstream solar wind data for these years is very high (the average correlation coefficient R approximately equal to 0.86). The PM index also shows the high correlation with the cross-polar-cap voltage and hemispheric Joule heating (the correlation coefficient between the actual and predicted values of these parameters is approximately 0.9), which results in significant increasing the prediction reliability of these parameters. Using the PM index of geomagnetic activity provides a significant increase in the forecasting reliability of geomagnetic disturbances and related events in Geospace environment. The PM index may be also used as an important input parameter in modeling ionospheric, magnetospheric, and thermospheric processes.

Author

Space Weather; Weather Forecasting; Geomagnetism; Planetary Ionospheres

20080031109 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Atmospheric Dynamics of Titan

Flasar, F. Michael; Achterberg, Richard K.; Schinder, Paul J.; July 14, 2008; 1 pp.; In English; 37th COSPAR General Assembly, 14-18 Jul. 2008, Montreal, Canada; Copyright; Avail.: Other Sources; Abstract Only

Titan, after Venus, is the second example of an atmosphere with a global cyclostrophic circulation in the solar system, but one with a strong seasonal modulation in the middle atmosphere. Direct measurement of Titan's winds, particularly observations tracking the Huygens probe at 10degS, indicate that the zonal winds are generally in the sense of the satellite's rotation. They become cyclostrophic approx.35 km above the surface and generally increase with altitude, with the exception of a sharp minimum centered near 75 km, where the wind velocity decreases to nearly zero. Zonal winds derived from the temperature field retrieved from Cassini measurements using the thermal wind equation, indicate a strong winter circumpolar vortex, with maximum winds of 190 m/s near 300 km at mid-northern latitudes. One of the most intriguing findings is that the pole of stratospheric temperatures and winds appears to be offset from the IAU definition of Titan's pole by approx. 4deg. The mean meridional circulation can be inferred from the temperature field, and the meridional distribution of organic molecules and condensates and hazes.

Author

Atmospheric Physics; Titan; Huygens Probe; Wind Measurement; Temperature Distribution; Middle Atmosphere; Modulation

20080031333 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Multi-Layer Insulation Debris Sightings on Orbit

SaintCyr, Chris; Murtagh, Bill; May 05, 2008; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

I would like to discuss a topic that has affected many previous white-light coronagraphs as well as the HI1 instruments on STEREO. By design, all of these instruments are extremely sensitive to very faint sources including, unfortunately, those

generated by scattering from flakes of multi-layer insulation (MLI) that has been shed by the spacecraft. We will describe a rich history of these MLI debris sightings, and we note that engineering considerations are required to minimize these deleterious effects in the future.

Author

Coronagraphs; Multilayer Insulation; Space Debris; Debris

20080031656 NASA Goddard Space Flight Center, Greenbelt, MD, USA

CCMC Plans to Support SDO Operations

MacNeice, Peter; March 25, 2008; 1 pp.; In English; 2008 SDO-HMI/EVE/AIA Science Teams Meeting, 25-27 Mar. 2008, Napa, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

The CCMC will actively support the SDO Mission. It will do this, wherever feasible, by installing and running those models which the SDO science planners deem both appropriate and necessary to enable the science goals of SDO. In this presentation I will outline our philosophy in offering this support, the models we are actively pursuing to enable this, and the modes in which we intend to run these models. I will discuss how users of SDO data will be able to request model runs and analyse their outputs. I will also describe the facilities which we have at our disposal to support this effort, and our expectations for the resource requirements which this support will need.

Author

Space Missions; Goals; Aerospace Sciences; Support Systems

20080031662 NASA Goddard Space Flight Center, Greenbelt, MD, USA; Community Coordinated Modeling Center, Greenbelt, MD, USA

Deriving Tools from Real-time Runs: A New CCMC Support for SEC and AFWA

Hesse, Michael; Rastatter, Lutz; MacNeice, Peter; Kuznetsova, Masha; April 29, 2008; 1 pp.; In English; 2007 Space Weather Week, 29 Apr. - 1 May 2008, Boulder, CO, USA; No Copyright; Avail.: Other Sources; Abstract Only

The Community Coordinated Modeling Center (CCMC) is a US inter-agency activity aiming at research in support of the generation of advanced space weather models. As one of its main functions, the CCMC provides to researchers the use of space science models, even if they are not model owners themselves. The second focus of CCMC activities is on validation and verification of space weather models, and on the transition of appropriate models to space weather forecast centers. As part of the latter activity, the CCMC develops real-time simulation systems that stress models through routine execution. A by-product of these real-time calculations is the ability to derive model products, which may be useful for space weather operators. After consultations with NOAA/SEC and with AFWA, CCMC has developed a set of tools as a first step to make real-time model output useful to forecast centers. In this presentation, we will discuss the motivation for this activity, the actions taken so far, and options for future tools from model output.

Author

Space Weather; Real Time Operation; Models

20080031670 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Combined Impedance Probe and Langmuir Probe Studies of the Low-Latitude E Region

Rowland, D. E.; Pfaff, R. F.; Steigies, C. T.; May 18, 2008; 1 pp.; In English; 12th International Symposium on Equatorial Aeronomy (ISEA), 18-24 May 2008, Crete, Greece; Copyright; Avail.: Other Sources; Abstract Only

The EQUIS-2 sounding rocket and radar campaign, launched from Kwajalein Atoll in 2004, included a mission to study low-latitude irregularities and electrodynamics, led by NASA GSFC. This mission included two instrumented rockets launched into the nighttime E region (apogee near 120 km), which included comprehensive electrodynamics and neutral density instrumentation. These rockets carried the first of a new generation of impedance probes, that utilize a wide-band drive signal to simultaneously measure the impedance of an antenna in a plasma as a function of frequency from 7 keIz to 4 MHz, at a rapid cadence. This technique promises to permit true plasma spectroscopy, and resulted in the identification of multiple plasma resonances and accurate measurements of the plasma density, even in the low density nighttime E region. We present analyses of the technique and resulting spectra, and show how these data may be combined with fixed-bias Langmuir Probe data to infer the temperature structure of the E region as well as providing accurate absolute calibrations for the very high time resolution fixed-bias probe data. The data is shown to agree well with data from ionosonde, the ALTAIR radar, and the Peruvian beacon experiment.

Author

Sounding Rockets; Electrodynamics; Irregularities; Apogees; Impedance Probes; Impedance; Plasma Resonance; Ionosondes; Electrostatic Probes; Plasma Density; E Region

20080031704 NASA Goddard Space Flight Center, Greenbelt, MD, USA

GLAST and Suzaku

Sambruna, Rita; December 09, 2007; 1 pp.; In English; 2007 Suzaku Conference, 9-12 Dec. 2007, San Diego, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

The upcoming years will see a formidable synergy of high-energy observatories for the study of extragalactic objects, especially AGN. In particular, the launch of GLAST will allow us coordinated monitoring of sources with Suzaku over a very large energy band, from medium X-rays to GeV energies. In this talk I will review the science issues that such a remarkable coverage will enable us to address.

Author

Gamma Ray Telescopes; Satellites; Astronomical Observatories

20080032380 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

The Presence of Methane in the Atmosphere of an Extrasolar Planet

Swain, Mark R.; Vasisht, Gautam; Tinetti, Giovanna; Nature; March 20, 2008; Volume 452, pp. 329-331; In English; Original contains color illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40876>; <http://dx.doi.org/10.1038/nature06823>

Molecules present in the atmospheres of extrasolar planets are expected to influence strongly the balance of atmospheric radiation, to trace dynamical and chemical processes, and to indicate the presence of disequilibrium effects. As molecules have the potential to reveal atmospheric conditions and chemistry, searching for them is a high priority. The rotational-vibrational transition bands of water, carbon monoxide and methane are anticipated to be the primary sources of non-continuum opacity in hot-Jupiter planets. As these bands can overlap in wavelength, and the corresponding signatures from them are weak, decisive identification requires precision infrared spectroscopy. Here we report a near-infrared transmission spectrum of the planet HD 189733b that shows the presence of methane. Additionally, a resolved water vapour band at 1.9 (micro)m confirms the recent claim⁴ of water in this object. On thermochemical grounds, carbon monoxide is expected to be abundant in the upper atmosphere of hot-Jupiter planets, but is not identifiable here; therefore the detection of methane rather than carbon monoxide in such a hot planet could signal the presence of a horizontal chemical gradient away from the permanent dayside, or it may imply an ill-understood photochemical mechanism that leads to an enhancement of methane.

Author

Methane; Planetary Atmospheres; Photochemical Reactions; Thermochemistry; Upper Atmosphere; Chemical Reactions; Extrasolar Planets; Infrared Spectroscopy; Meteorology

20080032436 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Understanding Neutron Stars using Thermonuclear X-ray Bursts

Bhattacharyya, S.; September 18, 2007; 26 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NNG06EO90A; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080032436>

Studies of thermonuclear X-ray bursts can be very useful to constrain the spin rate, mass and radius of a neutron star = EOS model of high density cold matter in the neutron star cores. Extensive observation and analysis of the data from the rising portions of the bursts = modeling of burst oscillations and thermonuclear flame spreading. Theoretical study of thermonuclear flame spreading on the rapidly spinning neutron stars should be done considering all the main physical effects (including magnetic field, nuclear energy generation, Coriolis effect, strong gravity, etc.).

Author

Extraterrestrial Matter; Gravitation; Neutron Stars; Magnetic Fields; Oscillations; Flames

20080032526 NASA Goddard Space Flight Center, Greenbelt, MD, USA

NASA's THEMIS Mission: Multipoint Observations of Substorms, the Foreshock, and the Magnetopause

Sibeck, D. G.; Angelopoulos, V.; Kuznetsova, M.; Glabmeier, K.-H.; McFadden, J. P.; May 11, 2008; 1 pp.; In English; 2008 Israel Dynamics meeting, 11-18 May 2008, Dead Sea, Israel; Copyright; Avail.: Other Sources; Abstract Only

From launch on February 17 through the repositioning to final orbits that began in September 2007, the five-spacecraft of the THEMIS mission operated nominally in nearly identical 14.6 RE apogee near-equatorial orbits. On March 23, while aligned from east to west in the duskside magnetotail, the spacecraft observed two substorm sequences in fast survey mode. Timing the motion of these signatures served as an early proof of concept for the main phase of the mission: particle injection and dipolarization signatures propagated duskward from one probe to another, as did auroral intensifications seen by the

dedicated array of ground-based observatories. During the summer of 2007, the spacecraft were on the dayside, where the three inner spacecraft (C, D, E) were separated by 100-500 km and the two outer probes (B, -4) by 5,000 - 10,000 km. Here the THEMIS probes repeatedly encountered the magnetopause and bow shock, dissecting flux transfer events (FTEs), determining the instantaneous width of the low-latitude boundary layer, and simultaneously observing hot flow anomalies upstream and downstream from the bow shock at the moment of their inception. From January to March 2008, the spacecraft were in the Earth's magnetotail with apogees of 31.0, 19.5, 11.8 (2) and 10.0 RE corresponding to periods of 4, 2, and 1 days. Radial alignments once each four days offered an opportunity to pinpoint when and where substorms begin. This talk reviews THEMIS discoveries to date, with an emphasis on model-data comparisons of FTE characteristics

Author

Magnetopause; Magnetic Storms; Equatorial Orbits; Apogees; Sequencing; Shock Waves; Bow Waves

20080032584 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Magnetotail Current Sheet Thinning and Magnetic Reconnection Dynamics in Global Modeling of Substorms

Kuznetsova, M. M.; Hesse, M.; Rastaetter, L.; Toth, G.; DeZeeuw, D. L.; Gombosi, T. I.; May 05, 2008; 1 pp.; In English; 9th International Conference on Substorms (ICS9), 5-9 May 2008, Graz, Austria; Copyright; Avail.: Other Sources; Abstract Only

Magnetotail current sheet thinning and magnetic reconnection are key elements of magnetospheric substorms. We utilized the global MHD model BATS-R-US with Adaptive Mesh Refinement developed at the University of Michigan to investigate the formation and dynamic evolution of the magnetotail thin current sheet. The BATS-R-US adaptive grid structure allows resolving magnetotail regions with increased current density up to ion kinetic scales. We investigated dynamics of magnetotail current sheet thinning in response to southwards IMF turning. Gradual slow current sheet thinning during the early growth phase become exponentially fast during the last few minutes prior to nightside reconnection onset. The later stage of current sheet thinning is accompanied by earthward flows and rapid suppression of normal magnetic field component B_z . Current sheet thinning set the stage for near-earth magnetic reconnection. In collisionless magnetospheric plasma, the primary mechanism controlling the dissipation in the vicinity of the reconnection site is non-gyrotropic effects with spatial scales comparable with the particle Larmor radius. One of the major challenges in global MHD modeling of the magnetotail magnetic reconnection is to reproduce fast reconnection rates typically observed in smallscale kinetic simulations. Bursts of fast reconnection cause fast magnetic field reconfiguration typical for magnetospheric substorms. To incorporate nongyrotropic effects in diffusion regions we developed an algorithm to search for magnetotail reconnection sites, specifically where the magnetic field components perpendicular to the local current direction approaches zero and form an X-type configuration. Spatial scales of the diffusion region and magnitude of the reconnection electric field are calculated self-consistently using MHD plasma and field parameters in the vicinity of the reconnection site. The location of the reconnection sites and spatial scales of the diffusion region are updated during the simulations. Such an approach allows quantifying the interaction between large-scale global magnetospheric dynamics and microphysical processes in diffusion regions localized near reconnection sites. To clarify the role of smallscale non-MHD effects in diffusion region on the global magnetospheric dynamic and to test different models of dissipation we perform simulations with steady southward IMF driving of the magnetosphere.

Author

Magnetic Storms; Current Sheets; Magnetohydrodynamics; Geomagnetic Tail; Gyrotropism; Magnetospheric Instability; Computational Grids

20080032587 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Heliophysical Explorers (HELEX): Solar Orbiter and Sentinels - Report of the Joint Science and Technology Definition Team (JSTDT)

March 2008; 36 pp.; In English; Original contains color and black and white illustrations

Report No.(s): NASA/TM-2008-214159; ESA-SCI(2007)2; Copyright; Avail.: CASI: [A03](#), Hardcopy

Heliophysical Explorers (HELEX) brings together and augments the unique capabilities of ESA's Solar Orbiter mission (near-Sun and out-of-ecliptic in-situ plus remote-sensing observations) with those of NASA's Inner Heliospheric Sentinels (in-situ observations from multiple platforms arrayed at varying radial distances and azimuthal locations in the near-ecliptic plane) to investigate, characterize, and understand how the Sun determines the environment of the inner solar system and, more broadly, generates the heliosphere itself. This joint ESA-NASA science program offers a unique opportunity for coordinated, correlative measurements, resulting in a combined observational capability and science return that far outweighs that of either mission alone. Building on the knowledge gained from missions like Helios and Ulysses, and STEREO, HELEX will bring to bear the power of multipoint, in-situ measurements using previously unavailable instrumental capabilities in combination

with remote-sensing observations from a new, inner heliospheric perspective to answer fundamental questions about the Sun-heliosphere linkage.

Author

Heliosphere; Remote Sensing; Sun; Position (Location); In Situ Measurement; Azimuth

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ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20080030990 NASA Marshall Space Flight Center, Huntsville, AL, USA

So You Think the Crab is Described by a Power-Law Spectrum

Weisskopf, Martin C.; May 19, 2008; 1 pp.; In English; 3rd Meeting of the International Astronomical Consortium for High Energy Calibration, 19-21 May 2008, Tergensee, Germany; No Copyright; Avail.: Other Sources; Abstract Only

X-ray observations of the Crab Nebula and its pulsar have played a prominent role in the history of X-ray astronomy. Discoveries range from the detection of the X-ray Nebula and pulsar and the measurement of the Nebula-averaged X-ray polarization, to the observation of complex X-ray morphology, including jets emanating from the pulsar and the ring defining the shocked pulsar wind. The synchrotron origin of much of the radiation has been deduced by detailed studies across the electromagnetic spectrum, yet has fooled many X-ray astronomers into believing that the integrated spectrum from this system ought to be a power law. In many cases, this assumption has led observers to adjust the experiment response function(s) to guarantee such a result. We shall discuss why one should not observe a power-law spectrum, and present simulations using the latest available response matrices showing what should have been observed for a number of representative cases including the ROSAT IPC, XMM-Newton, and RXTE. We then discuss the implications, if any, for current calibrations.

Author

Crab Nebula; X Ray Astronomy; Power Spectra

20080031148 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Asymmetric 511 keV Positron Annihilation Line Emission from the Inner Galactic Disk

Skinner, Gerry; Weidenspointner, Georg; Jean, Pierre; Knodlseder, Jurgen; Ballmoos, Perer von; Bignami, Giovanni; Diehl, Roland; Strong, Andrew; Cordier, Bertrand; Schanne, Stephane; Winkler, Christoph; March 31, 2008; 1 pp.; In English; HEAD 2008 Meeting, 31 Mar. 2008 - 3 Mar. 2008, Los Angeles, CA, USA

Contract(s)/Grant(s): NNG06EO90A; No Copyright; Avail.: Other Sources; Abstract Only

A recently reported asymmetry in the 511 keV gamma-ray line emission from the inner galactic disk is unexpected and mimics an equally unexpected one in the distribution of LMXBs seen at hard X-ray energies. A possible conclusion is that LMXBs are an important source of the positrons whose annihilation gives rise to the line. We will discuss these results, their statistical significance and that of any link between the two. The implication of any association between LMXBs and positrons for the strong annihilation radiation from the galactic bulge will be reviewed.

Author

Asymmetry; Galactic Bulge; Positron Annihilation; Emission Spectra

20080031152 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Origin of the 'Extra Entropy'

Mushotzky, R.; February 11, 2008; 1 pp.; In English; The First Two Billion Years of Galaxy Formation: The Reionization Epoch and Beyond, 11-15 Feb. 2008, Aspen, CO, USA; No Copyright; Avail.: Other Sources; Abstract Only

I will discuss how one can determine the origin of the 'extra entropy' in groups and clusters and the feedback needed in models of galaxy formation. I will stress the use of x-ray spectroscopy and imaging and the critical value that Con-X has in this regard.

Author

Entropy; Constellation-X; Galactic Evolution; Time Measurement

20080031155 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Search for O VI Emission from the Shocked Circumstellar Gas of SN 1987A

Sonneborn, G.; Iping, R. C.; Lundqvist, P.; Fransson, C.; January 07, 2008; 1 pp.; In English; American Astronomical Society, 7-12 Jan. 2008, Austin, TX, USA; Copyright; Avail.: Other Sources; Abstract Only

The Far Ultraviolet Spectroscopic Explorer (FUSE) was used to search for broad O VI emission from the shock interaction zones produced by the collision of high-velocity supernova ejecta with the dense inner circumstellar ring of SN 1987A. Since the shock interaction with the inner ring began in 1997, broad (FWHM = 300 km/sec) emission from optical coronal lines (e.g. [Fe X], [Fe XI], and [Fe XIV]) has emerged and increased exponentially in strength. O VI 1032-1038 Angstrom emission is expected to track the coronal lines. O VI is also expected to be the primary cooling transition for the million-degree shocked gas. An accurate measurement of the O VI line strength would significantly improve current models of the shock interaction. FUSE observations of SN 1987A in 2000 and 2001 did not detect broad O VI due to spectral contamination from two early-type stars within a few arc seconds of the SN. However, O VI emission was detected with narrow line widths (FWHM less than 35 km/sec) and a heliocentric radial velocity of +280 km/sec. This places the emitting gas at rest relative to the supernova and is interpreted as emission from unshocked circumstellar gas. A new FUSE observation of SN 1987A obtained in May 2007 used a narrow slit (1.25 x 20 arcsec) to significantly reduce the spectral contamination from the two early-type stars. Yet the 2007 spectrum does not reveal any significant O VI emission. The implications of these results are discussed.

Author

Far UV Spectroscopic Explorer; Stellar Envelopes; Supernova 1987A; Early Stars

20080031156 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Observing Gamma-ray Bursts with GLAST

McEnery, Julie; January 07, 2008; 1 pp.; In English; AAS Meeting, 7-11 Jan. 2008, Austin, TX, USA; No Copyright; Avail.: Other Sources; Abstract Only

The Gamma-ray Large Area Telescope (GLAST) is a satellite-based observatory to study the high-energy gamma-ray sky. The Large Area Telescope, the main instrument, is a pair-conversion telescope which will survey the sky in the energy range 20 MeV to greater than 300 GeV. The LAT's wide field of view (greater than 2 sr), large effective area and low deadtime combine to provide excellent high-energy gamma-ray observations of GRB. To tie these frontier high-energy observations to the better-known properties at lower energies, a second instrument, the GLAST Burst Monitor (GBM) will provide important spectra and timing in the 8 keV to 30 MeV range. Upon detection of a GRB by the LAT or the GBM, the spacecraft can autonomously repoint to keep the GRB location within the LAT field of view, allowing high-energy afterglow observations. We describe how the instruments, spacecraft, and ground system work together to provide observations of gamma-ray bursts from 8 keV to over 300 GeV and provide rapid notification of these observations to the wider gamma-ray burst community. Analysis and simulation tools dedicated to the GRB science have been developed. In this contribution we show the expected LAT sensitivity obtained with such simulations, and illustrate the results we expect from GLAST observations with spectral and temporal analysis of simulated GRB.

Author

Gamma Ray Telescopes; Gamma Ray Astronomy; Gamma Ray Bursts; Satellite-Borne Instruments; Satellite Ground Support

20080031161 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Light Echos in Kerr Geometry: A Source of High Frequency QPOs from Random X-ray Bursts

Fukumura, K.; Kazanas, D.; January 07, 2008; 1 pp.; In English; AAS Meeting, 7-11 Jan. 2008, Austin, TX, USA; No Copyright; Avail.: Other Sources; Abstract Only

We propose that high frequency quasi-periodic oscillations (HFQPOs) can be produced from randomly-formed X-ray bursts (flashes) by plasma interior to the ergosphere of a rapidly-rotating black hole. We show by direct computation of their orbits that the photons comprising the observed X-ray light curves, if due to a multitude of such flashes, are affected significantly by the black hole's dragging of inertial frames; the photons of each such burst arrive to an observer at infinity in multiple (double or triple), distinct 'bunches' separated by a roughly constant time lag of t/M approximately equal to 14, regardless of the bursts' azimuthal position. We argue that every other such 'bunch' represents photons that follow trajectories with an additional orbit around the black hole at the photon circular orbit radius (a photon 'echo'). The presence of this constant lag in the response function of the system leads to a QPO feature in its power density spectra, even though the corresponding light curve consists of a totally stochastic signal. This effect is by and large due to the black hole spin and is shown to gradually diminish as the spin parameter a decreases or the radial position of the burst moves outside the static limit

surface (ergosphere). Our calculations indicate that for a black hole with Kerr parameter of $a/M=0.99$ and mass of $M=10M_{\text{sun}}$ the QPO is expected at a frequency of approximately 1.3-1.4 kHz. We discuss the plausibility and observational implications of our model/results as well as its limitations.

Author

Light Curve; High Frequencies; Oscillations; X Ray Stars; Bursts; Kerr Effects; Rotation; Black Holes (Astronomy)

20080031423 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The First Swift BAT Gamma-Ray Burst Catalog

Sakamoto, T.; Barthelmy, S. D.; Barbier, L.; Cummings, J. R.; Fenimore, E. E.; Gehrels, N.; Hullinger, D.; Krimm, H. A.; Markwardt, C. B.; Palmer, D. M.; Parsons, A. M.; Sato, G.; Stamatikos, M.; Tueller, J.; Ukwatta, T. N.; Zhang, B.; January 2007; 63 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NNG06GEO90A; Copyright; Avail.: CASI: [A04](#), Hardcopy

We present the first Swift Burst Alert Telescope (BAT) catalog of gamma ray bursts (GRBs), which contains bursts detected by the BAT between 2004 December 19 and 2007 June 16. This catalog (hereafter BAT1 catalog) contains burst trigger time, location, 90% error radius, duration, fluence, peak flux, and time averaged spectral parameters for each of 237 GRBs, as measured by the BAT. The BAT-determined position reported here is within 1.75' of the Swift X-ray Telescope (XRT)-determined position for 90% of these GRBs. The BAT T(sub 90) and T(sub 50) durations peak at 80 and 20 seconds, respectively. From the fluence-fluence correlation, we conclude that about 60% of the observed peak energies, $E(\text{sup obs})(\text{sub peak})$ of BAT GRBs could be less than 100 keV. We confirm that GRB fluence to hardness and GRB peak flux to hardness are correlated for BAT bursts in analogous ways to previous missions' results. The correlation between the photon index in a simple power-law model and $E(\text{sup obs})(\text{sub peak})$ is also confirmed. We also report the current status for the on-orbit BAT calibrations based on observations of the Crab Nebula.

Author

Gamma Ray Bursts; Astronomical Catalogs; Swift Observatory; Catalogs (Publications); X Ray Telescopes

20080031523 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Orbital Evolution and Maneuvers around Non-Spherical Bodies

AparecidaSilva, Aurea; [2007]; 190 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14654-TDI/1212; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A09](#), Hardcopy

In the last years several asteroids had their shapes identified using images from space probes or through the indirect radar data determination. In a general way, these asteroids have forms quite different from spherical. Conventional spherical harmonic representations of the gravitational potential of such bodies require expansions of high degree and order, which are numerically difficult to obtain. The polyhedral method is well suited to evaluate the gravitational field of an irregularly shaped body such as asteroids, comet nucleus and small planetary satellites. If complete coverage of the surface can be obtained, a polyhedral model of the body can be constructed. The purpose of the present work is to determine an analytical form to represent the potential around an irregular shaped body; to obtain a description of the possible orbital evolutions of a space vehicle that travels around a celestial body with those characteristics; and, finally, to find solutions for the problem of orbital maneuvers with minimum consumption of fuel. The results consist of sets of analytical expressions that give the potential due to different two-dimensional geometric forms that were implemented and tested. In the group of two-dimensional bodies it is included a study of the space of phase of the orbit in order to verify the stability or instability areas and the collision areas. This study is made through Poincare surface of section technique. It is also used the polyhedral method to study the gravitational potential of a spherical and non spherical three-dimensional bodies (a unity radius sphere, a prolate and an oblate ellipsoids with different values of semi axis). The dynamics of the orbit of a test particle around of such bodies is studied. In general, when the particle is far from the sphere, its position returns to the initial point after a keplerian orbital period. On the other hand, when the particle gets close to its surface, the effect of its polyhedral form shows short-periodic variations in the semimajor axis and eccentricity of the orbit. The results showed that the orbits close to the ellipsoids become eccentric and precess due the effects of its potential. With these results it can be verified that the polyhedral form of the object does work very well and this method is efficient for the trajectory study. The work generates fundamental theoretical knowledge that it can be applied in irregular bodies with more complex forms, such as the asteroids.

Author

Spacecraft Orbits; Orbital Maneuvers; Three Dimensional Bodies; Gravitational Fields

20080031654 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Recent Progress at NASA in LISA Formulation and Technology Development

Stebbins, Robin; July 12, 2007; 18 pp.; In English; 7th Edoardo Amaldi Conference on Gravitational Waves, 8-14 Jul. 2007, Sydney, Australia; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: <http://hdl.handle.net/2060/20080031654>

Over the last year, the NASA portion of the LISA team has been focused its effort on advancing the formulation of the mission and responding to a major National Academy review. This talk will describe advances in, and the current state of: the baseline mission architecture, the performance requirements, the technology development and plans for final integration and test. Interesting results stimulated by the NASINRC Beyond Einstein Program Assessment Review will also be described.

Author

LISA (Observatory); Mission Planning; Assessments

20080031655 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Gamma Ray Burst Discoveries with the Swift Mission

Gehrels, Neil; Tueller, Jack; October 17, 2007; 4 pp.; In English; INTEGRAL Science Workshop/ESA, 17-19 Oct. 2007, Sardinia, Italy; Original contains black and white illustrations; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: <http://hdl.handle.net/2060/20080031655>

There is a great synergy between the Swift and INTEGRAL missions. Swift provides wide-field hard x-ray monitoring and sensitive x-ray and UV/optical observations. INTEGRAL provides optical through gamma-ray coverage with emphasis on hard x-ray imaging and gamma-ray spectroscopy. For hard x-ray survey studies, the BAT and IBIS instruments are complementary with BAT covering the full sky every day and IBIS scanning the galactic plane. For GRBs, Swift follows up bursts detected by INTEGRAL. X-ray and optical observations give arcsecond positions and afterglow lightcurves. For IGR sources, X-ray observations identify counterparts. The joint BAT and IBIS survey data are giving the most complete picture of the hard x-ray sky ever obtained. This talk will review Swift capabilities and discuss joint observations that are taking place and planned

Author

Gamma Ray Bursts; Imaging Techniques; Sky Surveys (Astronomy); Gamma Ray Astronomy; Gamma Ray Sources (Astronomy)

20080031671 Columbia Univ., New York, NY, USA

Outburst of the 2 s Anomalous X-ray Pulsar 1E 1547.0-5408

Halpern, J. P.; Gotthelf, E. V.; Camilo, F.; Reynolds, J.; Ransom, S. M.; The Astrophysical Journal; April 2008; Volume 676, pp. 1178-1183; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNG05GC43G; Copyright; Avail.: Other Sources
ONLINE: <http://dx.doi.org/10.1086/527293>

Following our discovery of radio pulsations from the newly recognized anomalous X-ray pulsar (AXP) 1E 1547.0-5408, we initiated X-ray monitoring with the Swift X-ray telescope and obtained a single target-of-opportunity observation with the Newton X-ray Multi-Mirror Mission (XMM-Newton). In comparison with its historic minimum flux of 3×10^{13} ergs/sq cm/s, the source was found to be in a record high state, $f_{\text{(sub x)}}(1-8 \text{ keV}) = 5 \times 10^{12}$ ergs/sq cm/s, or $L_{\text{(sub x)}} = 1.7 \times 10^{35} (d/9 \text{ kpc})^2$ ergs/s, and declining by 25% in 1 month. Extrapolating the decay, we bound the total energy in this outburst to $1042 \text{ ergs} < E < \text{ergs}$. The spectra (fitted with a Comptonized blackbody) show that an increase in the temperature and area of a hot region, to 0.5 keV and -16% of the surface area of the neutron star, respectively, are primarily responsible for its increase in luminosity. The energy, spectrum, and timescale of decay are consistent with a deep crustal heating event, similar to an interpretation of the X-ray turn-on of the transient AXP XTE J18 10- 197. Simultaneous with the 4.6 hr ATdA4-Newton observation, we observed at 6.4 GHz with the Parkes telescope, measuring the phase relationship of the radio and X-ray pulse. The X-ray pulsed fraction of 1E 1547.0-5408 is only approx. 7 %, while its radio pulse is relatively broad for such a slow pulsar, which may indicate a nearly aligned rotator. As also inferred from the transient behavior of XTE J18 10-197, the only other AXP known to emit in the radio, the magnetic field rearrangement responsible for this X-ray outburst of 1E 1547.0-5408 is probably the cause of its radio turn-on.

Author

Neutron Stars; XMM-Newton Telescope; Pulsars; Energy Spectra; Magnetic Fields; Unsteady Flow

20080031672 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Use of the BAT Instrument on SWIFT for the Detection of Prompt Gamma-Ray Emission from Novae

Skinner, Gerry; Senziani, Fabio; Jean, Pierre; Hernanz, Margarita; January 2007; 4 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NNG06EO90A; Copyright; Avail.: CASI: [A01](#), Hardcopy

Gamma-rays are expected to be emitted during and immediately following a nova explosion due to the annihilation of positrons emitted by freshly produced short-lived radioactive isotopes. The expected gamma-ray emission is relatively short-lived and as nova explosions are unpredictable, the best chance of detecting the gamma-rays is with a wide field instrument. At the time when the flux is expected to reach its peak, most of the gamma-ray production is at depths such that the photons suffer several Compton scatterings before escaping, degrading their energy down to the hard X-ray band (10s of keV). SWIFT/BAT is a very wide field coded mask instrument working in the energy band 14-190 keV and so is very well suited to the search for such gamma-rays. A retrospective search is being made in the BAT data for evidence for gamma-ray emission from the direction of novae at around the time of their explosion. So far the only positive detection is of RS Ophiuchi and in this case the emission is probably due to shock heating.

Author

Novae; Gamma Ray Astronomy; Ophiuchi Clouds; Astrophysics; Telescopes

20080031673 Colorado Univ., Boulder, CO, USA

Constraints on the Emission and Viewing Geometry of the Transient Anomalous X-ray Pulsar XTE J1810-197

Perna, Rosalba; Gotthelf, E. V.; The Astrophysical Journal; July 2008; Volume 681, pp. 522-529; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NNG05GC43G; Copyright; Avail.: Other Sources

ONLINE: <http://dx.doi.org/10.1086/588211>

The temporal decay of the flux components of the transient anomalous X-ray pulsar XTE J1810-197 following its 2002 outburst presents a unique opportunity to probe the emission geometry of a magnetar. Toward this goal, we model the magnitude of the pulsar's modulation in narrow spectral bands over time. Following previous work, we assume that the postoutburst flux is produced in two distinct thermal components arising from a hot spot and a warm concentric ring. We include general relativistic effects on the blackbody spectra due to gravitational redshift and light bending near the stellar surface, which strongly depend on radius. This affects the model fits for the temperature and size of the emission regions. For the hot spot, the observed temporal and energy-dependent pulse modulation is found to require an anisotropic, pencil-beamed radiation pattern. We are able to constrain an allowed range for the angles that the line of sight (ψ) and the hot spot pole (χ) make with respect to the spin axis. Within errors, this is defined by the locus of points in the χ - ψ plane that lie along the line $[\chi + \beta(R)] [\psi + \beta(R)] = \text{const}$, where $\beta(R)$ is a function of the radius R of the star. For a canonical value of $R = 12$ km, the viewing parameters range from $\psi = \chi = 37^\circ$ to $(\psi, \chi) = (85^\circ, 15^\circ)$. We discuss our results in the context of magnetar emission models.

Author

Pulsars; X Rays; Stellar Models; Pulse Modulation; Line of Sight; Magnetars; Stars; Spectral Bands; Red Shift

20080031698 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The 'Supercritical Pile' GRB Model: Afterglows and GRB, XRR, XRF Unification

Kazanas, D.; March 18, 2007; 1 pp.; In English; The Next Decade of GRB Afterglows, 18-23 Mar. 2007, Amsterdam, Netherlands; No Copyright; Avail.: Other Sources; Abstract Only

We present the general notions and observational consequences of the 'Supercritical Pile' GRB model; the fundamental feature of this model is a detailed process for the conversion of the energy stored in relativistic protons in the GRB Relativistic Blast Waves (RBW) into relativistic electrons and then into radiation. The conversion is effected through the $p + e \rightarrow p + e + \gamma$ reaction, whose kinematic threshold is imprinted on the GRB spectra to provide a peak of their emitted luminosity at energy $E_p \sim 1$ MeV in the lab frame. We extend this model to include, in addition to the (quasi-)thermal relativistic post-shock protons an accelerated component of power law form. This component guarantees the production of e^+e^- pairs even after the RBW has slowed down to the point that its (quasi-) thermal protons cannot fulfill the threshold of the above reaction. We suggest that this last condition marks the transition from the prompt to the afterglow GRB phase. We also discuss conditions under which this transition is accompanied by a significant drop in the flux and could thus account for several puzzling, recent observations. Finally, we indicate that the

same mechanism applied to the late stages of the GRB evolution leads to a decrease in Γ , a feature amenable to future observational tests.

Author

Gamma Ray Bursts; Models; Afterglows; Astronomy

20080031706 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Finding our Origins with the Hubble and James Webb Space Telescopes

Gardner, Jonathan P.; December 09, 2007; 1 pp.; In English; Colloquium at the University of Alabama, 9-10 Dec. 2007, Alabama, USA; No Copyright; Avail.: Other Sources; Abstract Only

NASA is planning a successor to the Hubble Space Telescope designed to study the origins of galaxies, stars, planets and life in the universe. In this talk, Dr. Gardner will discuss the origin and evolution of galaxies, beginning with the Big Bang and tracing what we have learned with Hubble through to the present day. He will show that results from studies with Hubble have led to plans for its successor, the James Webb Space Telescope. Webb is scheduled to launch in 2013, and is designed to find the first galaxies that formed in the distant past and to penetrate the dusty clouds of gas where stars are still forming today. He will compare Webb to Hubble, and discuss recent progress in the construction of the observatory.

Author

Galactic Evolution; Hubble Space Telescope; James Webb Space Telescope; Spaceborne Telescopes

20080031708 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Beginning and End of the Universe

Gardner, Jonathan P.; December 09, 2007; 1 pp.; In English; Colloquium at the University of Alabama, 9-10 Dec. 2007, Alabama, USA; No Copyright; Avail.: Other Sources; Abstract Only

Cosmology is the scientific study of how the Universe began more than 13 billion years ago, how its properties have changed, and what its future might be. The balance of forces and energy cause the Universe to expand, first accelerating, then decelerating and then accelerating again. Within this overall structure, the interplay of atoms and light with the mysterious dark matter and dark energy causes stars and galaxies to form and evolve, leading to galaxies like our own home, the Milky Way. Observational cosmology uses telescopes on Earth and in space to reach back in time to find the faint remaining echoes of the Big Bang and to trace the formation and evolution of the galaxies and structures that fill the Universe. In this lecture, Dr. Gardner will give an overview of cosmology, outlining the 13-billion year history of the Universe, and highlighting the very rapid progress this field has made in the last decade. He will discuss the role that NASA space telescopes have played in this progress and will continue to play in the years to come. He will give a time-based history of the Universe, discussing the successive processes that formed matter, particles, atoms, stars and galaxies. In particular, he will focus on cosmological inflation, the rapid accelerated expansion that marks the beginning of the Universe, and dark energy, a tenuous substance that overcomes gravity and whose properties will determine its final fate.

Author

Galactic Evolution; Spaceborne Telescopes; Matter (Physics); Dark Matter; Cosmology; Gravitation; Dark Energy

20080031736 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Searching for Dark Matter Signatures in the GLAST LAT Electron Flux

Moiseev, Alexander; Profumo, Stefano; February 20, 2008; 13 pp.; In English; 8th UCLA Dark Matter Symposium, 20-22 Feb. 2008, Marina del Rey; Original contains black and white illustrations

Contract(s)/Grant(s): NNG06EO90A; Copyright; Avail.: CASI: A03, Hardcopy

We explored several viable scenarios of how LAT might observe DM, when the spectral feature is predicted to be observed in the HE electron flux. It has been demonstrated elsewhere that LAT will be capable to detect HE electrons flux in energy range from 20 GeV to > 1 TeV with 520% energy resolution and good statistics. If there is a DM-caused feature in the HE electron flux (in the range 20 GeV - 1 TeV), LAT will be the best current instrument to observe it!

Derived from text

High Energy Electrons; Sensory Feedback; Cosmic Rays; Flux (Rate); Energy Spectra; Dark Matter

20080032376 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

The Spitzer Space Telescope Mission

Werner, M. W.; Advances in Space Research; April 2005; Volume 36, pp. 1048-1049; In English

Contract(s)/Grant(s): NASA 1407; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40895>; <http://dx.doi.org/10.1016/j.asr.2005.04.012>

The Spitzer Space Telescope, NASA's Great Observatory for infrared astronomy, was launched 2003 August 25 and is

returning excellent scientific data from its Earth-trailing solar orbit. Spitzer combines the intrinsic sensitivity achievable with a cryogenic telescope in space with the great imaging and spectroscopic power of modern detector arrays to provide the user community with huge gains in capability for exploration of the cosmos in the infrared. The observatory systems are largely performing as expected, and the projected cryogenic lifetime is about five years. Spitzer is thus both a scientific and a technical precursor to the infrared astronomy missions of the future. This very brief paper refers interested readers to several sets of recent publications which describe both the scientific and the technical features of Spitzer in detail. Note that, until 2003 December, Spitzer was known as the Space Infrared Telescope Facility (SIRTF).

Author

Space Infrared Telescope Facility; Infrared Astronomy; Earth Orbits; Imaging Techniques; Infrared Telescopes; Solar Orbits; Infrared Radiation

20080032379 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

The Large-Grained Dust Coma of 174P/Echeclus

Bauer, James M.; Choi, Young-Jun; Weissman, Paul R.; Stansberry, John A.; Fernandez, Yanga R.; Roe, Henry G.; Buratti, Bonnie J.; Sung, Hyun-II; *Astronomical Society of the Pacific*; 11 April 2008; Volume 120, pp. 393-404; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40874>

On 2005 December 30, Y.-J. Choi and P. R. Weissman discovered that the formerly dormant Centaur 2000 EC98 was in strong outburst. Previous observations by P. Rousselot et al. spanning a 3-year period indicated a lack of coma down to the 27 mag arcsec² level. We present Spitzer Space Telescope MIPS observations of this newly active Centaur--now known as 174P/Echeclus (2000 EC98)--or 60558 Echeclus--taken in 2006 late February. The images show strong signal at both the 24 and 70 micron bands and reveal an extended coma about 2' in diameter. Analyses yield estimates of the coma signal contribution that are in excess of 90% of the total signal in the 24 micron band. Dust production estimates ranging from 1.7-4 x 10(exp 2) kg/s are on the order of 30 times that seen in other Centaurs. Simultaneous visible-wavelength observations were also obtained with Palomar Observatory's 200-inch telescope, the 1.8-m Vatican Advanced Technology Telescope, the Bohyunsan Optical Astronomy Observatory (BOAO) 1.8-m telescope, and Table Mountain Observatory's 0.6-m telescope, revealing a coma morphology nearly identical to the mid-IR observations. The grain size distribution derived from the data yields a log particle mass power-law with slope parameter (alpha) = -0.87 +/- 0.07, and is consistent with steady cometary-activity, such as that observed during the Stardust spacecraft's encounter at 81P/Wild 2, and not with an impact driven event, such as that caused by the Deep Impact experiment.

Author

Space Infrared Telescope Facility; Stardust Mission; Infrared Radiation; Dust; Particle Mass

20080032393 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

New Infrared Emission Features and Spectral Variations in Ngc 7023

Werner, M. W.; Uchida, K. I.; Sellgren, K.; Marengo, M.; Gordon, K. D.; Morris, P. W.; Houck, J. R.; Stansberry, J. A.; *The Astrophysical Journal Supplement Series*; September 2004; Volume 154, pp. 309-314; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NASA 1407; NASA 1257184; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40893>

We observed the reflection nebula NGC 7023, with the Short-High module and the long-slit Short-Low and Long-Low modules of the Infrared Spectrograph on the Spitzer Space Telescope. We also present Infrared Array Camera (IRAC) and Multiband Imaging Photometer for Spitzer (MIPS) images of NGC 7023 at 3.6, 4.5, 8.0, and 24 m. We observe the aromatic emission features (AEFs) at 6.2, 7.7, 8.6, 11.3, and 12.7 m, plus a wealth of weaker features. We find new unidentified interstellar emission features at 6.7, 10.1, 15.8, 17.4, and 19.0 m. Possible identifications include aromatic hydrocarbons or nanoparticles of unknown mineralogy. We see variations in relative feature strengths, central wavelengths, and feature widths, in the AEFs and weaker emission features, depending on both distance from the star and nebular position (southeast vs. northwest).

Author

Infrared Radiation; Emission; Nebulae; Interstellar Radiation; Spectral Emission

20080032407 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Mapping the CMB with the Wilkinson Microwave Anisotropy Probe

Hinshaw, Gary; December 03, 2007; 1 pp.; In English; COSMIC Cartography Conference, 3-6 Dec. 2007, Chicago, IL, USA; No Copyright; Avail.: Other Sources; Abstract Only

The data from the Wilkinson Microwave Anisotropy Probe (WMAP) satellite provide detailed full-sky maps of the cosmic microwave background temperature anisotropy and new full-sky maps of the polarization. Together, the data provide a wealth of cosmological information, including the age of the universe, the epoch when the first stars formed, and the overall composition of baryonic matter, dark matter, and dark energy. The results also provide constraints on the period of inflationary expansion in the very first moments of time. These and other aspects of the mission results will be discussed and commented on.

Author

Cosmology; Cosmic Microwave Background Radiation; Microwave Anisotropy Probe; Polarization; Dark Energy; Dark Matter; Matter (Physics)

20080032410 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Gamma-ray Astronomy and GLAST

McEnergy, Julie; November 20, 2007; 1 pp.; In English; Colloquium at the University of Wisconsin, 20-23 Nov. 2007, Madison, WI, USA; No Copyright; Avail.: Other Sources; Abstract Only

The high energy gamma-ray (30 MeV to 100 GeV) sky has been relatively poorly studied. Most of our current knowledge comes from observations made by the Energetic Gamma Ray Experiment Telescope (EGRET) detector on the Compton Gamma Ray Observatory (CGRO), which revealed that the GeV gamma-ray sky is rich and vibrant. Studies of astrophysical objects at GeV energies are interesting for several reasons: The high energy gamma-rays are often produced by a different physical process than the better studied X-ray and optical emission, thus providing a unique information for understanding these sources. Production of such high-energy photons requires that charged particles are accelerated to equally high energies, or much greater. Thus gamma-ray astronomy is the study of extreme environments, with natural and fundamental connections to cosmic-ray and neutrino astrophysics. The launch of GLAST in 2008 will herald a watershed in our understanding of the high energy gamma-ray sky, providing dramatic improvements in sensitivity, angular resolution and energy range. GLAST will open a new avenue to study our Universe as well as to answer scientific questions EGRET observations have raised. In this talk, I will describe the GLAST instruments and capabilities and highlight some of the science we expect to address.

Author

Gamma Ray Astronomy; Gamma Ray Telescopes

20080032417 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Gamma-ray Large Area Space Telescope (GLAST)

Ritz, Steve; April 13, 2008; 1 pp.; In English; APS Meeting, 13-16 Apr. 2008, Missouri, USA; No Copyright; Avail.: Other Sources; Abstract Only

The Gamma-ray Large Area Space Telescope, GLAST, is a mission to measure the cosmic gamma-ray flux in the energy range 20 MeV to more than 300 GeV, with supporting measurements for gamma-ray bursts from 8 keV to 30 MeV. The very large field of view will make it possible to observe 20% of the sky at any instant, and the entire sky on a timescale of a few hours. With its upcoming launch, GLAST will open a new and important window on a wide variety of phenomena, including black holes and active galactic nuclei; the optical-UV extragalactic background light, gamma-ray bursts; the origin of cosmic rays and supernova remnants; and searches for hypothetical new phenomena such as supersymmetric dark matter annihilations and Lorentz invariance violation. In addition to the science opportunities, this talk includes a description of the instruments, the opportunities for guest investigators, and the mission status.

Author

Gamma Ray Telescopes; X Ray Astronomy

20080032419 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Gamma-ray Large Area Space Telescope (GLAST)

Ritz, Steve; April 16, 2008; 1 pp.; In English; The University of Chicago Department of Physics Colloquium: The Gamma-ray Large Area Space Telescope (GLAST) Talks, 16-17 Apr. 2008, Illinois, USA; No Copyright; Avail.: Other Sources; Abstract Only

The Gamma-ray Large Area Space Telescope, GLAST, is a mission to measure the cosmic gamma-ray flux in the energy

range 20 MeV to more than 300 GeV, with supporting measurements for gamma-ray bursts from 8 keV to 30 MeV. The very large field of view will make it possible to observe 20% of the sky at any instant, and the entire sky on a timescale of a few hours. With its upcoming launch, GLAST will open a new and important window on a wide variety of phenomena, including black holes and active galactic nuclei; the optical-UV extragalactic background light, gamma-ray bursts; the origin of cosmic rays and supernova remnants; and searches for hypothetical new phenomena such as supersymmetric dark matter annihilations and Lorentz invariance violation. In addition to the science opportunities, this talk includes a description of the instruments, the opportunities for guest investigators, and the mission status.

Author

Gamma Ray Telescopes; X Ray Astronomy

20080032420 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Simulations of Sample-Up-The-Ramp for Space-Based Observations of Faint Sources

Benford, Dominic J.; June 23, 2008; 1 pp.; In English; SPIE: High Energy, Optical and Infrared Detectors for Astronomy, 223-28 Jun. 2008, Marseille, France; No Copyright; Avail.: Other Sources; Abstract Only

We have conducted simulations of a memory-efficient up-the-ramp sampling algorithm for infrared detector arrays. Our simulations use realistic sky models of galaxy brightness, shapes, and distributions, and include the contributions of zodiacal light and cosmic rays. A simulated readout is based on the HAWAII-2RG arrays, and includes read noise, dark current, pedestal, and other effects. The up-the-ramp algorithm rejects cosmic rays and produces a best estimate of the source flux under the assumption of very low signal-to-noise. We present an analysis of the fidelity of image brightness recovery with this algorithm.

Author

Infrared Detectors; Arrays; Zodiacal Light; Sky Brightness

20080032422 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Precision Attitude Determination for an Infrared Space Telescope

Benford, Dominic J., et al.; June 23, 2008; 1 pp.; In English; SPIE: Space Telescopes & InstrumentationI; Optical, Infrared and Millimeter, 23-28 Jun. 2008, Marseille, France; No Copyright; Avail.: Other Sources; Abstract Only

We have developed performance simulations for a precision attitude determination system using a focal plane star tracker on an infrared space telescope. The telescope is being designed for the Destiny mission to measure cosmologically distant supernovae as one of the candidate implementations for the Joint Dark Energy Mission. Repeat observations of the supernovae require attitude control at the level of 0.010 arcseconds (0.05 microradians) during integrations and at repeat intervals up to and over a year. While absolute accuracy is not required, the re-point precision is challenging. We have simulated the performance of a focal plane star tracker in a multidimensional parameter space, including pixel size, read noise, and readout rate. Systematic errors such as proper motion, velocity aberration, and parallax can be measured and compensated out. Our prediction is that a relative attitude determination accuracy of 0.001 to 0.002 arcseconds (0.005 to 0.010 microradians) will be achievable.

Author

Attitude Control; Infrared Telescopes; Pointing Control Systems

20080032423 NASA Goddard Space Flight Center, Greenbelt, MD, USA

A Large, Free-Standing Wire Grid for Microwave Variable-delay Polarization Modulation

Voellmer, George; June 23, 2008; 1 pp.; In English; SPIE 2008, 23-28 Jun. 2008, Marseille, France; No Copyright; Avail.: Other Sources; Abstract Only

One technique for mapping the polarization signature of the cosmic microwave background uses large, polarizing grids in reflection. We present the system requirements, the fabrication, assembly, and alignment procedures, and the test results for the polarizing grid component of a 50 cm clear aperture, Variable-delay Polarization Modulator (VPM). This grid is being built and tested at the Goddard Space Flight Center as part of the Polarimeter for Observing Inflationary Cosmology at the Reionization Epoch (POINCARE). VPMs modulate the polarized component of a radiation source by splitting the incoming beam into two orthogonal polarization components using a free-standing wire grid. The path length difference between these components is varied with a translating mirror, and then they are recombined. This precision instrumentation technique can be used to encode and demodulate the cosmic microwave background's polarization signature. For the demonstration instrument, 64 micrometer diameter tungsten wires are being assembled into a 200 pm pitch, free-standing wire grid with a 50 cm clear aperture, and an expected overall flatness better than 30 micrometers. A rectangular, aluminum stretching frame

holds the wires with sufficient tension to achieve a minimum resonant frequency of 185 Hz, allowing VPM mirror translation frequencies of several Hz. A lightly loaded, flattening ring with a 50 cm inside diameter rests against the wires and brings them into accurate planarity.

Author

Fabrication; Polarization Modulation; Wire; Delay; Microwaves

20080032427 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Beginning and End of the Universe

Gardner, Jonathan; April 23, 2008; 1 pp.; In English; Shapley Lecture Program, 23-25 Apr. 2008, Minnesota, USA; No Copyright; Avail.: Other Sources; Abstract Only

Cosmology is the scientific study of how the Universe began more than 13 billion years ago, how its properties have changed, and what its future might be. The balance of forces and energy cause the Universe to expand, first accelerating, then decelerating and then accelerating again. Within this overall structure, the interplay of atoms and light with the mysterious dark matter and dark energy causes stars and galaxies to form and evolve, leading to galaxies like our own home, the Milky Way. Observational cosmology uses telescopes on Earth and in space to reach back in time to find the faint remaining echoes of the Big Bang and to trace the formation and evolution of the galaxies and structures that fill the Universe. In this lecture, Dr. Gardner will give an overview of cosmology, outlining the 13-billion year history of the Universe, and highlighting the very rapid progress this field has made in the last decade. He will discuss the role that NASA space telescopes have played in this progress and will continue to play in the years to come. He will give a time-based history of the Universe, discussing the successive processes that formed matter, particles, atoms, stars and galaxies. In particular, he will focus on cosmological inflation, the rapid accelerated expansion that marks the beginning of the Universe, and dark energy, a tenuous substance that overcomes gravity and whose properties will determine its final fate.

Author

Cosmology; Universe; General Overviews; Milky Way Galaxy

20080032428 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Finding our Origins with the Hubble and James Webb Space Telescopes

Gardner, Jonathan; April 23, 2008; 1 pp.; In English; Shapley Lecture Program, 23-25 Apr. 2008, Minnesota, USA; No Copyright; Avail.: Other Sources; Abstract Only

NASA is planning a successor to the Hubble Space Telescope designed to study the origins of galaxies, stars, planets and life in the universe. In this talk, Dr. Gardner will discuss the origin and evolution of galaxies, beginning with the Big Bang and tracing what we have learned with Hubble through to the present day. He will show that results from studies with Hubble have led to plans for its successor, the James Webb Space Telescope. Webb is scheduled to launch in 2013, and is designed to find the first galaxies that formed in the distant past and to penetrate the dusty clouds of gas where stars are still forming today. He will compare Webb to Hubble, and discuss recent progress in the construction of the observatory.

Author

Hubble Space Telescope; James Webb Space Telescope; Universe; Galactic Evolution

20080032429 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Binary Black Holes, Gravitational Waves, and Numerical Relativity

Centrella, Joan; May 12, 2008; 1 pp.; In English; Astrophysics Colloquium at Rochester Institute of Technology, 12-13 May 2008, New York, USA; No Copyright; Avail.: Other Sources; Abstract Only

The final merger of two black holes releases a tremendous amount of energy and is one of the brightest sources in the gravitational wave sky. Observing these sources with gravitational wave detectors requires that we know the radiation waveforms they emit. Since these mergers take place in regions of very strong gravitational fields, we need to solve Einstein's equations of general relativity on a computer in order to calculate these waveforms. For more than 30 years, scientists have tried to compute these waveforms using the methods of numerical relativity. The resulting computer codes have been plagued by instabilities, causing them to crash well before the black hole; in the binary could complete even a single orbit. Recently this situation has changed dramatically, with a series of amazing breakthroughs. This talk will take you on this quest for the holy grail of numerical relativity, showing how a spacetime is constructed on a computer to build a simulation laboratory for

binary black hole mergers. We will focus on the recent advances that are revealing these waveforms, and the dramatic new potential for discoveries that arises when these sources will be observed by LIGO and LISA.

Author

Black Holes (Astronomy); Gravitational Waves; Relativity; Numerical Analysis

20080032434 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Characterization and Evolution of the Swift X-ray Telescope Instrumental Background

Hill, Joanne; Pagani, C.; Morris, D. C.; Racusin, J.; Grupe, D.; Vetere, L.; Stroh, M.; Falcone, A.; Kennea, J.; Burrows, D. N.; Nousek, J. A.; Abbey, A. F.; Angelini, L.; Beardmore, A. P.; Campana, S.; Capalbi, M.; Chincarini, G.; Citterio O.; Cusumano, G.; Giommi, P.; Godet, O.; Hill, J. E.; LaParola, V.; Mangano, V.; Mineo, T.; [2007]; 8 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAS5-00136; NNG06EO90A; ASI I/R/039/04; Copyright; Avail.: CASI: [A02](#), Hardcopy

The X-ray telescope (XRT) on board the Swift Gamma Ray Burst Explorer has successfully operated since the spacecraft launch on 20 November 2004, automatically locating GRB afterglows, measuring their spectra and lightcurves and performing observations of high-energy sources. In this work we investigate the properties of the instrumental background, focusing on its dynamic behavior on both long and short timescales. The operational temperature of the CCD is the main factor that influences the XRT background level. After the failure of the Swift active on-board temperature control system, the XRT detector now operates at a temperature range between -75C and -45C thanks to a passive cooling Heat Rejection System. We report on the long-term effects on the background caused by radiation, consisting mainly of proton irradiation in Swift's low Earth orbit and on the short-term effects of transits through the South Atlantic Anomaly (SAA), which expose the detector to periods of intense proton flux. We have determined the fraction of the detector background that is due to the internal, instrumental background and the part that is due to unresolved astrophysical sources (the cosmic X-ray background) by investigating the degree of vignetting of the measured background and comparing it to the expected value from calibration data.

Author

X Ray Telescopes; Swift Observatory; Gamma Ray Bursts; Afterglows; Charge Coupled Devices; Temperature Control; Background Radiation

20080032448 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Mapping the CMB with the Wilkinson Microwave Anisotropy Probe

Inshaw, Gary F.; December 17, 2007; 1 pp.; In English; 6th International Conference on Gravitation and Cosmology Inter-University Centre for Astronomy and Astrophysics, 17-21 Dec. 2007, Pune, India; No Copyright; Avail.: Other Sources; Abstract Only

The data from the Wilkinson Microwave Anisotropy Probe (WMAP) satellite provide detailed full-sky maps of the cosmic microwave background temperature anisotropy and new full-sky maps of the polarization. Together, the data provide a wealth of cosmological information, including the age of the universe, the epoch when the first stars formed, and the overall composition of baryonic matter, dark matter, and dark energy. The results also provide constraints on the period of inflationary expansion in the very first moments of time. These and other aspects of the mission results will be discussed and commented on. WMAP, part of NASA's Explorers program, was launched on June 30, 2001. The WMAP satellite was produced in a partnership between the Goddard Space Flight Center and Princeton University. The WMAP team also includes researchers at the Johns Hopkins University; the Canadian Institute of Theoretical Astrophysics; University of Texas; University of Chicago; Brown University; University of British Columbia; and University of California, Los Angeles.

Author

Microwave Anisotropy Probe; Cosmic Microwave Background Radiation; Astronomical Maps; Polarization; Spaceborne Astronomy

20080032449 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Neutron Stars and Black Holes Seen with the Rossi X-Ray Timing Explorer (RXTE)

Swank, Jean; June 29, 2008; 1 pp.; In English; International Workshop on Radiation Imaging Detectors, 29 Jun. - 3 Jul. 2008, Helsinki, Finland; No Copyright; Avail.: Other Sources; Abstract Only

Astrophysical X-rays bring information about location, energy, time, and polarization. X-rays from compact objects were seen in the first explorations to vary in time. Eclipses and pulsations have simple explanations that identified the importance of X-ray binaries and magnetic neutron stars in the first decade of X-ray astronomy. The dynamics of accretion onto stellar

and supermassive black holes and onto neutron stars with relatively low magnetic fields shows up as more complex variations, quasi-periodic oscillations, noise with characteristic frequency spectra, broad-band changes in the energy spectra. To study these variations, RXTE instruments needed to have large area and operational flexibility to find transient activity and observe when it was present. Proportional counters and Phoswich scintillators provided it in a modest mission that has made textbook level contributions to understanding of compact objects. The first seen, and the brightest known, X-ray binary, Sco X-1 is one of a class of neutron stars with low mass companions. Before RXTE, none of these had been seen to show pulsations, though they were hypothesized to be the precursors of radio pulsars with millisecond periods and low magnetic fields. RXTE's large area led to identifying coherent millisecond pulsars in a subset which are relatively faint transients. It also led to identifying short episodes of pulsation during thermonuclear bursts, in sources where a steady signal is not seen. The X-ray stage verifies the evolution that produces millisecond radio pulsars. Masses and radii of neutron stars are being determined by various techniques, constraining the equation of state of matter at nuclear densities. Accretion should lead to a range of neutron star masses. An early stage of superstrong magnetic field neutron stars is now known to produce X-ray and gamma-ray bursts in crust quakes and magnetic field reconnection releases of energy. Soft Gamma Repeaters, Anomalous X-ray Pulsars, and high magnetic field rotation-powered pulsars are all now called magnetars, because they have pulse periods indicating they are slowing down as they would with magnetic dipole radiation for a surface field above 5×10^{13} gauss. The accretion disk has been connected to the launching of radio jets from black holes, and even from neutron stars. Estimates of the angular momenta of black holes are being made from different approaches, modelling a high frequency oscillation that may be related to how close the inner part of the accretion disk is to the black hole, modelling the continua spectra of the X-ray emission, and modeling the emission of red-shifted iron that may be emitted from the accretion disk. These investigations require early discovery of the black hole transient with the All Sky Monitor on RXTE or other monitoring information, frequent extended observations, and coordinated observations with missions that give higher energy resolution, or radio and infrared information.

Author

Astrophysics; Black Holes (Astronomy); Neutron Stars; X Ray Timing Explorer

20080032451 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Cosmological Inflation: A Personal Perspective

Kazanas, Demos; April 24, 2008; 1 pp.; In English; Physics Colloquium at Rochester Institute of Technology, 24-25 Apr. 2008, New York, USA; No Copyright; Avail.: Other Sources; Abstract Only

We present a brief review of Cosmological Inflation from the personal perspective of the speaker who almost 30 years ago proposed a way of resolving the problem of Cosmological Horizon by employing certain notions and developments from the field of High Energy Physics. Along with a brief introduction of the Horizon and Flatness problems of standard cosmology, this lecture concentrates on personal reminiscing of the notions and ideas that prevailed and influenced the author's thinking at the time. The lecture then touches upon some more recent developments related to the subject including exact solutions to conformal gravity that provide a first principles emergence of a characteristic acceleration in the universe and concludes with some personal views concerning the direction that the cosmology field has taken in the past couple of decades and certain speculations some notions that may indicate future directions of research.

Author

Cosmology; Universe

20080032452 NASA Goddard Space Flight Center, Greenbelt, MD, USA

A Wide Spectrum of Solar Science for After School Astronomy Club

Mayo, Lou; Thieman, James R.; May 26, 2008; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

After School Astronomy clubs are an important method of exposing students to astronomy at the critical middle school age when sparking an interest can inspire a lifelong career or hobby. We know that teachers complain that they can spend little time on astronomy in the classroom since they must teach to the test and the curriculum requirements do not have very extensive astronomy coverage. We also know that space is a very popular subject with students that can motivate them to join an after school club. One of the problems with after school astronomy clubs is that they don't often have a chance to observe the night sky. We propose to train club mentors on how to do daytime solar observing so students fulfill the IYA goal of looking through a telescope. We propose to provide a half day workshop for elementary and middle school teachers on starting and maintaining After School Astronomy clubs with special emphasis on observing the Sun not only in the visible spectrum but with radio waves and other parts of the spectrum as well. We will use NASA-oriented or NASA-funded educational materials and websites to bring a variety of ideas to the mentors and a broad knowledge of astronomy to the students. Attendees will be given an overview of the science of the Sun and how it can affect us on the Earth. They will be shown the dynamic nature of the Sun and what to look for to track the events happening there. The educators will be shown simple approaches to directly

observing the Sun such as pinhole cameras, use of projection techniques with telescopes or binoculars, etc. They will be acquainted with sunspotter scopes and the advantages and disadvantages (such as expense) they pose for getting students involved. We will also point out the possibilities of using regular telescopes with solar filters and the specialized solar viewing telescopes such as the Coronado. Once the educators are comfortable with the simple approaches to viewing the Sun we will expose them to advanced topics such as remotely viewing the Sun using telescopes available on the web. Resources such as the Sun-Earth Viewer will allow them to study near real-time images of the Sun in multiple wavelengths. They will also be shown how they can monitor the Sun at radio wavelengths via remote telescopes or even how to purchase and build their own radio telescopes for hands-on monitoring of the Sun and other radio sources. We will conduct a brief evaluation of the participants knowledge of the Sun as they come into the workshop. We will also ask them to complete a brief knowledge survey at the end to determine if their knowledge and comfort level with solar science has improved significantly.

Author

Astronomy; Education; Sun; Radio Sources (Astronomy)

20080032454 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Joint XMM-Newton, Chandra, and RXTE Observations of Cyg X-1 at Phase Zero

Pottschmidt, Katja; July 13, 2008; 1 pp.; In English; 37th COSPAR Scientific Assembly, 13-20 Jul. 2008, Montreal, Canada
Contract(s)/Grant(s): NNG06EO90A; Copyright; Avail.: Other Sources; Abstract Only

We present first results of simultaneous observations of the high mass X-ray binary Cyg X-1 for 50 ks with XMM-Newton, Chandra-HETGS and RXTE in 2008 April. The observations are centered on phase 0 of the 5.6 d orbit when pronounced dips in the X-ray emission from the black hole are known to occur. The dips are due to highly variable absorption in the accretion stream from the O-star companion to the black hole. Compared to previous high resolution spectroscopy studies of the dip and non-dip emission with Chandra, the addition of XMM-Newton data allows for a better determination of the continuum, especially through the broad iron line region (with RXTE constraining the greater than 10 keV continuum).

Author

X Ray Astrophysics Facility; X Ray Binaries; Black Holes (Astronomy); Cygnus Constellation

20080032455 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Hard X-Ray Emission from Scorpius X-1 as seen by INTEGRAL

Sturmer, Steve; Weidenspointner, G.; Shrader, C. R.; October 17, 2007; 1 pp.; In English; Five Years of INTEGRAL, 17-18 Oct, 2997, Chia Laguna, Sardinia, Italy

Contract(s)/Grant(s): NNG06EO90A; Copyright; Avail.: Other Sources; Abstract Only

We present the results of our hard X-ray and gamma-ray study of the LMXB Sco X-1 utilizing INTEGRAL IBIS/ISGRI and SPI data as well as contemporaneous RXTE PCA data. We have concentrated on investigating the high-energy spectral properties of the Sco X-1 including the nature of the high-energy spectrum and its possible correlations with the location of the source on the color-color diagram. We also present the results of a search for positron-electron annihilation line emission from Sco X-1, as it is the brightest of a bulge X-ray binary population which approximately traces the 511-keV spatial distribution inferred from SPI.

Author

Scorpius Constellation; X Ray Binaries; X Ray Timing Explorer; Gamma Rays

20080032456 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Swift Multi-wavelength Observing Campaigns: Strategies and Outcomes

Krimm, Hans A.; August 09, 2007; 1 pp.; In English; 2nd Multi-wavelength Workshop for Next-Generation Gamma-Ray Experiments/Adler Planetarium and Astronomy Museum, 9-10 Aug. 2007, Chicago, IL, USA

Contract(s)/Grant(s): NNG06EO90A; No Copyright; Avail.: Other Sources; Abstract Only

The Swift gamma-ray burst explorer has been operating since December 2004 as both a gamma-ray burst (GRB) monitor and telescope and a multi-wavelength observatory, covering the energy range from V band and near UV to hard X rays above 150 keV. It is designed to rapidly re-point to observe newly discovered GRBs, and this maneuverability, combined with an easily changed observing program, allows Swift to also be an effective multiwavelength observatory for non-GRB targets, both as targets of opportunity and pre-planned multi-wavelength observing campaigns. Blazars are particularly attractive targets for coordinated campaigns with TeV experiments since many blazars are bright in both the hard X-ray and TeV energy ranges. Successful coordinated campaigns have included observations of 3C454.3 during its 2005 outburst. The latest Swift funding cycles allow for non- GRB related observations to be proposed. The Burst Alert Telescope on Swift also serves as

a hard X-ray monitor with a public web page that includes light curves for over 400 X-ray sources and is used to alert the astronomical community about increased activity from both known and newly discovered sources. This presentation will include Swift capabilities, strategies and policies for coordinated multi-wavelength observations as well as discussion of the potential outcomes of such campaigns.

Author

Swift Observatory; Gamma Ray Astronomy; Astronomy; Wavelengths

20080032458 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Measuring Cosmic Expansion and Large Scale Structure with Destiny

Benford, Dominic J.; Lauer, Tod R.; August 27, 2007; 1 pp.; In English; Century of Cosmology Conference, 27-31 Aug. 2007, Venice, Italy; No Copyright; Avail.: Other Sources; Abstract Only

Destiny is a simple, direct, low cost mission to determine the properties of dark energy by obtaining a cosmologically deep supernova (SN) type Ia Hubble diagram and by measuring the large-scale mass power spectrum over time. Its science instrument is a 1.65m space telescope, featuring a near-infrared survey camera/spectrometer with a large field of view. During its first two years, Destiny will detect, observe, and characterize 23000 SN Ia events over the redshift interval $0.4 < z < 1.7$, thereby constructing a high-precision Hubble diagram to constrain the dark energy equation of state. Destiny will be used in its third year as a high resolution, wide-field imager to conduct a weak lensing survey covering > 1000 square degrees to measure the large-scale mass power spectrum. The combination of surveys is much more powerful than either technique on its own, and will have over an order of magnitude greater sensitivity than will be provided by ongoing ground-based projects.

Author

Spaceborne Telescopes; Dark Energy; Supernovae; Hubble Diagram; Mass Spectra; Equations of State

20080032465 NASA Goddard Space Flight Center, Greenbelt, MD, USA

HST/ACS Narrowband Imaging of the Kepler Supernova Remnant

Sankrit, Ravi; Blair, William P.; Frattare, Lisa M.; Rudnick, Lawrence; DeLaney, Tracey; Harrus, Ilana M.; Ennis, Jessica A.; Submitted to The Astronomical Journal; [2007]; 30 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NNG04GB78A; Copyright; Avail.: CASI: [A03](#), Hardcopy

We present narrowband images of the Kepler supernova remnant obtained with the Advanced Camera for Surveys aboard the Hubble Space Telescope. The images, with an angular resolution of $0.05''$ reveal the structure of the emitting gas in unprecedented detail. Radiative and nonradiative shocks are found in close proximity, unresolvable in ground-based spectra, indicating that the pre-shock medium is highly clumped. The ionization structure, traced by differences in the $[O\ III]$ to $[N\ III]$ flux ratio, varies on subarcsecond scales. The variation is due to 110th differences in shock velocity as well as gradients in the evolutionary stage of the shocks. A prominent complex of knots protruding beyond the boundary of the remnant in the northwest is found to consist of bright radiative knots, collected by arcuate nonradiative filaments. Based on the coincidence of the optical emission with a bright isolated knot of X-ray emission, we infer that this feature is due to a Rayleigh-Taylor finger that formed at the contact discontinuity and overtook the primary blast wave.

Author

Supernova Remnants; Hubble Space Telescope; Angular Resolution; Imaging Techniques; Boundaries; Cameras; Detonation Waves; Emission

20080032470 NASA Goddard Space Flight Center, Greenbelt, MD, USA

A KPC-Scale X-Ray Jet in the BL Lac Source S5 2007+777

Sambruna, Rita M.; Donato, Davide; Cheung, C.C.; Tavecchio, F.; Maraschi, L.; Submitted to The Astrophysical Journal; [2008]; 29 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

X-ray jets in AGN are commonly observed in FR II and FR I radiogalaxies, but rarely in BL Lacs, most probably due to their orientation close to the line of sight and the ensuing foreshortening effects. Only three BL Lacs are known so far to contain a kpc-scale X-ray jet. In this paper, we present the evidence for the existence of a fourth extended X-ray jet in the classical radio-selected source S5 2007+777, which for its hybrid FR I/II radio morphology has been classified as a HYMOR (HYbrid MORphology Radio source). Our Chandra ACISS observations of this source revealed an X-ray counterpart to the $19''$ -long radio jet. Interestingly, the X-ray properties of the kpc-scale jet in S5 2007+777 are very similar to those observed in FR II jets. First, the X-ray morphology closely mirrors the radio one, with the X-rays being concentrated in the discrete radio knots. Second, the X-ray continuum of the jet/brightest knot is described by a very hard power law, with photon index γ_{X} approximately 1. Third, the optical upper limit from archival HST data implies a concave radio-to-X-ray SED.

If the X-ray emission is attributed to IC/CMB with equipartition, strong beaming ($\delta=13$) is required, implying a very large scale (Mpc) jet. The beaming requirement can be somewhat relaxed assuming a magnetic field lower than equipartition. Alternatively, synchrotron emission from a second population of very high-energy electrons is viable. Comparison to other HYMOR jets detected with Chandra is discussed, as well as general implications for the origin of the FRI/II division.

Author

Radio Galaxies; Active Galactic Nuclei; Radio Sources (Astronomy); X Rays

20080032508 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Synergy of Gamma-Ray Burst Detectors In The Glast Era

Band, David L.; [2008]; 4 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NNG06EO90A; No Copyright; Avail.: CASI: [A01](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080032508>

Simultaneous observations by the large number of gamma-ray burst detectors operating in the GLAST era will provide the spectra, lightcurves and locations necessary for studying burst physics and testing the putative relations between intrinsic burst properties. The detectors' energy band and the accumulation timescale of their trigger system affect their sensitivity to hard vs. soft and long vs. short bursts. Coordination of the Swift and GLAST observing plans consistent with Swift's other science objectives could increase the rate of GLAST bursts with redshifts.

Author

Gamma Ray Bursts; Red Shift; Actuators; Light Curve; Coordination; Gamma Ray Telescopes

20080032509 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Correlated Temporal and Spectral Variability

Swank, Jean H.; [2007]; 8 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080032509>

The variability of neutron star and black hole X-ray sources has several dimensions, because of the roles played by different important time-scales. The variations on time scales of hours, weeks, and months, ranging from 50% to orders of magnitude, arise out of changes in the flow in the disk. The most important driving forces for those changes are probably various possible instabilities in the disk, though there may be effects with other dominant causes. The changes in the rate of flow appear to be associated with changes in the flow's configuration, as the accreting material approaches the compact object, for there are generally correlated changes in both the Xray spectra and the character of the faster temporal variability. There has been a lot of progress in tracking these correlations, both for Z and Atoll neutron star low-mass X-ray binaries, and for black hole binaries. I will discuss these correlations and review briefly what they tell us about the physical states of the systems.

Author

Black Holes (Astronomy); Variability; X Ray Sources; X Ray Binaries; Correlation

20080032520 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Neutron Stars and Thermonuclear X-ray Bursts

Bhattacharyya, Supid; October 03, 2007; 26 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NNG06EO90A; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080032520>

This viewgraph presentation describes neutron stars and thermonuclear x ray bursts. The contents include: 1) Neutron Stars: why do we care?; 2) Thermonuclear Bursts: why do we care?; 3) Neutron Stars: Mass, Radius and Spin: a. Continuum Spectroscopy of Bursts b. Spectral Lines from Bursts c. Timing Properties of Bursts; 4) Neutron Star Atmosphere: Thermonuclear Flame Spreading; and 5) Future Prospects and Conclusions.

CASI

Neutron Stars; Mathematical Models; Line Spectra; Thermonuclear Reactions; X Ray Astronomy

20080032538 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Bess Investigation of the Origin of Cosmic-ray Antiprotons and Search for Cosmological Antimatter

Mitchell, John; Yamamoto, Akira; Yoshimura, Koji; Makida, Yasuhiro; Matsuda, Shinya; Hasegawa, Masaya; Horikoshi, Atsushi; Tanaka, Ken-ichi; Suzuki, Junichi; Nishimura, Jun; Sakai, Ken-ichi; Shinoda, Ryoko; Orito, Rei; Matsukawa, Yosuke; Kusumoto, Akira; Fuke, Hideyuki; Mitchell, John W.; Streitmatter, Robert E.; Hams, Thomas; Sasaki, Makoto; Seo, Eun-suj; Lee, Moo-hyon; Kim, Ki-chun; Thakur, Neeharika; Ormes, Jonathan F.; July 13, 2008; 2 pp.; In English; 37th COSPAR Scientific Assembly 2008 Meeting, 13-20 Jul. 2008, Montreal, Canada; Copyright; Avail.: Other Sources; Abstract Only

The Balloon-borne Experiment with a Superconducting Spectrometer (BESS) collaboration has made precise measurements of the spectra of cosmic ray antiprotons and light nuclei and conducted a sensitive search for antinuclei. Ten BESS high-latitude flights, eight from Canada and two from Antarctica, span more than a Solar cycle between 1993 and 2007/2008. BESS measurements of low-energy antiprotons constrain candidate models for dark matter including the possible signature of primordial black hole evaporation. The stringent BESS measurements of antiprotons and the elemental and isotopic spectra of H and He provide strong constraints on models of cosmic-ray transport in the Galaxy and Solar System. BESS has also reported the first antideuteron upper limit. BESS employs a superconducting magnetic-rigidity spectrometer with time-of-flight and aerogel Cherenkov detectors to identify incident particles by charge, charge sign, mass, and energy. The BESS-Polar long-duration instrument has reduced lower energy limit of 100 MeV (top of the atmosphere) to increase its sensitivity to possible primary antiproton sources. BESS-Polar II was rebuilt with extended magnet lifetime, improved detector and electronic performance, and greater data storage capacity. It was flown from Antarctica December 2007-January 2008, recording about 4.6 billion events during 24.5 days at float altitude with the magnet on. During the flight the influence of a high-speed stream in the Solar wind was observed. Details of the BESS-Polar II instrument and flight performance are reported elsewhere at this conference. The successful BESS-Polar II flight at Solar minimum is especially important. Most cosmic-ray antiprotons are secondary products of nuclear interactions of primary cosmic-ray nuclei with the interstellar gas, giving a spectrum that peaks at about 2 GeV and falls rapidly to higher and lower energies. However, BESS data taken in the previous Solar minimum show a small excess over secondary expectations at low energies, possibly suggesting the presence of an additional component that may be masked at higher levels of Solar modulation. The high-statistics Solar minimum data obtained by BESS-Polar II will provide a definitive test of this component. We will review the BESS program and report the latest results including the antiproton and proton spectra measured in the BESS-Polar I flight, the search for cosmic antinuclei, and the status of the BESS-Polar II analysis.

Author

Balloon-Borne Instruments; Spectrometers; Solar System; Cosmology; Superconductivity; Cosmic Rays

20080032541 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Tracing the Mass-Dependent Star Formation History of Late-Type Galaxies using X-ray Emission: Results from the CHANDRA Deep Fields

Lehmer, B.D.; Brandt, W.N.; Schneider, D.P.; Steffen, A.T.; Alexander, D.M.; Bell, E.F.; Hornschemeier, A.E.; McIntosh, D.H.; Bauer, F.E.; Gilli, R.; Mainieri, V.; Silverman, J.D.; Tozzi, P.; Wolf, C.; Submitted to Astrophysical Journal; [2008]; 21 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

We report on the X-ray evolution over the last approx. 9 Gyr of cosmic history (i.e., since $z = 1.4$) of late-type galaxy populations in the Chandra Deep Field-North and Extended Chandra Deep Field-South (CDF-N and E-CDF-S, respectively; jointly CDFs) survey fields. Our late-type galaxy sample consists of 2568 galaxies, which were identified using rest-frame optical colors and HST morphologies. We utilized X-ray stacking analyses to investigate the X-ray emission from these galaxies, emphasizing the contributions from normal galaxies that are not dominated by active galactic nuclei (AGNs). Over this redshift range, we find significant increases (factors of approx. 5-10) in the X-ray-to-optical mean luminosity ratio ($L(\text{sub } x)/L(\text{sub } B)$) and the X-ray-to-stellar-mass mean ratio ($L(\text{sub } x)/M(\text{sub } *)$) for galaxy populations selected by $L(\text{sub } B)$ and $M(\text{sub } *)$, respectively. When analyzing galaxy samples selected via SFR, we find that the mean X-ray-to-SFR ratio ($L(\text{sub } x)/\text{SFR}$) is consistent with being constant over the entire redshift range for galaxies with $\text{SFR} = 1\text{-}100$ Solar Mass/yr, thus demonstrating that X-ray emission can be used as a robust indicator of star-formation activity out to z approx. 1.4. We find that the star-formation activity (as traced by X-ray luminosity) per unit stellar mass in a given redshift bin increases with decreasing stellar mass over the redshift range $z = 0.2\text{-}1$, which is consistent with previous studies of how star-formation activity depends on stellar mass. Finally, we extend our X-ray analyses to Lyman break galaxies at z approx. 3 and estimate that $L(\text{sub } x)/L(\text{sub } B)$ at z approx. 3 is similar to its value at $z = 1.4$.

Author

Cosmology; Surveys; Galactic Evolution; Star Formation; X Ray Analysis; X Ray Optics; Active Galactic Nuclei; Luminosity; Mass Ratios; Red Shift; Stellar Mass

20080032635 Bordeaux Univ., France

Bordeaux Observatory Analysis Center Report

Charlot, Patrick; Bellanger, Antoine; Bourda, Geraldine; Collioud, Arnaud; Baudry, Alain; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 181-184; In English; See also [20080032620](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

This report summarizes the activities of the Bordeaux Observatory Analysis Center in 2007. During this period, we have continued the Very Long Baseline Interferometry (VLBI) imaging activity initiated previously. A total of 574 VLBI maps have been produced by full imaging of three RDV sessions. Other activities focus on regular processing of the International VLBI Service for Geodesy and Astrometry (IVS) IVS-R1 and IVS-R4 sessions and calculation of additional structure indices to refine our source categorization based on this criterion. Newly developed activities include simulations to study the imaging capabilities of the next generation VLBI system and, on the observational side, the initiation of a VLBI survey of weak sources that are potential candidates to link the ICRF and the future GAIA frame. Plans for 2008 follow the same analysis and research lines, with also specific contributions in the framework of the Working Group on the Second Realization of the International Celestial Reference Frame.

Author

Astronomical Observatories; Very Long Base Interferometry; Astrometry

20080032658 Instituto Geografico Nacional, Madrid, Spain

Observatorio Astronomico Nacional - Yebes

Colomer, Francisco; deVicente, Pablo; Gomez-Gonzalez, Jesus; Lopez-Fernandez, Jose Antonio; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 117-120; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

This report updates the description of the Observatorio Astronomico Nacional (OAN) facilities as an International Very Long Baseline Interferometry (VLBI) Service for Geodesy and Astrometry (IVS) network station. The new 40-m radiotelescope has seen first light, and commissioning is in progress. First geodetic VLBI observations are expected in 2008.

Author

Astronomical Observatories; Very Long Base Interferometry; Geodesy; Astrometry; Radio Astronomy

20080032659 National Astronomical Observatory, Tokyo, Japan

Nanshan VLBI Station Report for 2007

Yusup, Aili; Wang, Na; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 106-108; In English; See also [20080032620](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

The Nanshan 25-meter radio telescope is operated by Urumqi Observatory. This report describes the activities and the status of Nanshan Very Long Base Interferometry (VLBI) station as an International VLBI Service for Geodesy and Astrometry (IVS) network station in 2007. Specifically, the telescope, recording system and time and frequency system are described. Geodetic observations from 2007 sessions are provided in a table and future plans, including the building of a new 1.3 cm dual polarization cryogenic receiver, are described.

Author

Very Long Base Interferometry; Geodesy; Astrometry

20080032660 Massachusetts Inst. of Tech., Westford, MA, USA

Westford Antenna

Poirier, Mike; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 109-112; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

Technical information is provided about the antenna and Very Long Baseline Interferometry (VLBI) equipment at the Westford site of Haystack Observatory, and about changes to the systems since the International VLBI Service for Geodesy and Astrometry (IVS) 2006 Annual Report.

Author

Very Long Base Interferometry; Astronomical Observatories; Geodesy; Astrometry

20080032664 Institute of Applied Astronomy Russian Academy of Sciences, Russia

Zelenchukskaya Radio Astronomical Observatory

Dyakon, Andrei; Smolentev, Sergey; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008,

pp. 121-123; In English; See also [20080032620](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

This report briefly summarizes the observing activities at the Zelenchukskaya 32-m Very Long Baseline Interferometry (VLBI) station during the year 2007. The Zelenchukskaya Radio Astronomical Observatory was founded by the Institute of Applied Astronomy as one of three stations of the VLBI network QUASAR. The basic instruments of the observatory are a 32-m radio telescope and technical systems for VLBI observations. During 2007 the Zelenchukskaya IVS station participated in a total of 36 observing sessions; a list of these sessions is provided. Plans for 2008 include participation in domestic observational programs for obtaining Earth orientation parameters, putting the cable length control system ('ground unit') into operation, and upgrading the electronic part of the angle data unit.

Author

Radio Astronomy; Astronomical Observatories; Very Long Base Interferometry

20080032670 Fundamentalstation Wettzell, Kotzting, Gabon

Fundamentalstation Wettzell - 20m Radiotelescope

Schluter, Wolfgang; Kronschnabl, Gergard; Kilger, Richard; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 113 - 116; In English; See also [20080032620](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

The 20m Radiotelescope in Wettzell, Germany contributed very successfully and strongly to the IVS observing program again in 2007. Technical changes, improvements, and upgrades have been done to increase the reliability of the entire International Very Long Baseline Interferometry (VLBI) Service for Geodesy and Astrometry observing system.

Author

Radio Telescopes; Astronomical Observatories

90

ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20080031147 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The INTEGRAL Mission: Status and Science

Sturner, Steven J.; March 31, 2008; 1 pp.; In English; HEAD 2008 Meeting, 31 Mar. 2008 - 3 Apr. 2008, Los Angeles, CA, USA

Contract(s)/Grant(s): NNG06EO90A; No Copyright; Avail.: Other Sources; Abstract Only

Since its launch on October 17, 2002, the INTErnational Gamma-Ray Astrophysics Laboratory (INTEGRAL) mission has been producing exciting scientific results. I will present a brief overview of the INTEGRAL mission including its complement of scientific instruments and its current operational status. This will set the stage for the scientific talks that follow. I will then discuss opportunities for US investigator participation including the NASA INTEGRAL Guest Investigator Program and support services available through the US INTEGRAL Guest Observer Facility.

Author

Astrophysics; Gamma Rays; Space Missions; NASA Space Programs

20080031149 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Testing Photoionization Calculations Using Chandra X-ray Spectra

Kallman, Tim; January 28, 2008; 1 pp.; In English; Atomic Ion Stage Abundances in Astrophysical Plasmas/Auburn University, 28 Jan. 2008 - 6 Feb. 2008, Auburn, AL, USA; No Copyright; Avail.: Other Sources; Abstract Only

A great deal of work has been devoted to the accumulation of accurate quantities describing atomic processes for use in analysis of astrophysical spectra. But in many situations of interest the interpretation of a quantity which is observed, such as a line flux, depends on the results of a modeling- or spectrum synthesis code. The results of such a code depends in turn on many atomic rates or cross sections, and the sensitivity of the observable quantity on the various rates and cross sections may be non-linear and if so cannot easily be derived analytically. In such cases the most practical approach to understanding the sensitivity of observables to atomic cross sections is to perform numerical experiments, by calculating models with various rates perturbed by random (but known) factors. In addition, it is useful to compare the results of such experiments with some sample observations, in order to focus attention on the rates which are of the greatest relevance to real observations. In this paper I will present some attempts to carry out this program, focussing on two sample datasets taken with the Chandra HETG.

I will discuss the sensitivity of synthetic spectra to atomic data affecting ionization balance, temperature, and line opacity or emissivity, and discuss the implications for the ultimate goal of inferring astrophysical parameters.

Author

Photoionization; X Ray Spectra; X Ray Astrophysics Facility; Mathematical Models

20080031159 NASA Goddard Space Flight Center, Greenbelt, MD, USA; Science Systems and Applications, Inc., Greenbelt, MD, USA

Tracing the First Stars with Fluctuations of the Cosmic Infrared Background

Kashlinsky, A.; Arendt, R. G.; Mather, J.; Moseley, S. H.; *Nature*; January 2005; Volume 438, pp. 45-50; In English; Original contains black and white illustrations

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ONLINE: <http://dx.doi.org/10.1038/nature04143>

The deepest space- and ground-based observations find metal-enriched galaxies at cosmic times when the Universe was less than 1 Gyr old. These stellar populations had to be preceded by the metal-free first stars, known as 'population III'. Recent cosmic microwave background polarization measurements indicate that stars started forming early-when the Universe was 5200 Myr old. It is now thought that population III stars were significantly more massive than the present metal-rich stellar populations. Although such sources will not be individually detectable by existing or planned telescopes, they would have produced significant cosmic infrared background radiation in the near-infrared, whose fluctuations reflect the conditions in the primordial density field. Here we report a measurement of diffuse flux fluctuations after removing foreground stars and galaxies. The anisotropies exceed the instrument noise and the more local foregrounds; they can be attributed to emission from population III stars, at an era dominated by these objects.

Author

Cosmic Microwave Background Radiation; Population III Stars; Galaxies; Infrared Radiation

20080031163 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Dissipation Mechanism of Magnetic Reconnection

Hesse, Michael; May 12, 2008; 1 pp.; In English; 2008 *Isradynamics: Dynamical Processes in Space Plasmas*, 11-19 May 2008, Dead Sea, Israel; No Copyright; Avail.: Other Sources; Abstract Only

Magnetic reconnection is arguably the most efficient transport and energy conversion mechanism in almost ideal plasmas. Reconnection controls the overall dynamics in space and astrophysics plasmas, as well as in many laboratory plasma systems. Reconnection operates by means of a localized diffusion region, where deviations from the plasma idealness condition generate electric fields and permit plasma transport even far away from the diffusion region itself. Recent advances in analytic theory and computer modeling have begun to shed light on the internal dynamics of the diffusion region. In particular, we begin to understand the delicate nature of the force balance in the inner diffusion region, where particles can become unmagnetized and where electric field forces are important. This presentation will provide a brief introduction of the reconnection process and its applications. This introduction will be followed by a detailed analysis of the current understanding of dissipation region physics, and by an outlook toward future research.

Author

Magnetic Field Reconnection; Dissipation; Magnetohydrodynamics

20080031272 NASA Goddard Space Flight Center, Greenbelt, MD, USA

RS Ophiuchi in Quiescence: Why Is It X-ray Faint?

Mukai, Koji; [2007]; 4 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NNG06EO90A; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031272>

The short interval between successive outbursts of RS Oph strongly suggests that it has a high mass white dwarf accreting at a high rate. This, in turn, suggests the possibility of prominent X-ray emission from RS Oph in quiescence. However, archival quiescent X-ray observations of RS Oph show it to be a modest soft X-ray source but not a strong 2-10 keV X-ray source. In this aspect, RS Oph differs markedly from T CrB. We speculate on the possible mechanisms that could significantly suppress the 2-10 keV X-ray emission in RS Oph.

Author

Ophiuchi Clouds; Astrophysics; ROSAT Mission; Spectrum Analysis; X Ray Astronomy

20080031331 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Simulating Sources of Superstorm Plasmas

Fok, Mei-Ching; May 26, 2008; 1 pp.; In English; Joint Meeting of the American Astronautical Society/Science programs Division, American Geophysical Union, 26-30 May 2008, Fort Lauderdale, FL, USA; Copyright; Avail.: Other Sources; Abstract Only

We evaluated the contributions to magnetospheric pressure (ring current) of the solar wind, polar wind, auroral wind, and plasmaspheric wind, with the surprising result that the main phase pressure is dominated by plasmaspheric protons. We used global simulation fields from the LFM single fluid ideal MHD model. We embedded the Comprehensive Ring Current Model within it, driven by the LFM transpolar potential, and supplied with plasmas at its boundary including solar wind protons, polar wind protons, auroral wind O⁺, and plasmaspheric protons. We included auroral outflows and acceleration driven by the LFM ionospheric boundary condition, including parallel ion acceleration driven by upward currents. Our plasmasphere model runs within the CRCM and is driven by it. Ionospheric sources were treated using our Global Ion Kinetics code based on full equations of motion. This treatment neglects inertial loading and pressure exerted by the ionospheric plasmas, and will be superseded by multifluid simulations that include those effects. However, these simulations provide new insights into the respective role of ionospheric sources in storm-time magnetospheric dynamics.

Author

Magnetic Storms; Magnetospheres; Ring Currents; Magnetohydrodynamic Simulation

20080031343 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Hemispheric and Topographic Asymmetry of Magnetospheric Particle Irradiation for Icy Moon Surfaces

Cooper, John F.; Sturmer, S. J.; August 13, 2007; 1 pp.; In English; Ices, Oceans and Fire: Satellites of the Outer Solar System Workshop, 13-15 Aug. 2007, Boulder, Co, USA; No Copyright; Avail.: CASI: [A01](#), Hardcopy
ONLINE: <http://hdl.handle.net/2060/20080031343>

All surfaces of icy moons without significant atmospheres, i.e. all except Titan in the giant planet systems, are irradiated by hot plasma and more energetic charged particles from the local magnetospheric environments. This irradiation can significantly impact the chemical composition, albedo, and detectable presence of signs of life on the sensible surfaces, while also limiting lifetimes and science operations of orbital spacecraft for extreme radiation environments as at Europa. Planning of surface remote sensing and lander operations, and interpretation of remote sensing and in-situ measurements, should include consideration of natural shielding afforded by the body of the moon, by any intrinsic or induced magnetic fields as at Ganymede, and by topographic structures.

Author

Irradiation; Asymmetry; Topography; Chemical Composition; Magnetic Fields; Titan; Remote Sensing; Energetic Particles

20080031420 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Fast X-ray Oscillations during Magnetar Flares

Strohmayr, Tod E.; January 2007; 8 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: [A02](#), Hardcopy
ONLINE: <http://hdl.handle.net/2060/20080031420>

The giant flares produced by highly magnetized neutron stars, 'magnetars,' are the brightest sources of high energy radiation outside our solar system. Serendipitous observations with NASA's Rossi X-ray Timing Explorer (RXTE) of the two most recent flares resulted in the discovery of high frequency oscillations in their X-ray fluxes. The frequencies of these oscillations range from approx. 20 Hz to as high as 1800 Hz, and may represent the first detection of global oscillation modes of neutron stars. Here I will present an observational and theoretical overview of these oscillations and discuss how they might allow us to probe neutron star interiors and dense matter physics.

Author

Magnetars; Solar Flares; General Overviews; Oscillations; X Ray Astronomy; Astrophysics

20080031491 NASA Marshall Space Flight Center, Huntsville, AL, USA

Analysis of Regolith Simulant Ejecta Distributions from Normal Incident Hypervelocity Impact

Edwards, David L.; Cooke, William; Suggs, Rob; Moser, Danielle E.; May 20, 2008; 8 pp.; In English; 9th International Space Conference on the Protection of Materials and Structures from the Space Environment, 20-23 May 2008, Toronto, Canada; Original contains black and white illustrations; Copyright; Avail.: CASI: [A02](#), Hardcopy

The National Aeronautics and Space Administration (NASA) has established the Constellation Program. The

Constellation Program has defined one of its many goals as long-term lunar habitation. Critical to the design of a lunar habitat is an understanding of the lunar surface environment; of specific importance is the primary meteoroid and subsequent ejecta environment. The document, NASA SP-8013 'Meteoroid Environment Model Near Earth to Lunar Surface', was developed for the Apollo program in 1969 and contains the latest definition of the lunar ejecta environment. There is concern that NASA SP-8013 may over-estimate the lunar ejecta environment. NASA's Meteoroid Environment Office (MEO) has initiated several tasks to improve the accuracy of our understanding of the lunar surface ejecta environment. This paper reports the results of experiments on projectile impact into powdered pumice and unconsolidated JSC-1A Lunar Mare Regolith simulant targets. Projectiles were accelerated to velocities between 2.45 and 5.18 km/s at normal incidence using the Ames Vertical Gun Range (AVGR). The ejected particles were detected by thin aluminum foil targets strategically placed around the impact site and angular ejecta distributions were determined. Assumptions were made to support the analysis which include; assuming ejecta spherical symmetry resulting from normal impact and all ejecta particles were of mean target particle size. This analysis produces a hemispherical flux density distribution of ejecta with sufficient velocity to penetrate the aluminum foil detectors.

Author

Lunar Surface; Ejecta; Hypervelocity Impact; Meteorite Collisions; Projectile Cratering; Regolith; Environment Models; Hypervelocity Projectiles

20080031653 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Astrophysics to z approx. 10 with Gravitational Waves

Stebbins, Robin; Hughes, Scott; Lang, Ryan; July 11, 2007; 22 pp.; In English; 7th Edoardo Amaldi Conference on Gravitational Waves, 8-14 Jul. 2007, Sydney, Australia; Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

The most useful characterization of a gravitational wave detector's performance is the accuracy with which astrophysical parameters of potential gravitational wave sources can be estimated. One of the most important source types for the Laser Interferometer Space Antenna (LISA) is inspiraling binaries of black holes. LISA can measure mass and spin to better than 1% for a wide range of masses, even out to high redshifts. The most difficult parameter to estimate accurately is almost always luminosity distance. Nonetheless, LISA can measure luminosity distance of intermediate-mass black hole binary systems (total mass approx. $10(\exp 4)$ solar mass) out to z approx. 10 with distance accuracies approaching 25% in many cases. With this performance, LISA will be able to follow the merger history of black holes from the earliest mergers of proto-galaxies to the present. LISA's performance as a function of mass from 1 to $10(\exp 7)$ solar mass and of redshift out to z approx. 30 will be described. The re-formulation of LISA's science requirements based on an instrument sensitivity model and parameter estimation will be described.

Author

Black Holes (Astronomy); Gravitational Waves; LISA (Observatory); Astrophysics; Stellar Mass; Luminosity; Red Shift

20080031689 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

On the Possibility of Observing the SZ Effect on the WMAP Maps

Trevisan, Marina; [2007]; 145 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14779-TDI/1232; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A07](#), Hardcopy

The Sunyaev-Zel'dovich (SZ) effect offers a unique and powerful observational tool in cosmology and in large scale structure studies. It is a spectral distortion of the cosmic microwave background (CMB) caused by inverse Compton scattering of CMB photons by hot electrons present in the central regions of galaxy clusters, and is insensitive to the redshift of the cluster. In this work, the methods and results of SZ effect observations using Wilkinson Microwave Anisotropy Probe (WMAP) data in Q (41 GHz), V (61 GHz) and W (94 GHz) bands are presented. The radial profiles of the temperature deviation of the CMB are obtained for a sample of 42 clusters of galaxies. These profiles are compared to the expected profiles, inferred by considering the isothermal beta model derived from X-ray data and taking into account the WMAP point spread function. The comparison is performed considering the difference between the central values of the predicted and observed profiles, weighted by the uncertainties involved. The average observed SZ decrement only accounts for about 1/3 of the expected decrement. The difference between predicted and observed decrements is 0.119 ± 0.014 mK at 95% confidence level. Part of this discrepancy between expected and observed decrements can be explained by the presence of factors that affect SZ measurements, such as Galaxy emission, radio sources, substructures, instrument noise and CMB fluctuations, with amplitudes of the order of the SZ effect itself. Excluding clusters that are prone to contamination, the discrepancy between

X-ray and WMAP data is reduced, resulting in a difference between predicted and observed decrements of 0.059 ± 0.026 mK, at 95% confidence level.

Author

High Energy Electrons; Distortion; Cosmic Microwave Background Radiation; Compton Effect; Energy Transfer; Photons; Cosmology; Microwave Anisotropy Probe

20080031696 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Observations of the Cosmic Microwave Background Polarization: Limit at 42 GHz

Leonardi, Rodrigo; [2007]; 157 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14793-TDI/1236; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A08](#), Hardcopy

Cosmic Microwave Background (CMB) polarization is an important current topic in cosmology. This work presents measurements of CMB polarization in a 5.5 deg^2 sky region centered at the North Celestial Pole. The observations were carried out with an off-axis Gregorian ground-based microwave telescope and receiver system consisting of two pseudo-correlation polarimeters at 42 GHz and 90 GHz. The instrument was installed at an altitude of 3880 m in an astronomical site in California, USA. In addition to sky polarization observations, the site characteristics for microwave astronomy were determined using a weather station and a 225 GHz radiometer. These procedures allowed microwave opacity and transmission to be estimated from local measurements. A median opacity at 225 GHz of 0.11 was measured, which corresponds to a transmission of 89.6%. The instrument collected 2169 hours of data for each polarimeter. A pipeline was implemented to allow instrument characterization, sky maps production, and angular power spectrum analysis. An upper limit of 14 μK (95% confidence level) on the angular power spectrum EE in the range $170 < l < 240$ was obtained. This upper limit is consistent with EE polarization prediction from standard Λ -Cold Dark Matter cosmological model.

Author

Cosmic Microwave Background Radiation; Cosmology; Radio Astronomy

20080031709 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Binary Black Holes and Gravitational Waves

Centrella, Joan; November 27, 2007; 1 pp.; In English; Washington Academy of Sciences, 27 Nov. 2007, Washington D.C., USA; No Copyright; Avail.: Other Sources; Abstract Only

The final merger of two black holes releases a tremendous amount of energy, more than the combined light from all the stars in the visible universe. This energy is emitted in the form of gravitational waves, and observing these sources with gravitational wave detectors such as LIGO and LISA requires that we know the pattern or fingerprint of the radiation emitted. Since black hole mergers take place in regions of extreme gravitational fields, we need to solve Einstein's equations of general relativity on a computer in order to calculate these wave patterns. For more than 30 years, scientists have tried to compute these wave patterns. However, their computer codes have been plagued by problems that caused them to crash. This situation has changed dramatically in the past 2 years, with a series of amazing breakthroughs. This discussion examines these gravitational patterns, showing how a spacetime is constructed on a computer to build a simulation laboratory for binary black hole mergers. The focus is on recent advances that are revealing these waveforms, and the dramatic new potential for discoveries that arises when these sources will be observed by the space-based gravitational wave detector LISA.

Author

Black Holes (Astronomy); Gravitational Waves; Astrophysics

20080032408 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Results from Binary Black Hole Simulations in Astrophysics Applications

Baker, John G.; December 17, 2007; 1 pp.; In English; 6th International Conference on Gravitation and Cosmology, 17-21 Dec. 2007, Pune, India; No Copyright; Avail.: Other Sources; Abstract Only

Present and planned gravitational wave observatories are opening a new astronomical window to the sky. A key source of gravitational waves is the merger of two black holes. The Laser Interferometer Space Antenna (LISA), in particular, is expected to observe these events with signal-to-noise ratio's in the thousands. To fully reap the scientific benefits of these observations requires a detailed understanding, based on numerical simulations, of the predictions of General Relativity for the waveform signals. New techniques for simulating binary black hole mergers, introduced two years ago, have led to dramatic advances in applied numerical simulation work. Over the last two years, numerical relativity researchers have made

tremendous strides in understanding the late stages of binary black hole mergers. Simulations have been applied to test much of the basic physics of binary black hole interactions, showing robust results for merger waveform predictions, and illuminating such phenomena as spin-precession. Calculations have shown that merging systems can be kicked at up to 2500 km/s by the thrust from asymmetric emission. Recently, long lasting simulations of ten or more orbits allow tests of post-Newtonian (PN) approximation results for radiation from the last orbits of the binary's inspiral. Already, analytic waveform models based PN techniques with incorporated information from numerical simulations may be adequate for observations with current ground based observatories. As new advances in simulations continue to rapidly improve our theoretical understanding of the systems, it seems certain that high-precision predictions will be available in time for LISA and other advanced ground-based instruments. Future gravitational wave observatories are expected to make precision.

Author

Black Holes (Astronomy); Astrophysics; Simulation; Numerical Analysis; LISA (Observatory); Relativity

20080032409 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Binary Black Holes and Gravitational Waves

Centrella, Joan; November 10, 2007; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

The final merger of two black holes releases a tremendous amount of energy, more than the combined light from all the stars in the visible universe. This energy is emitted in the form of gravitational waves, and observing these sources with gravitational wave detectors such as LIGO and LISA requires that we know the pattern or fingerprint of the radiation emitted. Since black hole mergers take place in regions of extreme gravitational fields, we need to solve Einstein's equations of general relativity on a computer in order to calculate these wave patterns.

Author

Black Holes (Astronomy); Gravitational Waves; Emittance; Astrophysics

20080032411 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Cosmological Inflation: A Personal Perspective

Kazanas, Demosthenes; December 17, 2007; 1 pp.; In English; The Very Early Universe 25 Years On, 17-20 Dec. 2007, Cambridge, UK; No Copyright; Avail.: Other Sources; Abstract Only

We present a review of the sequence of events/circumstances that led to the introduction of interplay between the physics associated with phase transitions in the early universe and their effects on its dynamics of expansion with the goal of resolving the horizon problem that it has since become known as Cosmological Inflation. We then provide a brief review of the fundamentals and the solutions of a theory of gravity based on local scale invariance, known as Weyl gravity that have been elaborated by the presenter and his collaborator P. D. Mannheim. We point out that this theory provides from first principles for a characteristic universal acceleration, whose value appears to be in agreement with observations across a vast range of length scales in the universe.

Author

Cosmology; Expansion; Universe; Galactic Evolution; Astrophysics

20080032412 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Stellar Imager (SI) - A Mission to Resolve Stellar Surfaces, Interiors, and Magnetic Activity

Carpenter, Kenneth; July 16, 2007; 1 pp.; In English; 'Biggest, Baddest, Coolest Stars' Eastern Tennessee State University, 16-18 Jul 2007, Tennessee, USA; No Copyright; Avail.: Other Sources; Abstract Only

The Stellar Imager (SI) is a UV/Optical, Space-Based Interferometer designed to enable 0.1 milli-arcsecond (mas) spectral imaging of stellar surfaces and, via asteroseismology, stellar interiors and of the Universe in general. The ultra-sharp images of the Stellar Imager will revolutionize our view of many dynamic astrophysical processes by transforming point sources into extended sources, and snapshots into evolving views. SI's science focuses on the role of magnetism in the Universe, particularly on magnetic activity on the surfaces of stars like the Sun. SI's prime goal is to enable long-term forecasting of solar activity and the space weather that it drives. SI will also revolutionize our understanding of the formation of planetary systems, of the habitability and climatology of distant planets, and of many magneto-hydrodynamically controlled processes in the Universe. SI is included as a 'Flagship and Landmark Discovery Mission' in the 2005 NASA Sun Solar system Connection (SSSC) Roadmap and as a candidate for a 'Pathways to Life Observatory' in the NASA Exploration of

the Universe Division (EUD) Roadmap (May, 2005). In this paper we discuss the science goals and technology needs of, and the baseline design for, the SI Mission (<http://hires.gsfc.nasa.gov/si/>) i ts ability to image the ‘Biggest, Baddest, Coolest Stars’.

Author

Interferometers; Astronomical Interferometry; Stellar Atmospheres; Stellar Interiors; Geomagnetism; Stellar Activity; Imaging Techniques; Image Resolution; Solar Activity; Astrophysics

20080032413 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Space Infrared Interferometric Telescope (SPIRIT) and its Complementarity to ALMA

Leisawitz, Dave, et al.; June 22, 2007; 1 pp.; In English; ALMA Workshop: Transformational Science with ALMA Through Disks to Stars and Planets, 22-24 Jun. 2007, Virginia, USA; No Copyright; Avail.: Other Sources; Abstract Only

We report results of a pre-Formulation Phase study of SPIRIT, a candidate NASA Origins Probe mission. SPIRIT is a spatial and spectral interferometer with an operating wavelength range 25 - 400 microns. SPIRIT will provide sub-arcsecond resolution images and spectra with resolution $R = 3000$ in a 1 arcmin field of view to accomplish three primary scientific objectives: (1) Learn how planetary systems form from protostellar disks, and how they acquire their chemical organization; (2) Characterize the family of extrasolar planetary systems by imaging the structure in debris disks to understand how and where planets of different types form; and (3) Learn how high-redshift galaxies formed and merged to form the present-day population of galaxies. In each of these science domains, SPIRIT will yield information complementary to that obtainable with the James Webb Space Telescope (JWST) and the Atacama Large Millimeter Array (ALMA), and all three observatories could operate contemporaneously. Here we shall emphasize the SPIRIT science goals (1) and (2) and the mission’s complementarity with ALMA.

Author

Spaceborne Telescopes; Infrared Telescopes; Interferometers; Astronomical Interferometry; Radio Astronomy; Antenna Arrays; Astronomical Spectroscopy; Imaging Techniques; Image Resolution

20080032424 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Pulsars and Acceleration Sites

Harding, Alice; May 18, 2008; 1 pp.; In English; XXth Rencontres de Blois: Challenges in Particle Astrophysics, 18-23 May 2008, Blois, France; No Copyright; Avail.: Other Sources; Abstract Only

Rotation-powered pulsars are excellent laboratories for the studying particle acceleration as well as fundamental physics of strong gravity, strong magnetic fields and relativity. But even forty years after their discovery, we still do not understand their pulsed emission at any wavelength. I will review both the basic physics of pulsars as well as the latest developments in understanding their high-energy emission. Special and general relativistic effects play important roles in pulsar emission, from inertial frame-dragging near the stellar surface to aberration, time-of-flight and retardation of the magnetic field near the light cylinder. Understanding how these effects determine what we observe at different wavelengths is critical to unraveling the emission physics. Fortunately the Gamma-Ray Large Area Space Telescope (GLAST), with launch in May 2008 will detect many new gamma-ray pulsars and test the predictions of these models with unprecedented sensitivity and energy resolution for gamma-rays in the range of 30 MeV to 300 GeV.

Author

Pulsars; Particle Acceleration; Astrophysics; Stellar Structure

20080032432 NASA Goddard Space Flight Center, Greenbelt, MD, USA

An Intriguing Convex Break in the EGRET SED of Mrk 421

Nandikotkur, Giridhar; Jahoda, Keith M.; Georganopoulos, M.; Hartman, R. C.; Mukherjee, R.; Thompson, D. J.; Swank, Jean H.; [January 2007]; 12 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

Based upon analysis of the entire EGRET data from Mrk 421, it is found that the time-averaged spectra are inconsistent with the predictions of current theoretical models that have had success in describing simultaneous X-ray/TeV observations, and suggest additional components in the GeV band, as well as complex time variability. Current theoretical pictures explain the GeV emission as comptonization of the synchrotron photons in the jet, and predict hard spectra that should join smoothly with the TeV emission. Our analysis shows that the situation is more complex. The spectrum ranges from hard to soft during individual epochs, and shows a convex break in the aggregated data. We also present the mission-averaged EGRET spectrum for PKS 2155-304, which shows a similar (but not as pronounced) convex curvature. We discuss a series of possible

explanations for the 10(exp 22) - 10(exp 23) HZ declining part of the EGRET nu F(sub nu), spectrum for Mrk 421, and suggest that it is synchrotron emission from the high energy tail of the electron population that produces the X-rays during the highest X-ray states. Such multi-MeV photons are produced by electrons accelerated close to the limit of diffusive shock acceleration. Simultaneous GLAST and X-ray observations of high X-ray states will address the issue of the convex curvature in the future.

Author

Convexity; Gamma Ray Telescopes; Spectral Energy Distribution; X Ray Telescopes

20080032433 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Infrared and X-Ray Evidence for Circumstellar Grain Destruction by the Blast Wave of Supernova 1987A

Dwek, Eliahu; Arendt, Richard G.; Bouchet, Patrice; Burrows, David N.; Challis, Peter; Danziger, John; DeBuizer James M.; Gehrz, Robert D.; Kirshner, Robert P.; McCray, Richard; Park, Sangwok; Polomski, Elisha; Woodward, Charles; September 21, 2007; 25 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): 1215746; LTSA-2003-0065; GO-9114; GO5-6073X; GO6-7047X; Copyright; Avail.: CASI: [A03](#),

Hardcopy

Multiwavelength observations of supernova remnant (SNR) 1987A show that its morphology and luminosity are rapidly changing at X-ray, optical, infrared, and radio wavelengths as the blast wave from the explosion expands into the circumstellar equatorial ring, produced by mass loss from the progenitor star. The observed infrared (IR) radiation arises from the interaction of dust grains that formed in mass outflow with the soft X-ray emitting plasma component of the shocked gas. Spitzer IRS spectra at 5 - 30 microns taken on day 6190 since the explosion show that the emission arises from approx. $1.1 \times 10^{(exp -6)}$ solar mass of silicate grains radiating at a temperature of approx. $180 \pm (15-20)$ K. Subsequent observations on day 7137 show that the IR flux had increased by a factor of 2 while maintaining an almost identical spectral shape. The observed IR-to-X-ray flux ratio (IRX) is consistent with that of a dusty plasma with standard LMC dust abundances. This flux ratio has decreased by a factor of approx. 2 between days 6190 and 7137, providing the first direct observation of the ongoing destruction of dust in an expanding SN blast wave on dynamic time scales. Detailed models consistent with the observed dust temperature, the ionization fluence of the soft X-ray emission component, and the evolution of IRX suggest that the radiating silicate grains are immersed in a $3.5 \times 10^{(exp 6)}$ K plasma with a density of $(0.3 - 1) \times 10^{(exp 4)}$ /cu cm, and have a size distribution that is confined to a narrow range of radii between 0.02 and 0.2 microns. Smaller grains may have been evaporated by the initial UV flash from the supernova.

Author

Stellar Envelopes; Supernova Remnants; Infrared Spectra; Confinement; Detonation Waves; Dusty Plasmas; Infrared Radiation; X Ray Optics; Supernova 1987A; Stellar Mass

20080032477 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Ion Anisotropy and High-Energy Variability of Large Solar Particle Events: A Comparative Study

Tan, Lun C.; Reames, Donald V.; Ng, Chee K.; [2008]; 34 pp.; In English; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080032477>

We have made comparative studies of ion anisotropy and high-energy variability of solar energetic particle (SEP) events previously examined by the Solar, Heliospheric, and Interplanetary Environment (SHINE) Workshop campaign. We have found distinctly different characteristics of SEPs between two large 'gradual' events having very similar solar progenitors (the 2002 April 21 and August 24 events). Since the scattering centers of SEPs are approximately frozen in the solar wind, we emphasize work in the solar-wind frame where SEPs tend to be isotropized, and small anisotropies are easier to detect. While in the August event no streaming reversal occurred, in the April event the field-aligned anisotropy of all heavy ions showed sign of streaming reversal. The difference in streaming reversal was consistent with the difference in the presence of the outer reflecting boundary. In the April event the magnetic mirror, which was located behind the interplanetary shock driven by the preceding coronal mass ejection (CME), could block the stream of SEPs, while in the August event SEPs escaped freely because of the absence of nearby boundary. The magnetic mirror was formed at the bottleneck of magnetic field lines draped around a flank of the preceding CME. In the previous SHINE event analysis the contrasting event durations and Fe/O ratios of the both events were explained as the interplay between shock geometry and seed population. Our new findings, however, indicate that event duration and time as well as spectral variation are also affected by the presence of a nearby reflecting boundary.

Author

Anisotropy; Solar Corpuscular Radiation; Variability; Solar Wind; Energetic Particles; Heavy Ions

20080032491 California Inst. of Tech., Pasadena, CA, USA

Rest-Frame Mid-Infrared Detection of an Extremely Luminous Lyman Break Galaxy with the Spitzer Infrared Spectrograph (IRS)

Teplitz, H. I.; Charmandaris, V.; Armus, L.; Appleton, P. N.; Houck, J. R.; Soifer, B. T.; Weedman, D.; Brandl, B. R.; vanCleve, J.; Grillmair, C.; Uchid, K. I.; The Astrophysical Journal Supplement Series; September 2004; Volume 154, pp. 103-106; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAS-1407; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40878>

We present the first rest-frame of approximately 4 microns detection of a Lyman break galaxy. The data were obtained using the 16 microns imaging capability of the Spitzer Infrared Spectrograph. The target object, J134026.44+634433.2, is an extremely luminous Lyman break galaxy at $z=2.79$, first identified in Sloan Digital Sky Survey (SDSS) spectra (as reported by Bentz et al.). The source is strongly detected with a flux of 0.94 ± 0.02 mJy. Combining Spitzer and SDSS photometry with supporting ground-based J- and K-band data, we show that the spectral energy distribution is consistent with an actively star-forming galaxy. We also detect other objects in the Spitzer field of view, including a very red mid-infrared source. We find no evidence of a strong lens among the mid-infrared sources.

Author

Starburst Galaxies; Infrared Radiation; Infrared Astronomy; Spectrographs; Spectral Energy Distribution

20080032492 Universidad Nacional Autonoma de Mexico, Mexico

Models for the Infrared Cavity of HH 46/47

Raga, A. C.; Noriega-Crespo, A.; Gonzalez, R. F.; Velazquez, P. F.; The Astrophysical Journal Supplement Series; September 2004; Volume 154, pp. 346-351; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): CONACyT-36572-E; CONACyT-41320; DGAPA (UNAM)-IN 112602; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40885>; <http://dx.doi.org/10.1086/422639>

We have modeled the limb-brightened cavity seen in the new Spitzer Space Telescope IR images of the southwest lobe of HH 46/47 as the bow shock driven by an outflow from a young, low-mass star. We present models in which the outflow is a perfectly collimated, straight jet, models in which the jet precesses, and finally a model in which the outflow takes the form of a latitude-dependent wind. We study cases in which the outflow moves into a constant-density cloud and into a stratified cloud. We find that the best agreement with the observed cavity is obtained for the precessing jet in a stratified cloud. However, the straight jet (traveling in a stratified cloud) also gives cavity shapes close to the observed one. The latitude-dependent wind model that we have computed gives cavity shapes that are substantially wider than the observed cavity. We therefore conclude that the cavity seen in the Spitzer observations of the southwest lobe of the HH 46/47 outflow do not seem to imply the presence of a latitude-dependent wind, as it can be modeled successfully with a perfectly collimated jet model.

Author

Herbig-Haro Objects; Infrared Imagery; Cavities; Astronomical Models; Astrophysics; Stellar Evolution

20080032493 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Extremely Red Objects in the Lockman Hole

Wilson, G.; Huang, J. -S.; Perez-Gonzalez, P. G.; Egami, E.; Ivison, R. J.; Rigby, J. R.; Alonso-Herrero, A.; Barmby, P.; Dole, H.; Fazio, G. G.; LeFloch, E.; Papovich, C.; Rigopoulou, D.; Bai, L.; Engelbracht, C. W.; Frayer, D.; Gordon, K. D.; Hines, D. C.; Misselt, K. A.; Miyazaki, S.; Morrison, J. E.; Rieke, G. H.; Rieke, M. J.; Surace, J.; The Astrophysical Journal Supplement Series; September 2004; Volume 154, pp. 107-111; In English; Original contains color illustrations

Contract(s)/Grant(s): JPL-960541; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40890>; <http://dx.doi.org/10.1086/422716>

We investigate extremely red objects (EROs) using near- and mid-infrared observations in five passbands (3.6 to 24 microns) obtained from the Spitzer Space Telescope, and deep ground-based R and K imaging. The great sensitivity of the Infrared Array Camera (IRAC) camera allows us to detect 64 EROs (a surface density of 2.90 ± 0.36 arcmin⁻²); [3.6](sub AB) is less than 23.7) in only 12 minutes of IRAC exposure time, by means of an R - [3.6] color cut (analogous to the traditional red R - K cut). A pure infrared K - [3.6] red cut detects a somewhat different population and may be more effective at selecting z greater than 1.3 EROs. We find approximately 17% of all galaxies detected by IRAC at 3.6 or 4.5 microns to be EROs. These percentages rise to about 40% at 5.8 microns, and about 60% at 8.0 microns. We utilize the spectral bump at 1.6 microns to divide the EROs into broad redshift slices using only near-infrared colors (2.2/3.6/4.5 microns). We

conclude that two-thirds of all EROs lie at redshift z greater than 1.3. Detections at 24 microns imply that at least 11% of 0.6 less than z and less than 1.3 EROs and at least 22% of z greater than 1.3 EROs are dusty star-forming galaxies.

Author

Faint Objects; Stellar Color; Starburst Galaxies; Gases; Hydrogen; Galactic Evolution

20080032511 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Evidence for Long-term Retrograde Motions of Sunspot Patterns and Indications of Coupled g-Mode Rotation Rates

Juckett, David A.; Wolff, Charles L.; [2008]; 23 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

Solar g-modes are global oscillations that would exist primarily in the radiative zone (RZ) and would be excited by either convective overshoot or nuclear burning in the core. Wolff and O'Donovan (*Astrophys. J.* 661. 568, 2007) proposed a nonlinear coupling of g-modes into groups that share the same harmonic degree l . Each group (denoted set(l)) exhibits a unique retrograde rotation rate with respect to the RZ that depends mainly on l . The coupling yields two angularly defined hot spots offset from the equator on opposite sides of the Sun that would deposit energy asymmetrically in the lower convective envelope (CE). It is anticipated that when two or more groups overlap in longitude, an increase in local heating would influence the distribution of sunspots. In this paper, we scanned a multitude of rotational reference frames for sunspot clustering to test for frames that are concordant with the rotation of these g-modes sets. To achieve this, spherical harmonic filtering of sunspot synoptic maps was used to extract patterns consistent with coalesced g-modes. The latitude band, with minimal differential rotation, was sampled from each filtered synoptic map and layered into a stackplot. This was progressively shifted, line-by-line, into different rotational reference frames. We have detected long-lived longitudinal alignments, spanning several solar cycles, consistent with the rotation rate of the deep solar interior as well as other rotational frames predicted by the coupled g-mode model. Their sidereal rotation rates of 370.0, 398.8, 112.7, 418.3, 321.0, 424.2 and 430.0 mHz correspond, respectively, to coupled g-modes for $l = 2$ through 7 and G, where G is a set with high l values or a group of such sets (unresolved) that rotate almost as fast as the RZ. This initial evidence for the coupled g-mode model leads to the tentative conclusion that a portion of the driving force for sunspot occurrence is linked to energy extracted from the solar core and deposited at the top of the RZ by solar g-modes.

Author

Sunspots; Coupled Modes; Rotation; Solar Cycles; Extraction; Harmonic Functions; Oscillations; Alignment; Convection

20080032640 NASA Goddard Space Flight Center, Greenbelt, MD, USA

U.S. Naval Observatory VLBI Analysis Center

Boboltz, David; Fey, Alan L.; Bartlett, Jennifer L.; Dugan, Zachary; Kingham, Kerry A.; Hall, David M.; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 238-241; In English; See also [20080032620](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

This report summarizes the activities of the VLBI Analysis Center at the USA Naval Observatory for calendar year 2007. Over the course of the year, Analysis Center personnel analyzed biweekly 24-hour experiments with designations IVS-R1 and IVS-R4 for use in-house and continued timely submission of IVS-R4 databases for distribution to the IVS. During the 2007 calendar year, the USNO Analysis Center produced three periodic global Terrestrial Reference Frame (TRF) solutions with designations usn2007a, usn2007b, and usn2007c. Earth orientation parameters (EOP) based on these solutions, updated by the latest 24-hour (IVS-R1 and IVS-R4) experiments, were submitted to the IVS. Other activities in the 2007 calendar year included the generation of a new Sinex solution, usn2007b, and the continued submission of Sinex files based on new 24-hour experiments to the IVS. In support of the Celestial Reference Frame (CRF), Analysis Center personnel continued a program designed to increase the sky density of ICRF sources, especially in the southern hemisphere. Activities included scheduling, analyzing and submitting databases for IVS-CRF experiments and the production of global CRF solutions designated crf2007a, crf2007b, and crf2007c. In addition, Analysis Center personnel performed research into the next generation ICRF-2 and a future high-frequency reference frame based on the VLBA K/Q-band experiments. Activities planned for the 2008 calendar year include the continued production of EOP/TRF/CRF global solutions and continued research into future reference frames.

Author

Very Long Base Interferometry; Celestial Reference Systems

20080032662 Naval Observatory, Washington, DC, USA

USNO Analysis Center for Source Structure Report

Fey, Alan L.; Boboltz, David A.; Ojha, Roopesh; Gaume, Ralph A.; Kingham, Kerry A.; International VLBI Service for

Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 242-244; In English; See also [20080032620](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

This report summarizes the activities of the USA Naval Observatory Analysis Center for Source Structure for calendar year 2007. VLBA RDV experiments RDV61, RDV63, and RDV65 were calibrated and imaged. VLBA high frequency experiment BL122D was calibrated and imaged. Images from these four experiments, together with images from RDV28, were added to the USNO Radio Reference Frame Image Database. A Southern Hemisphere imaging and astrometry program for maintenance of the ICRF continued. Activities planned for the year 2008 include continued imaging of ICRF sources at standard and higher frequencies and continued analysis of source structure and its variation.

Author

Imaging Techniques; Very Long Baseline Array (VLBA)

20080032686 Shanghai Astronomical Observatory, China

SHAO Analysis Center 2007 Annual Report

Li, Jinling; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 235-237; In English; See also [20080032620](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

Our research activities in 2007 focused on the atmosphere delay calibration of VLBA phase-referencing observations, the selection of stable sources for the next realization of the extragalactic celestial reference frame, and the processing of the satellite VLBI tracking data. These activities will be continued next year; in particular, we will prepare the software for the Chinese lunar exploration and Martian exploration. The local survey at Sheshan section of Shanghai Astronomical Observatory will be continued too. We use CALC/SOLVE for our routine VLBI data analysis. We are developing softwares coded in FORTRAN to deal with the tracking data of satellite by VLBI, ranging, and Doppler.

Author

Celestial Reference Systems; Very Long Base Interferometry

20080032687 Canadian VLBI Technology Development Center, Canada

Canadian VLBI Technology Development Center

Petrachenko, Bill; International VLBI Service for Geodesy and Astrometry 2007 Annual Report; May 2008, pp. 247-248; In English; See also [20080032620](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

The Canadian VLBI Technology Development Center (TDC) is actively involved in theoretical studies to define recommendations for the VLBI2010 system. In addition, two development programs at the Dominion Radio Astrophysical Observatory (DRAO) are of potential interest to VLBI2010. Composite antennas that are light, stiff and cost-effective are being developed for the SKA, and a state-of-the-art correlator is being developed for the EVLA.

Author

Very Long Base Interferometry; Astronomical Observatories

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance*.

20080031137 NASA Johnson Space Center, Houston, TX, USA

Observation and Analysis of Martian Meteorite Y000593: Evidence of Biosignatures

Spencer, L. M.; McKay, D. S.; Gibson, E. K.; Thomas-Keprta, K. L.; Wentworth, S. J.; Clemett, S. J.; [2008]; 1 pp.; In English; 71st Annual Meeting of the Meteoritical Society (METSOC 2008), 28 Jul. - 1 Aug. 2008, Matsue, Japan; No Copyright; Avail.: Other Sources

Yamato000593 is a meteorite discovered in Antarctica by JARE in 2000 and identified as a Martian nakhlite [1]. Previously, Fisk et al. [4] suggested tunnels and galleries, along with secondary clay and carbonate phases, discovered in both oceanic basalts and the Nakhla meteorite are likely the result of biogenic activity. Here we report the first in-depth analysis of secondary alteration features in Y000593 suggesting the presence of carbonate phases and pre-terrestrial iddingsite clay associated with tunnels and galleries similar to those previously studied in Nakhla and oceanic basalts. No evidence of terrestrial contamination has yet been found in Y000593. It is known that the iddingsite in Nakhla formed under low temperature, aqueous weathering conditions [2]; consequently, the presence of this mineral as well as carbonate in Y000593 may be further evidence supporting a past history of warmer and wetter climate on Mars [3]. Optical and FE-SEM analysis

of a polished thin section revealed iddingsite-filled impact microfractures. Within grains of olivine and veins of high-silica glass we document 1-4 m tunnels and galleries which extend outward from fractures and which are quite similar to those in Nakhla [2-4]. EDX analyses of these alteration features also reveal carbonate phases with high Mn and Ca abundances. Iddingsite and carbonate phases are both closely associated with the tunnel and gallery features. Alteration in Y000593 appears similar in size and distribution to tunnels and galleries previously observed in Nakhla as well as oceanic basalts containing live DNA [4]. EDX compositions of alteration products in both Martian meteorites are consistent with phases observed in oceanic basalts and attributed to biotic weathering.

Author

SNC Meteorites; Biomarkers; Planetary Geology; Fractures (Materials)

20080031184 Fermi National Accelerator Lab., Batavia, IL, USA; Washington Univ., Seattle, WA, USA; California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA; Johns Hopkins Univ., Baltimore, MD, USA

SDSS Spectroscopic Survey of Stars

Ivezic, Z.; Schlegel, D.; Uomoto, A.; Bond, N.; Beers, T.; Jan. 01, 2007; 7 pp.; In English

Contract(s)/Grant(s): DE-AC02-76CH03000

Report No.(s): DE2007-897890; FERMILAB-CONF-07OSCD; No Copyright; Avail.: National Technical Information Service (NTIS)

In addition to optical photometry of unprecedented quality, the Sloan Digital Sky Survey (SDSS) is also producing a massive spectroscopic database. They discuss determination of stellar parameters, such as effective temperature, gravity and metallicity from SDSS spectra, describe correlations between kinematics and metallicity, and study their variation as a function of the position in the Galaxy. They show that stellar parameter estimates by Beers et al. show a good correlation with the position of a star in the g-r vs. u-g color-color diagram, thereby demonstrating their robustness as well as a potential for photometric parameter estimation methods. Using Beers et al. parameters, they find that the metallicity distribution of the Milky Way stars at a few kpc from the galactic plane is bimodal with a local minimum at $(Z/Z(\text{sub (circle-dot)}))$ (approx) -1.3. The median metallicity for the low-metallicity $(Z/Z(\text{sub (circle-dot)})) < =1.3$ subsample is nearly independent of Galactic cylindrical coordinates R and z, while it decreases with z for the high-metallicity $(Z/Z(\text{sub (circle-dot)})) > -1.3$ sample. They also find that the low-metallicity sample has (approx) 2.5 times larger velocity dispersion and that it does not rotate (at the (approx) 10 km/s level), while the rotational velocity of the high-metallicity sample decreases smoothly with the height above the galactic plane.

NTIS

Sky Surveys (Astronomy); Spectroscopy; Surveys; Variable Stars

20080031231 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Cassini/CIRS Observations of Water Vapor in Saturn's Stratosphere

Bjoraker, G. L.; Achterberg, R. K.; Simon-Miller, A. A.; Carlson, R. C.; Jennings, D. E.; July 28, 2008; 1 pp.; In English; Saturn After Cassini-Huygens Symposium/ESA and Technology Facilities Council, 28 Jul. - 1 Aug. 2008, London, UK; Copyright; Avail.: Other Sources; Abstract Only

The Composite Infrared Spectrometer (CIRS) on the Cassini spacecraft has obtained numerous spectra of Saturn at varying spectral and spatial resolutions since Saturn Orbit Insertion in 2004. Emission lines due to water vapor in Saturn's stratosphere were first detected using whole-disk observations from the Infrared Space Observatory (Feuchtgruber et al 1997) and subsequently confirmed by the Submillimeter Wave Astronomy Satellite (Rergin et al 2000). CIRS has detected water and the data permit the retrieval of the latitudinal variation of water on Saturn. Emission lines of H₂O on Saturn are very weak in the CIRS data. Thus, large spectral averages as well as improvements in calibration are necessary to detect water vapor. Zonally averaged nadir spectra were produced every 10 degrees of latitude. Stratospheric temperatures in the 0.5 - 5.0 mbar range were obtained by inverting spectra of CH₄ in the v₄ band centered at 1304 cm(exp -1). The origin of water vapor is believed to be from the ablation of micrometeorites containing water ice, followed by photochemistry. This external source of oxygen originates either from the Saturn system (from the rings or perhaps from Enceladus) or from the interplanetary medium. Connerney (1986) proposed a mechanism to transport water from the inner edge of the B-ring along magnetic field lines to specific latitudes (50N and 44S) on Saturn. Prange et al (2006) interpreted a minimum in the abundance of acetylene from ultraviolet spectra near 41S on Saturn as possibly due to an enhanced influx of water. Existing CIRS far-IR spectra are at relatively low spatial resolution, but observations at closer range planned for the extended mission will be able to test the 'ring rain' mechanism by searching for localized water vapor enhancement at midlatitudes.

Author

Cassini Mission; Infrared Spectrometers; Saturn Rings; Stratosphere; Water Vapor

20080031344 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Jurassic Diabase from Leeseburg, VA: A Proposed Lunar Simulant

Taylor, Patrick T.; Lowman, P. D.; Nagihara, Seiichi; Milam, M. B.; Nakamura, Yosio; July 20, 2008; 2 pp.; In English; NASA Lunar Science Institute Meeting, 20-23 Jul. 2008, Moffett Field, CA, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031344>

A study of future lunar seismology and heat flow is being carried out as part of the NASA Lunar Sortie Science Program. This study will include new lunar drilling techniques, using a regolith simulant, for emplacement of instruments. Previous lunar simulants, such as JSC-1 and MLS-1, were not available when the study began, so a local simulant source was required. Diabase from a quarry at Leeseburg, Virginia, was obtained from the Luck Stone Corporation. We report here initial results of a petrographic examination of this rock, GSC-1 henceforth.

Derived from text

Seismology; Lunar Geology; Petrography; Mineralogy

20080031483 NASA Marshall Space Flight Center, Huntsville, AL, USA

Monitoring and Forecasting Space Weather in Geospace Environment

Lyatsky, Wladislaw; Khazanov, George V.; April 29, 2008; 1 pp.; In English; Space Weather Workshop, 29 Apr. - 2 May 2008, Colorado, USA; No Copyright; Avail.: Other Sources; Abstract Only

For improving the reliability of Space Weather prediction, we developed a new, Polar Magnetic (PM) index of geomagnetic activity, which shows high correlation with both upstream solar wind data and related events in the magnetosphere and ionosphere. Similarly to the existing polar cap PC index, the new PM index was computed from data from two near-pole geomagnetic observatories; however, the method for computing the PM index is different. The high correlation of the PM index with both solar wind data and events in Geospace environment makes possible to improve significantly forecasting geomagnetic disturbances and such important parameters as the cross-polar-cap voltage and global Joule heating, which play an important role in the development of geomagnetic, ionospheric and thermospheric disturbances. We tested the PM index for 10-year period (1995-2004). The correlation between PM index and upstream solar wind data for these years is very high (the average correlation coefficient R approximately equal to 0.86). The PM index also shows the high correlation with the cross-polar-cap voltage and hemispheric Joule heating (the correlation coefficient between the actual and predicted values of these parameters approximately equal to 0.9), which results in significant increasing the prediction reliability of these parameters. Using the PM index of geomagnetic activity provides a significant increase in the forecasting reliability of geomagnetic disturbances and related events in Geospace environment. The PM index may be also used as an important input parameter in modeling ionospheric, magnetospheric, and thermospheric processes.

Author

Forecasting; Geomagnetism; Space Weather; Earth Orbital Environments; Polar Meteorology

20080031533 NASA Marshall Space Flight Center, Huntsville, AL, USA

Constellation Program Life-cycle Cost Analysis Model (LCAM)

Prince, Andy; Rose, Heidi; Wood, James; May 12, 2008; 12 pp.; In English; ISPA/SCEA 2008 Joint Annual Conference, 12-14 May 2008, Nordwijk, Netherlands; Original contains color and black and white illustrations; Copyright; Avail.:

CASI: A03, Hardcopy

The Constellation Program (CxP) is NASA's effort to replace the Space Shuttle, return humans to the moon, and prepare for a human mission to Mars. The major elements of the Constellation Lunar sortie design reference mission architecture are shown. Unlike the Apollo Program of the 1960's, affordability is a major concern of USA policy makers and NASA management. To measure Constellation affordability, a total ownership cost life-cycle parametric cost estimating capability is required. This capability is being developed by the Constellation Systems Engineering and Integration (SE&I) Directorate, and is called the Lifecycle Cost Analysis Model (LCAM). The requirements for LCAM are based on the need to have a parametric estimating capability in order to do top-level program analysis, evaluate design alternatives, and explore options for future systems. By estimating the total cost of ownership within the context of the planned Constellation budget, LCAM can provide Program and NASA management with the cost data necessary to identify the most affordable alternatives. LCAM is also a key component of the Integrated Program Model (IPM), an SE&I developed capability that combines parametric sizing tools with cost, schedule, and risk models to perform program analysis. LCAM is used in the generation of cost estimates for system level trades and analyses. It draws upon the legacy of previous architecture level cost models, such as the Exploration Systems Mission Directorate (ESMD) Architecture Cost Model (ARCOM) developed for Simulation Based Acquisition (SBA), and ATLAS. LCAM is used to support requirements and design trade studies by calculating changes in cost relative to a baseline

option cost. Estimated costs are generally low fidelity to accommodate available input data and available cost estimating relationships (CERs). LCAM is capable of interfacing with the Integrated Program Model to provide the cost estimating capability for that suite of tools.

Author (revised)

Constellation Program; Life Cycle Costs; Computer Programs; Architecture (Computers); Lunar Landing

20080031646 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Lunar Surface Potential Changes Possible Associated with Traversals of the Bow Shock

Collier, M. R.; Stubbs, T. J.; Hills, H. K.; July 20, 2008; 4 pp.; In English; Dynamical Processes in Space Plasmas, 20-23 Jul. 2008, San Jose, CA, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

We report an analysis of seven Apollo 14 Apollo Lunar Surface Experiments Package (ALSEP) Suprathermal Ion Detector Experiment (SIDE) 'resonance' events from January 1972 through January 1973. The events appear to be associated with traversals of the Moon through the terrestrial bow shock.

Derived from text

Bow Waves; Apollo Lunar Surface Experiments Package; Moon; Solar Wind

20080031650 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Previously Unrecognized Large Lunar Impact Basins Revealed by Topographic Data

Frey, Herbert V.; March 09, 2008; 2 pp.; In English; Lunar Planetary Science Conference, 9-14 Mar. 2008, Houston, TX, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: [A01](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080031650>

The discovery of a large population of apparently buried impact craters on Mars, revealed as Quasi- Circular Depressions (QCDs) in Mars Orbiting Laser Altimeter (MOLA) data [1,2,3] and as Circular Thin Areas (CTAs) [4] in crustal thickness model data [5] leads to the obvious question: are there unrecognized impact features on the Moon and other bodies in the solar system? Early analysis of Clementine topography revealed several large impact basins not previously known [6,7], so the answer certainly is 'Yes.' How large a population of previously undetected impact basins, their size frequency distribution, and how much these added craters and basins will change ideas about the early cratering history and Late Heavy Bombardment on the Moon remains to be determined. Lunar Orbiter Laser Altimeter (LOLA) data [8] will be able to address these issues. As a prelude, we searched the state-of-the-art global topographic grid for the Moon, the Unified Lunar Control Net (ULCN) [9] for evidence of large impact features not previously recognized by photogeologic mapping, as summarized by Wilhelms [10].

Derived from text

Photogeology; Mars Craters; Structural Basins; Laser Altimeters; Lunar Orbiter; Size Distribution; Clementine Spacecraft; Photomapping

20080031657 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Temperatures and Composition in the Saturn System from Cassini CIRS

Flasar, F. Michael; July 14, 2008; 1 pp.; In English; COSPAR General Assembly, 14-18 Jul. 2008, Montreal, Canada; Copyright; Avail.: Other Sources; Abstract Only

We summarize recent observations by the Composite Infrared Spectrometer of Saturn, its rings, Titan, and the icy satellites. Limb observations of Saturn show vertical oscillations of temperatures and zonal-wind shears in the equatorial region that may be related to a temporal oscillation similar to the terrestrial QBO and Jupiter's QJO. There is also evidence of subsidence at mid-northern latitudes driven by the equatorial activity. Nadir-viewing observations show compact warm spots in the troposphere and stratosphere at both (summer and winter) poles, likely associated with subsidence. Observations of Titan have defined better the characteristics of the northern winter polar vortex, with 190 m/s winds surrounding a cold atmosphere at 1 microbar. The very warm polar stratopause at 10 microbar and the enhanced abundances of organic compounds suggest subsidence within the vortex. Analysis of the zonal structure in temperature indicates that the stratospheric zonal winds rotate about an axis that is displaced approximately 4.1 deg from the IAU pole. Additional flybys, including a close one in March 2008, continue to characterize the endogenic activity in Enceladus's south polar region. Temperature maps of bright and dark terrains on Iapetus indicate that its ice is approximately stable to sublimation in the bright regions and highly unstable in the dark regions. Thermal mapping of Saturn's rings continues to constrain their composition, and observations at different solar phase angles, spacecraft elevations, solar elevations, and local hour angles have elucidated the effects of

ring-particle shadowing and vertical motions on the thermal structure, and revealed the presence of small-scale structure associated with self-gravity wakes.

Author

Temperature Distribution; Saturn Rings; Infrared Spectrometers; Titan; Icy Satellites; Wind Shear

20080032368 Colorado Univ., Boulder, CO, USA

Modeling Variability of Plasma Conditions in the Io Torus

Delamere, P. A.; Bagenal, F.; *Journal of Geophysical Research*; July 03, 2003; Volume 108, pp. 1276; In English

Contract(s)/Grant(s): NNG04GQ85G; Copyright; Avail.: Other Sources

ONLINE: <http://dx.doi.org/10.1029/2002JA009706>

Telescopic observations and in situ measurements of the Io plasma torus show the density, temperature and composition to vary over time, sometimes up to a factor of 2. While previous models of the physical and chemical processes in the Io plasma torus have reasonably modeled the conditions of the Voyager 1 era, their authors have not addressed the observed variability nor explored the sensitivity of torus conditions to input parameters. In this paper we present a homogeneous torus model parameterized by five variables (transport timescale, neutral source strength, ratio of oxygen sulfur to atoms in the source, fraction of superthermal electrons, temperature of these hot electrons). The model incorporates the most recent data for ionization, recombination, charge exchange and radiative energy losses for the major torus species (S, S(sup +), S(sup ++), S(sup +++), O, O(sup +), O(sup ++)). We solve equations of conservation of mass and energy to find equilibrium conditions for a set of input parameters. We compare model plasma conditions with those observed by Voyager 1, Voyager 2, and Cassini. Furthermore, we explore the sensitivity of torus conditions to each parameter. We find that (1) torus conditions are distinctly different for the Voyager 1, Voyager 2 and Cassini eras, (2) unique torus input parameters for any given era are poorly constrained given the wide range of solution space that is consistent with the range of observed torus conditions, (3) ion composition is highly sensitive to the specification of a non-thermal electron distribution, (4) neutral O/S source ratio is highly variable with model values ranging between 1.7 for Cassini to 4.0 for Voyager 1 conditions, (5) transport times range between 23 days for Voyager 2 to 50 days for Voyager 1 and Cassini, (6) neutral source strengths range between 7 to 30 x 10(sup -4) cm(sup -3) s(sup -1) which corresponds to a net production of 0.4 to 1.3 tons/s for a torus volume of 1.4 x 10(sup 31) cm(sup 3), or 38 R(sub j)(sup 3).

Author

Io; Toruses; Toroidal Plasmas; Variability

20080032387 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

On the Discovery of CO Nighttime Emissions on Titan by Cassini/VIMS: Derived Stratospheric Abundances and Geological Implications

Baines, Kevin H.; Drossart, Pierre; Lopez-Valverde, Miguel A.; Atreya, Sushil K.; Sotin, Christophe; Momary, Thomas W.; Brown, Robert H.; Buratti, Bonnie J.; Clark, Roger N.; Nicholson, Philip D.; *Planetary and Space Science*; December 2006; Volume 54, Issue 15, pp. 1552-1562; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40867>; <http://dx.doi.org/10.1016/j.pss.2006.06.020>

We present a quantitative analysis of CO thermal emissions discovered on the nightside of Titan by Baines et al. [2005. The atmospheres of Saturn and Titan in the near-infrared: First results of Cassini/VIMS. *Earth, Moon, and Planets*, 96, 119-147] in Cassini/VIMS spectral imagery. We identify these emission features as the P and R branches of the 1-0 vibrational band of carbon monoxide (CO) near 4.65 microns. For CH₃D, the prominent Q branch of the nu(2) fundamental band of CH₃D near 4.55 microns is apparent. CO₂ emissions from the strong nu(3) vibrational band are virtually absent, indicating a CO₂ abundance several orders of magnitude less than CO, in agreement with previous investigations. Analysis of CO emission spectra obtained over a variety of altitudes on Titan's nightside limb indicates that the stratospheric abundance of CO is 32 +/- 15 ppm, and together with other recent determinations, suggests a vertical distribution of CO nearly constant at this value from the surface throughout the troposphere to at least the stratopause near 300 km altitude. The corresponding total atmospheric content of CO in Titan is similar to 2.9 +/- 1.5 x 10(exp 14) kg. Given the long lifetime of CO in the oxygen-poor Titan atmosphere (similar to 0.5-1.0 Gyr), we find a mean CO atmospheric production rate of 6 +/- 3 x 10(exp 5) kg yr(exp -1). Given the lack of primordial heavy noble gases observed by Huygens [Niemann et al., 2005. The abundances of constituents of Titan's atmosphere from the GCMS on the Huygens probe. *Nature*, 438, 779-784], the primary source of atmospheric CO is likely surface emissions. The implied CO/CH₄ mixing ratio of near-surface material is 1.8 +/- 0.9 x 10(exp -4), based on an average methane surface emission rate over the past 0.5 Gyr of 1.3 x 10(exp -13) gm cm(exp -2) s(exp -1) as required to balance hydrocarbon haze production via methane photolysis [Wilson and Atreya, 2004. Current state of

modeling the photochemistry of Titan's mutually dependent atmosphere and ionosphere. *J. Geophys. Res.* 109, E06002 Doi: 10.1029/2003JE002181]. This low CO/CH₄ ratio is much lower than expected for the sub-nebular formation region of Titan and supports the hypothesis [e.g., Atreya et al., 2005. Methane on Titan: photochemical-meteorological-hydrogeochemical cycle. *Bull. Am. Astron. Soc.* 37, 735] that the conversion of primordial CO and other carbon-bearing materials into CH₄-enriched clathrate-hydrates occurs within the deep interior of Titan via the release of hydrogen through the serpentinization process followed by Fischer-Tropsch catalysis. The time-averaged predicted emission rate of methane-rich surface materials is approximately 0.02 km(exp 3) yr (exp -1), a value significantly lower than the rate of silicate lava production for the Earth and Venus, but nonetheless indicative of significant geological processes reshaping the surface of Titan.

Author

Titan; Titan Atmosphere; Carbon Monoxide; Nightglow; Stratosphere; Atmospheric Chemistry; Atmospheric Composition; Planetary Surfaces; Methane; Photochemical Reactions; Planetary Geology

20080032388 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

The Atmospheres of Saturn and Titan in the Near-Infrared: First Results of Cassini/VIMS

Baines, K. H.; Drossart, P.; Momary, T. W.; Formisano, V.; Griffith, C.; Bellucci, G.; Bibring, J. P.; Brown, R. H.; Buratti, B. J.; Capaccioni, F.; Cerroni, P.; Clark, R. N.; Coradini, A.; Combes, M.; Cruikshank, D. P.; Jaumann, R.; Langevin, Y.; Matson, D. L.; McCord, T. B.; Mennella, V.; Nelson, R. M.; Nicholson, P. D.; Sicardy, B.; Sotin, C.; Earth, Moon, and Planets; June 2005; ISSN 0167-9295; Volume 96, pp. 119-147; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40863>; <http://dx.doi.org/10.1007/s11038-005-9058-2>

The wide spectral coverage and extensive spatial, temporal, and phase-angle mapping capabilities of the Visual Infrared Mapping Spectrometer (VIMS) onboard the Cassini-Huygens Orbiter are producing fundamental new insights into the nature of the atmospheres of Saturn and Titan. For both bodies, VIMS maps over time and solar phase angles provide information for a multitude of atmospheric constituents and aerosol layers, providing new insights into atmospheric structure and dynamical and chemical processes. For Saturn, salient early results include evidence for phosphine depletion in relatively dark and less cloudy belts at temperate and mid-latitudes compared to the relatively bright and cloudier Equatorial Region, consistent with traditional theories of belts being regions of relative downwelling. Additional Saturn results include (1) the mapping of enhanced trace gas absorptions at the south pole, and (2) the first high phase-angle, high-spatial-resolution imagery of CH₄ fluorescence. An additional fundamental new result is the first nighttime near-infrared mapping of Saturn, clearly showing discrete meteorological features relatively deep in the atmosphere beneath the planet's sunlit haze and cloud layers, thus revealing a new dynamical regime at depth where vertical dynamics is relatively more important than zonal dynamics in determining cloud morphology. Zonal wind measurements at deeper levels than previously available are achieved by tracking these features over multiple days, thereby providing measurements of zonal wind shears within Saturn's troposphere when compared to cloudtop movements measured in reflected sunlight. For Titan, initial results include (1) the first detection and mapping of thermal emission spectra of CO, CO₂, and CH₃D on Titan's nightside limb, (2) the mapping of CH₄ fluorescence over the dayside bright limb, extending to approximately 750 km altitude, (3) wind measurements of approximately 0.5 ms(exp -1), favoring prograde, from the movement of a persistent (multiple months) south polar cloud near 88 deg S latitude, and (4) the imaging of two transient mid-southern-latitude cloud features.

Author

Saturn Atmosphere; Titan Atmosphere; Atmospheric Composition; Atmospheric Chemistry; Planetary Mapping; Infrared Spectrometers; Cassini Mission; Huygens Probe

20080032390 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

An Overview of the Mars Reconnaissance Orbiter (MRO) Science Mission

Zurek, Richard W.; Smrekar, Suzanne E.; *Journal Of Geophysical Research*; May 12, 2007; Volume 112; 22 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40865>; <http://dx.doi.org/10.1029/2006JE002701>

The Mars Reconnaissance Orbiter (MRO) is the latest addition to the suite of missions on or orbiting Mars as part of the NASA Mars Exploration Program. Launched on 12 August 2005, the orbiter successfully entered Mars orbit on 10 March 2006 and finished aerobraking on 30 August 2006. Now in its near-polar, near-circular, low-altitude (approximately 300 km), 3 p.m. orbit, the spacecraft is operating its payload of six scientific instruments throughout a one-Mars-year Primary Science Phase (PSP) of global mapping, regional survey, and targeted observations. Eight scientific investigations were chosen for MRO, two of which use either the spacecraft accelerometers or tracking of the spacecraft telecom signal to acquire data needed for

analysis. Six instruments, including three imaging systems, a visible-near infrared spectrometer, a shallow-probing subsurface radar, and a thermal-infrared profiler, were selected to complement and extend the capabilities of current working spacecraft at Mars. Whether observing the atmosphere, surface, or subsurface, the MRO instruments are designed to achieve significantly higher resolution while maintaining coverage comparable to the current best observations. The requirements to return higher-resolution data, to target routinely from a low-altitude orbit, and to operate a complex suite of instruments were major challenges successfully met in the design and build of the spacecraft, as well as by the mission design. Calibration activities during the seven-month cruise to Mars and limited payload operations during a three-day checkout prior to the start of aerobraking demonstrated, where possible, that the spacecraft and payload still had the functions critical to the science mission. Two critical events, the deployment of the SHARAD radar antenna and the opening of the CRISM telescope cover, were successfully accomplished in September 2006. Normal data collection began 7 November 2006 after solar conjunction. As part of its science mission, MRO will also aid identification and characterization of the most promising sites for future landed missions, both in terms of safety and in terms of the scientific potential for future discovery. Ultimately, MRO data will advance our understanding of how Mars has evolved and by which processes that change occurs, all within a framework of identifying the presence, extent, and role of water in shaping the planet's climate over time.

Author

Mars Reconnaissance Orbiter; Mars Exploration; Data Acquisition

20080032401 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Modeling Temporal Variability of Plasma Conditions in the Io Torus during the Cassini Era

Delamere, P. A.; Steffl, A.; Bagenal, F.; Journal of Geophysical Research (Space Physics); October 29, 2004; Volume 109, No. 10; 1 pp.; In English

Contract(s)/Grant(s): NNG04GQ85G; Copyright; Avail.: Other Sources

ONLINE: <http://dx.doi.org/10.1029/2003JA010354>

Observations of ultraviolet (UV) emissions from the major ion species ($S^{sup +}$, $S^{sup ++}$, $S^{sup +++}$, $O^{sup +}$, $O^{sup ++}$) of the Io Plasma torus made during the Cassini flyby (October 2000 to March 2001) have revealed significant time variability. Using a homogeneous model for mass and energy flow in the torus parameterized by five input variables (transport timescale, neutral source strength, ratio of oxygen to sulfur atoms in the source, fraction of superthermal electrons, and temperature of the hot electrons), we have investigated the time variability of the torus properties (density, composition, and temperature) during the Cassini era. In order to match the changes in emissions, the model suggests that a significant change in the neutral source occurred near the beginning of the observing period, decreasing from more than 1.8 tons/s to 0.7 tons/s. The changes in the neutral source appear to coincide with the declining phase of a dramatic (i.e., 2-3 order of magnitude) peak in iogenic dust emissions observed by Galileo prior to the Cassini era.

Author

Io; Toroidal Plasmas; Ultraviolet Emission; Temporal Distribution; Variability

20080032402 Colorado Univ., Boulder, CO, USA

Radial Variations in the Io Plasma Torus during the Cassini Era

Delamere, P. A.; Bagenal, F.; Steffl, A.; Journal of Geophysical Research; December 27, 2005; Volume 110; 2 pp.; In English

Contract(s)/Grant(s): NNG04GQ85G; Copyright; Avail.: Other Sources

ONLINE: <http://dx.doi.org/10.1029/2005JA011251>

A radial scan through the midnight sector of the Io plasma torus was made by the Cassini Ultraviolet Imaging Spectrograph on 14 January 2001, shortly after closest approach to Jupiter. From these data, Steffl et al. (2004a) derived electron temperature, plasma composition (ion mixing ratios), and electron column density as a function of radius from $L = 6$ to 0 as well as the total luminosity. We have advanced our homogeneous model of torus physical chemistry (Delamere and Bagenal, 2003) to include latitudinal and radial variations in a manner similar to the two-dimensional model by Schreier et al. (1998). The model variables include: (1) neutral source rate, (2) radial transport coefficient, (3) the hot electron fraction, (4) hot electron temperature, and (5) the neutral O/S ratio. The radial variation of parameters 1-4 are described by simple power laws, making a total of nine parameters. We have explored the sensitivity of the model results to variations in these parameters and compared the best fit with previous Voyager era models (Schreier et al., 1998), Galileo data (Crary et al., 1998), and Cassini observations (Steffl et al., 2004a). We find that radial variations during the Cassini era are consistent with a neutral source rate of 700-1200 kg/s, an integrated transport time from $L = 6$ to 9 of 100-200 days, and that the core electron temperature is largely determined by a spatially and temporally varying superthermal electron population.

Author

Io; Toroidal Plasmas; Physical Chemistry; Plasma Composition; Radial Distribution; Electron Energy; Hot Electrons

20080032403 Colorado Univ., Boulder, CO, USA

Cassini UVIS Observations of the Io Plasma Torus, 3, Observations of Temporal and Azimuthal Variability

Steff, A. J.; Delamere, P. A.; Bagenal, F.; Icarus; January 2006; Volume 180, Issue 1, pp. 124-140; In English

Contract(s)/Grant(s): NNG04GQ85G; Copyright; Avail.: Other Sources

ONLINE: <http://dx.doi.org/10.1016/j.icarus.2005.07.013>

In this third paper in a series presenting observations by the Cassini Ultraviolet Imaging Spectrometer (UVIS) of the Io plasma torus, we show remarkable, though subtle, spatio-temporal variations in torus properties. The Io torus is found to exhibit significant, near sinusoidal variations in ion composition as a function of azimuthal position. The azimuthal variation in composition is such that the mixing ratio of S II is strongly correlated with the mixing ratio of S III and the equatorial electron density and strongly anti-correlated with the mixing ratios of both S IV and O II and the equatorial electron temperature. Surprisingly, the azimuthal variation in ion composition is observed to have a period of 10.07 h -- 1.5% longer than the System III rotation period of Jupiter, yet 1.3% shorter than the System UV period defined by [Brown, M. E., 1995. *J. Geophys. Res.* 100, 21683-21696]. Although the amplitude of the azimuthal variation of S III and O II remained in the range of 2-5%, the amplitude of the S II and S IV compositional variation ranged between 5 and 25% during the UVIS observations. Furthermore, the amplitude of the azimuthal variations of S II and S IV appears to be modulated by its location in System III longitude, such that when the region of maximum S II mixing ratio (minimum S IV mixing ratio) is aligned with a System III longitude of 200 deg +/-, the amplitude is a factor of 4 greater than when the variation is anti-aligned. This behavior can explain numerous, often apparently contradictory, observations of variations in the properties of the Io plasma torus with the System III and System IV coordinate systems.

Author

Io; Toroidal Plasmas; Temporal Distribution; Spatial Distribution; Variability; Azimuth; Plasma Composition; Ions

20080032404 Southwest Research Inst., Boulder, CO, USA

Cassini UVIS Observations of the Io Plasma Torus, 4, Modeling Temporal and Azimuthal Variability

Steff, A. J.; Delamere, P. A.; Bagenal, F.; Icarus; March 2008; Volume 194, Issue 1, pp. 153-165; In English

Contract(s)/Grant(s): NNG04GQ85G; Copyright; Avail.: Other Sources

ONLINE: <http://dx.doi.org/10.1016/j.icarus.2007.09.019>

In this fourth paper in a series, we present a model of the remarkable temporal and azimuthal variability of the Io plasma torus observed during the Cassini encounter with Jupiter. Over a period of three months, the Cassini Ultraviolet Imaging Spectrograph (UVIS) observed a dramatic variation in the average torus composition. Superimposed on this long-term variation, is a 10.07-hour periodicity caused by azimuthal variation in plasma composition subcorotating relative to System III longitude. Quite surprisingly, the amplitude of the azimuthal variation appears to be modulated at the beat frequency between the System III period and the observed 10.07-hour period. Previously, we have successfully modeled the months-long compositional change by supposing a factor of three increase in the amount of material supplied to Io's extended neutral clouds. Here, we extend our torus chemistry model to include an azimuthal dimension. We postulate the existence of two azimuthal variations in the number of superthermal electrons in the torus: a primary variation that subcorotates with a period of 10.07 hours and a secondary variation that remains fixed in System III longitude. Using these two hot electron variations, our model can reproduce the observed temporal and azimuthal variations observed by Cassini UVIS.

Author

Io; Toroidal Plasmas; Temporal Distribution; Azimuth; Variability; Plasma Composition; Physical Chemistry; Hot Electrons

20080032425 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Debris Disks and Hidden Planets

Kuchner, Marc; May 28, 2008; 1 pp.; In English; Debris Disks and Hidden Planets, 28-30 May 2008, California, USA; No Copyright; Avail.: Other Sources; Abstract Only

When a planet orbits inside a debris disk like the disk around Vega or Beta Pictoris, the planet may be invisible, but the patterns it creates in the disk may give it away. Observing and decoding these patterns may be the only way we can detect exo-Neptunes orbiting more than 20 AU from their stars, and the only way we can spot planets in systems undergoing the late stages of planet formation. Fortunately, every few months, a new image of a debris disk appears with curious structures begging for explanation. I'll describe some new ideas in the theory of these planet-disk interactions and provide a buyers guide to the latest models (and the planets they predict).

Author

Debris; Planetary Evolution; Infrared Astronomy; Far Infrared Radiation

20080032447 Colorado Univ., Boulder, CO, USA

On the Origin of System III Asymmetries in the Io Torus

Schneider, N. M.; Delamere, P. A.; October 10, 2006; 1 pp.; In English

Contract(s)/Grant(s): NNG04GQ85G; Copyright; Avail.: Other Sources; Abstract Only

The Io plasma torus exhibits several intriguing asymmetries which offer insights to the processes that transport mass and energy through the system. While these asymmetries are increasingly well described observationally, most still lack physical explanations. One important asymmetry is fixed in the coordinate system corotating with Jupiter's magnetic field. Space-based and ground-based observations have shown that torus ions are hotter and more highly ionized around System III 20 deg. Our simulations show that this type of torus asymmetry can be caused by enhanced pickup of fresh ions from Io's neutral clouds near these longitudes. The enhancement is caused primarily by the tilt and offset of the torus relative to the neutral clouds. We will report on the model parameters required to match the observed asymmetries, and offer predictions which will allow a test of this hypothesis.

Author

Io; Toroidal Plasmas; Asymmetry; Mass Flow; Energy Distribution; Planetary Atmospheres; Plasma Composition

20080032490 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Current State of Modeling the Photochemistry of Titan's Mutually Dependent Atmosphere and Ionosphere

Wilson, Eric H.; Atreya, S. K.; Journal of Geophysical Research; June 4, 2004; Volume 109; 39 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40873>; <http://dx.doi.org/10.1029/2003JE002181>

In the context of recent observations, microphysical models, and laboratory data, a photochemical model of Titan's atmosphere, including updated chemistry focusing on rate coefficients and cross sections measured under appropriate conditions, has been developed to increase understanding of these processes and improve upon previous Titan photochemical models. The model employs a two-stream discrete ordinates method to characterize the transfer of solar radiation, and the effects of electron-impact, cosmic-ray deposition, and aerosol opacities from fractal and Mie particles are analyzed. Sensitivity studies demonstrate that an eddy diffusion profile with a homopause level of 850 km and a methane stratospheric mole fraction of 2.2% provides the best fit of stratospheric and upper atmosphere observations and an improved fit over previous Titan photochemical models. Lack of fits for C₃H₈, HC₃N, and possibly C₂H₃CN can be resolved with adjustments in aerosol opacity. The model presents a benzene profile consistent with its detection in Titan's stratosphere [Coustenis et al., 2003], which may play an important role in the formation of Titan hazes. An electron peak concentration of 4200 cm⁻³ is calculated, which exceeds observations by 20%, considerably lower than previous ionosphere models. With adjustments in aerosol opacities and surface fluxes the model illustrates that reasonable fits to existing observations are possible with a single eddy diffusion profile, contrary to the conclusions of previous Titan models. These results will aid in the receipt and interpretation of data from Cassini-Huygens, which will arrive at Titan in 2004 and deploy a probe into Titan's atmosphere in January 2005.

Author

Titan Atmosphere; Planetary Ionospheres; Photochemical Reactions; Atmospheric Models; Jupiter (Planet)

20080032557 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

A Chapman-Layers Ionospheric Model for Mars

Pi, Xiaoqing; Edwards, Charles D.; Hajj, George A.; Hajj, George A.; Ao, Chi; Romans, Larry J.; Callas, John L.; Mannucci, Anthony J.; Asmar, Sami W.; Kahan, Daniel S.; August 2008; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): NAS7-03001

Report No.(s): JPL Publication 08-24; No Copyright; Avail.: CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080032557>

A numerical model (CLIMM) is developed that adopts functions of two Chapman layers to compute Mars ionospheric electron densities at given local solar zenith angle and height. Electron density profiles derived from Mars Global Surveyor (MGS)-to-Earth radio occultation measurements collected during 1998 through 2005 are used to fit the model. The present model does not include variations with solar extreme ultraviolet (EUV) radiation cycles and seasons, and may have increased errors at lower latitudes. A more sophisticated model taking into account these variations is being developed and will be available in the future.

Author

Mathematical Models; Mars (Planet); Mars Global Surveyor; Geophysics; Planetary Ionospheres

92
SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see 93 *Space Radiation*.

20080030994 NASA Marshall Space Flight Center, Huntsville, AL, USA

The Helium Abundance at Quiescent Current Sheets and the Slow Solar Wind

Suess, Steven T.; Ko, Y.-K.; VonSteiger, R.; May 06, 2008; 1 pp.; In English; 2nd Heliospheric Network Workshop, 6-9 May 2008, Kefalonia, Greece; Copyright; Avail.: Other Sources; Abstract Only

Ulysses MAG data were used to identify current sheets during sunspot minimum years of 1994-1997 and 2004-2006. The purpose of limiting the dates was to focus attention on 'quiescent current sheets' with as little influence from ICMEs as possible. SWOOPS data were then used in a superposed epoch analysis to study Helium abundance in the vicinity of the current sheet, similar to the study done by Borrini et al. (1981). That earlier study found a narrow (ca. 2 day) minimum in He/H around the current sheet that is extremely variable from one year to the next in the period 1971-1978. A similar result is found here for data at all latitudes and distances in 2004-2006. Conversely, data from 1994-1997 produce a deep minimum several times wider (ca. 10 days). The reason for this is found to be that low He/H is more closely associated with slow wind than the current sheet per se. There are thus apparently at least two sources of slow wind, one associated with very low He/H of 0-0.02 and one associated with moderate abundance of 0.03-0.05. The large variability is a consequence of the relatively small number of current sheet encounters around solar minimum and the random distribution of low He/H intervals, lasting less than 1 day to more than 7 days, throughout slow wind.

Author

Helium; Abundance; Current Sheets; Solar Wind; Solar Wind Velocity

20080031036 NASA Marshall Space Flight Center, Huntsville, AL, USA

Fe, O, and C Charge States Associated With Quiescent Versus Active Current Sheets in the Solar Wind

Suess, S. T.; Ko, Y.-K.; vonSteiger, R.; May 26, 2008; 1 pp.; In English; Joint American Geophysical Union and AAS Solar Physics Division Meeting, 26-30 May 2008, Fort Lauderdale, FL, USA; Copyright; Avail.: Other Sources; Abstract Only

Ulysses MAG data were used to locate the heliospheric current sheet in data from 1991 through 2006. The purpose was to characterize typical charge states for Fe, O, and C in the vicinity of the current sheet and provide insight into the physical sources for these charge states in the corona. A study of He/H around the current sheets has led to a clear distinction between quiescent current sheets at times of low solar activity and active current sheets associated with magnetic clouds (and, presumably, ICMEs). It has been shown that high ionization state Fe is produced in the corona in current sheets associated with CMEs through spectroscopic observations of the corona and through in situ detection at Ulysses. Here we show that the ionization state of Fe is typically only enhanced around active current sheets while the ionization states of O and C are commonly enhanced around both quiescent and active current sheets. This is consistent with UV coronal spectroscopy, which has shown that reconnection in current sheets behind CMEs leads to high temperatures not typically seen above quiet streamers.

Author

Solar Wind; Current Sheets; Iron; Oxygen; Carbon; Ion Charge; Ionization

20080031327 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Analysis of Gyro-Synchrotron Radiation from Solar Bursts in Complex Magnetic Environment

JosedeAguiarSimoes, Paulo; [2008]; 116 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14597-TDI/1179; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A06](#), Hardcopy

In this study we have analyzed the spectral and spatial characteristics of gyrosynchrotron emission and polarization of solar bursts in highly inhomogeneous medium. We have tested the anisotropic pitch angle distribution of accelerated electrons, preparing our numerical code for a better analysis of the emission and the radiative transfer in inhomogeneous medium such as in the trap-plus-precipitation models. The SOHO/EIT and TRACE high resolution images have revealed in detail a structured magnetic configuration over solar active regions. In our method, we use the magnetic field geometry represented by tridimensional structures obtained from magnetic field extrapolation, tomography or any geometry that resembles the observed structures. We have calculated the radiation produced by non-thermal electron distributions in this complex environment and solved the radiative transfer equation; the results, presented in brightness distribution maps, polarization maps and spectra, are discussed. We note a spectral broadening due to the inhomogeneity of the sources. The maps revealed

a non uniform brightness distribution, with small scale structures. Also, we find different spectral characteristics at different regions of the emitting source. Some known statistical aspects of recently published results are obtained and the pitch angle dependence of optically thin emission has been contested by the inclusion of the radiative transfer computation performed here.

Author

Synchrotron Radiation; Solar Radio Bursts; Magnetic Fields; Polarization

20080031334 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Recent Insights into the Nature of Turbulence in the Solar Wind

Goldstein, Melvun L.; May 11, 2008; 1 pp.; In English; Dynamical Processes in Space Plasmas, 11-19 May 2008, EN Boqeq, Dead Sea, Israel; No Copyright; Avail.: Other Sources; Abstract Only

During the past several years, studies of solar wind turbulence using data from Cluster and other spacecraft, and results from new numerical simulations, have revealed new aspects of solar wind turbulence. I will try to highlight some of that research. At the shortest length scales and highest frequencies, there is renewed interest in determining how the turbulence dissipates, e.g., whether by kinetic Alfvén waves or whistler turbulence. Finding observational evidence for exponential damping of solar wind fluctuations has proven challenging. New studies using a combination of flux gate and search coil magnetometer data from Cluster have extended this search (in the spacecraft frame of reference) to more than 10 Hertz. New models and simulations are also being used to study the dissipation. A detailed study of fluctuations in the magnetosheath suggests that turbulent dissipation could be occurring at very thin current sheets as had been suggested by two-dimensional MHD simulations more than 20 years ago. Data from the four Cluster spacecraft, now at their maximum separation of 10,000 km provide new opportunities to investigate the symmetry properties, scale lengths, and the relative proportion of magnetic energy in parallel and perpendicular wave numbers of solar wind turbulence. By utilizing well-calibrated electron data, it has been possible to take advantage of the tetrahedral separation of Cluster in the solar wind near apogee to measure directly the compressibility and vorticity of the solar wind plasma.

Author

Solar Wind; Turbulence; Magnetohydrodynamic Simulation; Cluster Mission

20080031493 NASA Marshall Space Flight Center, Huntsville, AL, USA

Prediction Model for Relativistic Electrons at Geostationary Orbit

Khazanov, George V.; Lyatsky, Wladislaw; April 29, 2008; 1 pp.; In English; Space Weather Workshop, 29 Apr. - 2 May 2008, Colorado, USA; No Copyright; Avail.: Other Sources; Abstract Only

We developed a new prediction model for forecasting relativistic (greater than 2MeV) electrons, which provides a VERY HIGH correlation between predicted and actually measured electron fluxes at geostationary orbit. This model implies the multi-step particle acceleration and is based on numerical integrating two linked continuity equations for primarily accelerated particles and relativistic electrons. The model includes a source and losses, and used solar wind data as only input parameters. We used the coupling function which is a best-fit combination of solar wind/interplanetary magnetic field parameters, responsible for the generation of geomagnetic activity, as a source. The loss function was derived from experimental data. We tested the model for four year period 2004-2007. The correlation coefficient between predicted and actual values of the electron fluxes for whole four year period as well as for each of these years is stable and incredibly high (about 0.9). The high and stable correlation between the computed and actual electron fluxes shows that the reliable forecasting these electrons at geostationary orbit is possible.

Author

Geosynchronous Orbits; Mathematical Models; Relativistic Particles; Electrons; Interplanetary Magnetic Fields

20080031661 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Coronal Mass Ejections and their Implications for the Corona and Heliosphere

Antiochos, Spiro K.; May 04, 2008; 1 pp.; In English; 2nd Heliospheric Network Workshop, 4-10 May 2008, Island of Kefalonia, Greece; No Copyright; Avail.: Other Sources; Abstract Only

Coronal mass ejections (CMEs) are the largest and most energetic form of transients that connect the Sun to the heliosphere. They are critically important both for understanding the physical mechanisms of explosive solar activity and for predicting space weather. Furthermore they are an extreme example of how cross-scale coupling can play a critical role in determining the properties of a large-scale dynamical system. In this presentation CME theories are reviewed and the latest results from 3D numerical modeling of CME initiation propagation to the heliosphere are presented. In particular the focus

is on the breakout model, but many of the results hold for the flux rope models as well. The implications of these results for understanding heliospheric structure and dynamics and for upcoming space missions will be discussed.

Author (revised)

Coronal Mass Ejection; Coronas; Heliosphere

20080031666 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Demonstrations that the Solar Wind Is Not Accelerated by Waves

Roberts, Aaron; June 22, 2008; 1 pp.; In English; 2008 SHINE Workshop, 22-27 Jun. 2008, Park City, UT, USA; No Copyright; Avail.: Other Sources; Abstract Only

The present work uses both observations and theoretical considerations to show that hydromagnetic waves cannot produce the acceleration of the fast solar wind and the related heating of the open solar corona. Waves do exist, and can play a role in the differential heating and acceleration of minor ions, but their amplitudes are not sufficient to power the wind, as demonstrated by extrapolation of magnetic spectra from Helios and Ulysses observations. Dissipation mechanisms invoked to circumvent this conclusion cannot be effective for a variety of reasons. In particular, turbulence does not play a strong role in the corona as shown by both observations of coronal striations and theoretical considerations of line-tying to a nonturbulent photosphere, nonlocality of interactions, and the nature of the kinetic dissipation. In the absence of wave heating and acceleration, the chromosphere and transition region become the natural source of open coronal energization. We suggest a variant of the ‘velocity filtration’ approach in which the emergence and complex churning of the magnetic flux in the chromosphere and transition region continuously and ubiquitously produces the nonthermal distributions required. These particles are then released by magnetic carpet reconnection at a wide range of scales and produce the wind as described in kinetic approaches. Since the carpet reconnection is not the main source of the energization of the plasma, there is no expectation of an observable release of energy in nanoflares.

Author

Solar Wind; Magnetohydrodynamic Waves; Solar Corona; Ion Accelerators; Kinetics

20080032363 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Shell Models of RMHD Turbulence and the Heating of Solar Coronal Loops

Buchlin, E.; Velli, Marco C.; The Astrophysical Journal; June 10, 2007; Volume 662, pp. 701-714; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): SHP04-0000-0150; HPRN-CT-2001-00310; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40881>

A simplified nonlinear numerical model for the development of incompressible magnetohydrodynamics in the presence of a strong magnetic field $B_{||}$ and stratification, nicknamed ‘Shell-Atm,’ is presented. In planes orthogonal to the mean field, the nonlinear incompressible dynamics is replaced by two-dimensional shell models for the complex variables u and b , allowing one to reach large Reynolds numbers while at the same time carrying out sufficiently long integrations to obtain good statistics at moderate computational cost. The shell models of different planes are coupled by Alfvén waves propagating along $B_{||}$. The model may be applied to open or closed magnetic field configurations where the axial field dominates and the plasma pressure is low; here we apply it to the specific case of a magnetic loop of the solar corona heated by means of turbulence driven by photospheric motions, and we use statistics for its analysis. The Alfvén waves interact nonlinearly and form turbulent spectra in the directions perpendicular and, through propagation, also parallel to the mean field. A heating function is obtained and shown to be intermittent; the average heating is consistent with values required for sustaining a hot corona and is proportional to the aspect ratio of the loop to the -1.5 power, and characteristic properties of heating events are distributed as power laws. Crosscorrelations show a delay of dissipation compared with energy content.

Author

Magnetohydrodynamics; Cross Correlation; Coronal Loops; Magnetic Fields; Two Dimensional Models; Complex Variables; Magnetohydrodynamic Waves

20080032450 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Solar Energetic Particle Event of December 14, 2006

vonRosenvinge, T. T.; Richardson, I. G.; Cohen, C. M. S.; Cummings, A. C.; Leske, R. A.; Mewaldt, R. A.; Stone, E. C.; Widenbeck, M. E.; May 05, 2008; 1 pp.; In English; Second Heliospheric Workshop, 5-9 May 2008, Kefalonia, Greece; Copyright; Avail.: Other Sources; Abstract Only

We report on observations of a solar energetic particle event by instruments on five different spacecraft: the Advanced

Composition Explorer (ACE), STEREO A and B, WIND, and GOES II. The event began with a class X1.5 soft x-ray flare in AR930 on December 14 at 22:15 UT. At this time the two STEREO spacecraft were located outside the Earth's magnetosphere and were heading for their first lunar swing-by on December 15. The x-ray event was located on the sun at W46, a longitude which is nominally well-connected magnetically to the Earth. An interplanetary shock, associated with an earlier X3.4 event on December 13 (also from AR930), passed the Earth on December 14 at approx.13:56 (time at ACE). The corresponding magnetic cloud arrived at approx.22 UT on December 14, close to the time of the onset of the particle event associated with the X1.5 flare, and extended until approx.08 UT on December 15. The intensity of approx.14 MeV protons at STEREO A shows three dips by factors of approx.10 or more during the early stages of this event while the spacecraft was within the magnetic cloud. Similar dips are seen for protons to at least 100 MeV. In principle, these dips could have been caused by changes in the magnetic field direction with respect to the particle telescope's field of view while viewing a beamed particle distribution. However, this possibility can be ruled out because the magnetic field at the spacecraft shows no evidence of such directional variations, and similar particle intensity dips were seen by instruments on other spacecraft in the near-Earth solar wind. We shall present evidence that the dips were actually associated with varying magnetic connection to the Sun within the magnetic cloud. These dips were not observed at GOES II, suggesting they were somehow smoothed out by passage into the magnetosphere.

Author

Solar Flares; Energetic Particles; Magnetic Field Configurations; Particle Telescopes; Earth Magnetosphere; Advanced Composition Explorer; Field of View; Magnetic Clouds; Interplanetary Shock Waves

20080032453 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Interoperability of Heliophysics Virtual Observatories

Thieman, J.; Roberts, A.; King, T.; King, J.; Harvey, C.; May 26, 2008; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

If you'd like to find interrelated heliophysics (also known as space and solar physics) data for a research project that spans, for example, magnetic field data and charged particle data from multiple satellites located near a given place and at approximately the same time, how easy is this to do? There are probably hundreds of data sets scattered in archives around the world that might be relevant. Is there an optimal way to search these archives and find what you want? There are a number of virtual observatories (VOs) now in existence that maintain knowledge of the data available in subdisciplines of heliophysics. The data may be widely scattered among various data centers, but the VOs have knowledge of what is available and how to get to it. The problem is that research projects might require data from a number of subdisciplines. Is there a way to search multiple VOs at once and obtain what is needed quickly? To do this requires a common way of describing the data such that a search using a common term will find all data that relate to the common term. This common language is contained within a data model developed for all of heliophysics and known as the SPASE (Space Physics Archive Search and Extract) Data Model. NASA has funded the main part of the development of SPASE but other groups have put resources into it as well. How well is this working? We will review the use of SPASE and how well the goal of locating and retrieving data within the heliophysics community is being achieved. Can the VOs truly be made interoperable despite being developed by so many diverse groups?

Author

Atmospheric Physics; Interoperability; Solar Physics; Heliosphere

20080032504 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Model of Active Regions at Radio Frequencies

Selhorst, Caius Lucius; January 2007; 102 pp.; In Portuguese; Original contains color and black and white illustrations Report No.(s): INPE-14827-TDI/1267; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A06](#), Hardcopy

The goal of this work is to model in 3-D the solar atmosphere over active regions in order to reproduce the emission of these regions at radio frequencies. The model computes the radiative transfer equations for the thermal bremsstrahlung and gyro-resonance emission mechanisms. Because there are no measurements of magnetic fields intensities in the higher solar atmosphere, the MDI photospheric magnetograms had to be extrapolated. Based on the extrapolated magnetic fields we propose that all magnetic field lines with intensities greater than a $|B|_{min}$ have a flux tube formed around them, with temperatures and densities differing from the quiet Sun values. The model was tested by reproducing the emission from the active regions observed at 17 and 34 GHz by NoRH. At 34 GHz the observed emission is only due to bremsstrahlung, whereas gyro-resonance becomes important at 17 GHz. Active regions with emission only due to bremsstrahlung are weakly polarized, whereas those which present gyro-resonance emission have polarization degree greater than approximately 30%. The brightness temperature of non-polarized active regions at 17 and 34 GHz is due to the changes of density and temperature

distributions in the chromosphere and transition region, the changes at coronal heights have a small influence in the observed brightness temperature. In the highly polarized active regions, however, the gyro-resonance could be the most important emission mechanism at 17 GHz, depending on the height where the 3rd harmonic (approximately 2000 G) is formed. The MDI magnetograms have good accuracy for weak magnetic fields, however, they are not able to measure magnetic field intensities greater than $|B| = 2000$ G at the photosphere. The best solution found here was to fit gaussians to the photospheric magnetic field amplified by a factor of 2 in the active region negative umbra (NOAA 10008). With the amplified magnetic field intensities, the 3rd harmonic occurs at the base of the solar corona (approximately 3500-4000 km). To reproduce the brightness temperature maxima of $10(\exp 6)$ K, the densities at the base of the corona range between $10(\exp 9)$ and $10(\exp 10)$ particles cm^{-3} and temperatures of $3 - 5 \cdot 10(\exp 6)$ K. These density values are comparable to the observed measurements at EUV, whereas temperatures as high as these are observed only in soft X-rays. We conclude that the model is able to reproduce very well the maxima brightness temperatures at 17 and 34 GHz and also the morphology of these regions.

Author

Solar Activity; Solar Atmosphere; Three Dimensional Models; Emission; Radiative Transfer; Radio Frequencies

20080032519 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Identification of g-Modes in a Sun with Mixed Core

Woff, Charles L.; [2008]; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

The elusive g-mode oscillations mainly operate deep inside the Sun where the nuclear fires burn. They can modify the Sun's output on a cadence of months and years when coupled into groups. Scientists have failed to detect their oscillation periods because they were looking for periods much too short. This paper shows that if g-modes slowly mix the central 16% of the Sun on a million year time scale or less, then g-mode periods become two and a half times longer. These longer periods are identified in existing data from the orbiting GOLF and SOHO experiments. This opens the door to measuring the Sun's central regions with g-modes just as helioseismology has used sound waves to probe its outer half.

Author

Helioseismology; Sun; Oscillations; Sound Waves

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SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see *51 Life Sciences*; on human beings see *52 Aerospace Medicine*. For theory see *73 Nuclear Physics*.

20080031088 Pacific Northwest National Lab., Richland, WA, USA

Hanford External Dosimetry Technical Basis Manual PNL-MA-842

Rathbone, B. A.; Mar. 12, 2007; 222 pp.; In English

Contract(s)/Grant(s): DE-AC05-76RL01830

Report No.(s): DE2007-900924; PNNL-15750 REV.0.1; No Copyright; Avail.: Department of Energy Information Bridge

The Hanford External Dosimetry Program (HEDP) provides support to the U.S. Department of Energy's Richland Operations Office (RL), Office of River Protection (ORP), Pacific Northwest Site Office (PNSO), and DOE contractor radiation protection organizations in determining doses-of-record from external sources of radiation. The Pacific Northwest National Laboratory (PNNL) (a) administers the HEDP in coordination with Hanford contractor radiation protection organizations to ensure consistent site-wide implementation of external dosimetry practices for Hanford workers and visitors. Coordination of dosimetry practices at Hanford is accomplished through the Hanford Personnel Dosimetry Advisory Committee (HPDAC). Technical services provided by the HEDP include personnel, area, nuclear accident, and environmental dosimetry capabilities that comply with DOE requirements in 10 CFR 835, the DOE Laboratory Accreditation Program (DOELAP) performance standard (DOE 1986a) and DOELAP handbook (DOE 1986b) as well as selected DOE guidance in the Radiological Control standard (DOE 1999a), and the External Dosimetry Program Guide (DOE 1999b). The primary purposes of this Hanford External Dosimetry Technical Basis Manual are to document the design and implementation of the external dosimetry system used at Hanford, and to document the rationale for the methods used. This manual includes documentation of the technical basis for the dosimeter design, processing protocols, dose calculation methodology, and recommended dosimeter use in the field, in a manner intended to demonstrate compliance with 10 CFR 835 and Hanford

requirements and to ensure the defensibility of the doses of record. A secondary purpose of this manual is to provide general information on dosimeter response characteristics and guidance on the proper use and limitations of Hanford dosimeters that are used by Hanford radiation protection organizations.

NTIS

Dosimeters; Dosage; Handbooks; Procedures; Radiology

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GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

20080031067 Naval Postgraduate School, Monterey, CA USA

Deceptive Tactics for Protecting Cities Against Vehicle Borne Improvised Explosive Devices

Lugo, Manuel X; Mar 2008; 91 pp.; In English

Report No.(s): AD-A479948; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA479948>

This thesis focuses on interdiction of Vehicle Borne Improvised Explosive Devices (VBIED) on a major city by using transparent and deceptive assets. Transparent assets (e.g., road blocks) are those for which we assume positions are known by both attackers and interdictors. Decoys and traps are deceptive assets. Decoys are meant to be perceived as effective interdiction assets by attackers, while traps are not perceived. We use a mathematical optimization model to allocate interdiction assets maximizing expected interdicted value. Then, we use agent-based simulation to assess the effectiveness of those interdiction plans against a variety of attacker s behaviors: perceptive (as assumed by the optimization), naive, communicative, route blocker (static), route blocker (dynamic) and clairvoyant. We use two test networks and seven scenarios consisting of different combinations of interdiction assets. From our analysis we note that: (a) if the network incorporates deception, any behavior other than perceptive may be advantageous to the attacker; (b) a communicative behavior proves effective for the attackers against scenarios containing traps; (c) decoys are most effective if used in defense against perceptive-like behaviors; and, (d) if the defender expects perceptive-like behavior, then adding transparent assets to traps and decoys may be of little value.

DTIC

Deception; Explosive Devices; Tactics

20080032708 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Motivating Reluctant Learners with a Big Bang

Lochner, James C.; Cvetic, Geraldine A.; Hall, Jonathan B.; [2007]; 2 pp.; In English

Contract(s)/Grant(s): NNG06EO90A; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080032708>

We present results of a collaboration between a media specialist, a science teacher, and an astronomer to bring a modern astronomy topic to at-risk, emotionally disabled students who have experienced little success. These normally unengaged students became highly motivated because they were given an authentic task of presenting research on an intriguing science topic, and because they witnessed a collaboration brought together on their behalf This experience demonstrates that sophisticated astronomy topics can be used to motivate at-risk students.

Author

Education; Communication; Astronomy; Disorders

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