



10 | International Research and Cooperation

International coordination and cooperation are essential to improve understanding of climate variability and change. An international approach to research is required because of the global scope of the climate system as well as limitations in the scientific capacity and financial resources of any one country.

The United States continues to advocate the development and maintenance of an informal international framework to enhance international cooperation within which climate change science, including research and observational programs, may be planned and implemented effectively. The goals of U.S. efforts to promote international cooperation in support of CCSP are to:

- Actively promote and encourage cooperation between U.S. scientists and scientific institutions and agencies and their counterparts around the globe so that they can aggregate the scientific and financial resources necessary to undertake research on global change at all relevant scales, including both regional and global.
- Expand observing systems in order to provide global observational coverage of variability and change in the

atmosphere, oceans, and on land, especially as needed to underpin the research effort.

- Ensure that the data collected are of the highest quality possible and suitable for both research and forecasting, and that these data are exchanged and archived on a timely and effective basis among all interested scientists and end users.
- Support development of scientific capabilities and the application of results in developing countries in order to promote the fullest possible participation by scientists and scientific institutions in these countries in research, observational, and data management efforts.

These goals draw directly on the needs identified by the U.S. scientific community and are described in the *CCSP Strategic Plan*.

CCSP participates in and provides input to major international scientific and related organizations on behalf of the U.S. Government and scientific community. It does so

O U R C H A N G I N G P L A N E T

in part through its working groups, including the Interagency Working Group on International Research and Cooperation. In addition to promoting and encouraging participation of U.S. scientists and scientific institutions in international climate science, CCSP also shares in multilateral international support to maintain the central coordinating infrastructure of major international research programs and international activities that complement CCSP and U.S. Government goals in climate science.

In FY 2004 and 2005, the United States sought to encourage international cooperation in the development of observing systems through its continued participation in the Global Earth Observing System of Systems (GEOSS) and other activities such as the Global Climate Observing System (GCOS).

The United States also cooperated with its partners in a number of international scientific assessment and decision-support activities such as the Intergovernmental Panel on Climate Change (IPCC), the Arctic Climate Impact Assessment, and other application-related programs such as the International Research Institute for Climate Prediction.

The United States also continued its support for the major international global change research programs, including the World Climate Research Programme (WCRP), the International Human Dimensions Programme (IHDP), the International Geosphere-Biosphere Programme (IGBP), and DIVERSITAS. These programs are now coordinating their activities through the Earth System Science Partnership (ESSP). The SysTem for Analysis, Research, and Training receives strong U.S. support for its activities to promote outreach and capacity building that supports the WCRP, IGBP, IHDP, and DIVERSITAS. The United States also continued its support of international regional global change research networks such as the Inter-American Institute for Global Change Research, and the Asia-Pacific Network for Global Change Research. With cooperation from ESSP, the United States has provided support for a workshop to explore needs and opportunities for more formal cooperation in global change research in Africa.

Finally, in FY 2004 and 2005, the United States, through CCSP agencies, supported a variety of climate-related international research programs that advanced several Presidential initiatives and the suite of 15 climate change bilateral agreements coordinated by the U.S. Department of State.

Highlights of these and other key international activities led by or participated in by CCSP are outlined below.





INTERNATIONAL COOPERATION IN OBSERVING SYSTEMS

Global Earth Observing System of Systems. On 31 July 2003 in Washington, D.C., 33 nations plus the European Commission adopted a declaration that signifies political commitment to move toward development of a comprehensive, coordinated, and sustained Earth observation system(s). The Earth Observation Summit attracted a distinguished group of government dignitaries from around the world who are committed to significantly advancing the collective ability to gather Earth observation data.

The Summit participants affirmed the need for timely, high-quality, long-term, global information as a basis for sound decisionmaking. In order to monitor continuously the state of the Earth, to increase understanding of dynamic Earth processes, to enhance prediction of the Earth system, and to further implement environmental treaty obligations, participants recognized the need to support the creation of a comprehensive, coordinated, and sustained Earth observing system of systems.

To further this goal, the Summit participants launched the intergovernmental ad hoc Group on Earth Observations (GEO) to develop a 10-Year Implementation Plan. The group, co-chaired by the United States, the European Commission, Japan, and South Africa, currently comprises more than 50 countries and more than 30 international organizations. While a GEOSS will benefit the climate community, it will also address a wide range of other priority applications – for example, management of agriculture, biodiversity, disasters, ecosystems, energy resources, health, water, and weather-related risks.

Ministers met for the Second Earth Observation Summit in Tokyo, Japan, on 25 April 2004, where they adopted the Framework Document for a 10-Year Implementation Plan for this initiative. The plan was adopted by ministers at the Third Earth Observation Summit, hosted by the European Commission on 16 February 2005. A new GEO Secretariat, hosted by the World Meteorological Organization, has been established in Geneva.

Global Climate Observing System. GCOS was established in 1992 to ensure that the observations necessary to address climate-related issues are defined, obtained, and made available to all potential users. GCOS is co-sponsored by the World Meteorological Organization (WMO), the Intergovernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific, and Cultural Organization (UNESCO), the United Nations Environment Programme (UNEP), and the International Council for Science (ICSU). GCOS is working closely with GEO in the development of its implementation and work plans for the climate component of the GEOSS.

GCOS coordinates and facilitates the taking of required observations by national or international organizations in support of their own requirements as well as of

common goals. It provides an operational framework for integrating, and enhancing *in situ* and space-based observational systems of participating countries and organizations into a comprehensive system focused on the requirements for climate issues.

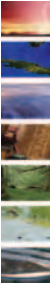
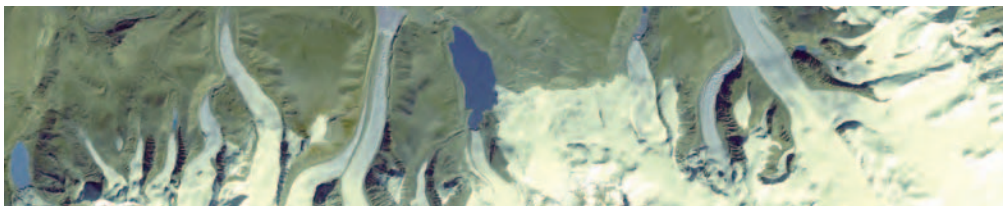
GCOS builds upon, and works in partnership with, other existing and developing observing systems such as the Global Ocean Observing System, the Global Terrestrial Observing System (GTOS), and the Global Observing System and Global Atmosphere Watch of the WMO. It draws upon proven networks established under research programs such as the WCRP and the IGBP.

GCOS also works very closely with the United Nations Framework Convention on Climate Change (UNFCCC) and its Conference of the Parties (COP), for whom it has developed an adequacy assessment and the GCOS Implementation Plan for defining and obtaining systematic observations of the climate system to meet the needs of the UNFCCC. This has led to a number of COP decisions and recommendations to the Parties in direct support of climate observation. U.S. GCOS activities and interactions with the GCOS Secretariat are coordinated by a U.S. GCOS Program Manager who works at NOAA's National Climatic Data Center.

The Global Observations of Forest Cover and Land Cover Dynamics

(GOFC-GOLD) Project. GOFC-GOLD is an international project with participation from USGS, NOAA, NASA, and several U.S. universities working in an internationally coordinated way to provide ongoing space-based and *in situ* observations of forests and other vegetation cover, for the sustainable management of terrestrial resources and to obtain an accurate, reliable, quantitative understanding of the terrestrial carbon budget.

The GTOS GOFC-GOLD project regularly conducts workshops for enhancing regional science networks and for observation coordination and data capacity building. In 2004, GOFC-GOLD, the Committee on Earth Observation Satellites Land Product Validation Workshop, and regional GOFC-GOLD data capacity building workshops were held in northern Eurasia, southern Africa, Southeast Asia, and South America, as well as an Implementation Team meeting on Land Cover. The GOFC Secretariat is managed by the Canadian Forest Service supported by the Canadian Space Agency. The UN Food and Agriculture Organization GTOS Secretariat maintains the GOFC-GOLD web site (see <www.fao.org/gtos/gofc-gold/2005_e.html>), which provides updates on project activities and forthcoming events.



SELECTED INTERNATIONAL ASSESSMENTS AND DECISION-SUPPORT PROGRAMS

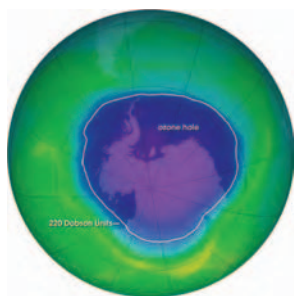
Intergovernmental Panel on Climate Change. The U.S. Government has played an active role in the IPCC process since its inception, and continues to do so. The United States chairs IPCC's Working Group I (which focuses on the physical basis of climate change) and provides support for its Technical Support Unit. In 2004, CCSP coordinated the nomination and review process for authors of the upcoming IPCC *Fourth Assessment Report*, set to be published in 2007, for the U.S. Government. Three panels, comprised of representatives from all CCSP agencies, reviewed over 400 nominations of U.S. scientists. This nomination and review period resulted in a large and strong group of U.S. nominees to the IPCC.

In FY 2005, the IPCC approved comprehensive assessments on two focused issues relating to climate change. In July 2005, it approved a *Special Report on Safeguarding the Ozone Layer and the Global Climate System: Issues Relating to Hydrocarbons and Perfluorocarbons*. The report covers scientific aspects of ozone-depleting substances and their substitutes as they pertain to radiative forcing, as well as issues involved in addressing atmospheric emissions of these classes of substances. In September 2005, it approved a *Special Report on Carbon Dioxide Capture and Storage*. Both reports involved strong participation from U.S. scientists and technical experts. CCSP coordinated the U.S. Government reviews of the first of these reports, and the Climate Change Technology Program (CCTP) coordinated review of the latter report.

CCSP supports participation of experts to serve as Coordinating Lead Authors, Lead Authors, and Review Editors of the reports and to participate in workshops that contribute to the IPCC process. At present, 116 U.S. scientists serve as authors on IPCC reports under preparation, and 15 as Review Editors. CCSP also coordinates the U.S. reviews of draft reports at the request of the Department of State.

Scientific Assessment of Ozone Layer Depletion. The international state-of-scientific understanding assessment reports regarding the ozone layer are produced every 4 years in accordance with the U.N. Montreal Protocol, to which the United States and over 180 other nations are signatories. The forthcoming *Scientific Assessment of Ozone Depletion: 2006* is in preparation and will be published in early 2007.

The report will describe the current status of understanding regarding ozone-depleting substances in the atmosphere, polar and global ozone observations, climate-ozone connections, expectations for future halocarbon levels and the ozone layer, and observed/future surface UV radiation. The report plays a particularly unique role in communicating scientific understanding to international decisionmakers regarding ozone-depleting substances and the protection of the ozone layer.

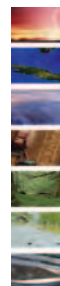
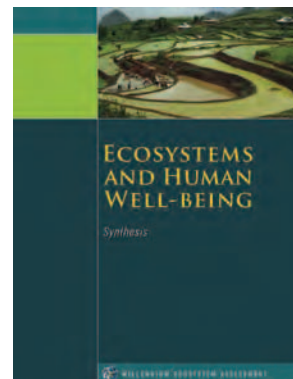


The ozone assessment is produced under the auspices of the WMO and UNEP. The United States has played a leading role in the international ozone assessments since their inception. Currently, U.S. scientists serve as two of the three co-chairs of the Montreal Protocol Scientific Assessment Panel and coordinating editor of the 2006 report. U.S. scientists are also prominent among the lead authors, co-authors, and reviewers.

Arctic Climate Impact Assessment. November 2004 marked the release of the 140-page synthesis report of the Arctic Climate Impact Assessment, *Impacts of a Warming Arctic*. This document can be downloaded from <amap.no/acia/> or ordered from Cambridge University Press. The individual science chapters of the full report have been released at <www.acia.uaf.edu/pages/scientific.html>. The full underlying document, scheduled for publication at the end of 2005, is the most comprehensive document to date addressing the state of the Arctic climate. It will serve the scientific and policy communities as an important reference on Arctic climate, its changes, and potential impacts and will also be available from Cambridge University Press. The U.S. Government will continue to support, and U.S. scientists will continue to participate in, activities with other pan-Arctic nations through the Arctic Council and other organizations.

Millennium Ecosystem Assessment. The Millennium Ecosystem Assessment (MA) is designed to meet the needs of decisionmakers and the public for scientific information concerning the consequences of ecosystem change for human well-being and options for responding to those changes. The MA identifies climate change as one of the key issues affecting current and projected future ecosystem change. The MA focuses on ecosystem services (the benefits people obtain from ecosystems), how changes in ecosystem services have affected human well-being, how ecosystem changes may affect people in future decades, and response options that might be adopted at local, national, or global scales to improve ecosystem management and thereby contribute to human well-being and poverty alleviation. The MA is a multi-scale assessment, consisting of interlinked assessments undertaken at local, watershed, national, regional, and global scales. More than 1,300 authors, many from the United States, have been involved in four expert working groups preparing the global assessment, and hundreds more in the sub-global assessments. The MA Synthesis Report was released in March 2005, with the MA's other global and sub-global assessment reports scheduled for publication in 2005 and 2006.

The International Research Institute for Climate Prediction. The International Research Institute for Climate Prediction (IRI) works within an expanding network of partnerships to address, and when possible mitigate, the frequently damaging



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effects of climate variability on societies in developing countries. This network draws on the respective strengths of local, national, multinational, research, academic, governmental, and non-governmental institutions. It provides an effective means for the directed transfer of technology and the concentration of relevant information and ideas from many sectors, disciplines, and regions.

Over the last 9 years, IRI has continued to develop the capacity to use climate forecasting to anticipate, understand, and manage a growing number of the impacts of climate variability. Their case studies, tools, and models have been applied to climate-influenced problems that range from reservoir management in the Philippines to malaria in Southern Africa and agriculture management in Uruguay. Its success has depended on the mutual sharing of knowledge and capacity with local organizations and individuals, who understand local conditions, needs, and opportunities and are best equipped to implement local solutions.

The IRI's global network of partners allows them to draw from a broad range of relevant disciplines as well as from concrete experiences of project success and failure from around the world. Their understanding of the problems they are trying to solve is nourished by a close relationship with local partners. Experience has taught the IRI that the strengthening of individuals and institutions in developing countries is one of the most important elements of their mission.

Famine Early Warning System Network. The United States supports the innovative application of science to alleviate risks related to existing climate variability or the potential for climate change through the Famine Early Warning System Network (FEWS NET). FEWS NET provides decisionmakers with the information to respond effectively to drought and food insecurity by analyzing remote-sensing data and ground-based meteorological, crop, and rangeland observations to identify early indications of potential famine. In addition to using data produced by host governments for its analyses, FEWS NET uses data from satellite imagery (NDVI and Meteosat Rainfall Estimation images) that it receives every 10 days throughout the year. FEWS NET operates in 20 countries in Africa, three countries in Central America, and in Haiti and Afghanistan.

RANET. Since the mid-1990s, the United States has provided support through NOAA and USAID's Office for Foreign Disaster Assistance (OFDA) to build the capacity of institutions and communities in Africa to generate, validate, and apply seasonal climate forecasts to plan for and respond to natural disasters such as droughts, tropical cyclones, and floods. The capacity building effort was achieved through an international framework called Climate Outlook Forums, which are the most trusted sources of seasonal forecast information and are the main conduits for generating and disseminating seasonal climate forecasts in Africa. Additionally, the United States, through NOAA's



long time partnership with the USAID-OFDA, supports the communication of seasonal climate information via radio and Internet technology called RANET. The RANET is a simple, cost-effective, and adaptable communication system that provides seasonal forecast information to remote areas in developing countries such as Africa.

International Climate Research Applications. Developing countries of Latin America and the Caribbean, Africa, Southeast Asia, and the South Pacific are vulnerable to climate variability and related environmental risks (e.g., droughts and floods) and may not be able to take advantage of opportunities such as advances in science and technology. As a result, these countries often bear a disproportionate share of the social and economic consequences of climate variability. Understanding the science of climate variability and using this insight to develop decision tools and methodologies is essential to enhancing informed planning and decisionmaking to reduce the impacts of climate variability and other environmental changes in these countries. An important CCSP goal is to support the development of scientific capabilities and the application of scientific tools in developing countries, and to promote the participation of developing country scientists and their institutions to fully participate in research, observation, and data management.

The Environment, Science, and Development (ESD) program of NOAA's Climate and Societal Interaction initiative contributes to the above CCSP goal. The ESD program facilitates the work of international scientific communities to conduct interdisciplinary, stakeholder-oriented, and on-site research designed to produce scientifically based tools and methods to underpin decisions to mitigate the impact of climate variability and change. Additionally, ESD's support will continue to contribute to building capabilities of scientists and institutions in Latin America, the Caribbean, Africa, Southeast Asia, and the South Pacific to effectively utilize climate information for managing climate risks such as droughts, floods, tropical cyclones, storm surges, etc. and for reducing the impact on economies and natural resources in developing countries.

ESD's support and collaboration with other partners such as USAID-OFDA have resulted in increased awareness of the value of climate information, and have better enabled decisionmakers in both the private and public sector who use climate information in decisionmaking and planning to mitigate hydrometeorological disasters and for natural resource management. In FY 2004, the ESD program supported a number of international climate research activities. These were designed to develop scientific capability in a number of developing countries in Latin America, the Caribbean, and Africa. Selected activities included:

- The "Regional capacity building for adapting to the impacts of climate variability and climate change in coastal zones of the Southern African Community (SADC) region" workshop contributes to NOAA's environmental literacy, outreach and education, and international collaboration in the African region. In addition, the



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initiative represents an activity of the U.S./South Africa Climate Change bilateral initiative aimed at capacity building for users of climate change data.

- The “Seasonal Climate Prediction and Management of the Panama Canal: Estimating the Benefits of Using Climate Forecast Information” project contributes to NOAA’s decision-support research portfolio and is aimed at assessing the value of climate information for the real-time management of the water resources of the Panama Canal watershed.
- In the Greater Horn of Africa, commonly referred to as Eastern Africa, a group of NOAA-supported scientists developed seasonal climate prediction tools through analysis of intra-seasonal behavior of rainfall in that region. From the results of the work, negative Southern Oscillation Indices (SOIs) indicate the emergence of El Niño and positive SOIs indicate the coming of La Niña.
- NOAA supported scientists in Uganda as they investigated and documented traditional rainfall indicators, which will contribute to increased understanding of traditional forecasting methods and their harmonization with scientific forecasts. Harmonization will both improve the resolution of scientific forecasts and facilitate the adoption of the forecast by decisionmakers, particularly at the grass-roots level.

In FY 2006, CCSP, through ESD, will sponsor a variety of efforts to apply climate research information, including the following:

- Generating, validating, and disseminating seasonal rainfall forecasts for international regions of Asia, Latin America and the Caribbean, Southeast Asia, the South Pacific, and Africa
- Collaborating with IRI, regional climate forecasting and application centers, and NOAA’s regional principal investigators to demonstrate the value of climate information through demonstration projects, development of decision-support resources, and use of earlier exploratory pilot project outputs in operational mode for application in specific decision contexts
- Building capacity and training of users for more effective and efficient utilization of climate information in their various decision domains
- Partnering with relevant boundary institutions such as agricultural extension agencies, non-governmental organizations, and other local and place-based organizations for effective interpretation, communication, and dissemination of climate information
- Continuing to provide technical support for the U.S. Climate Change Bilateral initiative projects.



COOPERATION IN SUPPORT OF INTERNATIONAL RESEARCH PROGRAMS

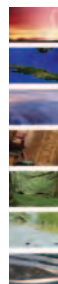
The International Geosphere-Biosphere Programme. The IGBP, because of its strong international research programs and coordination, has drawn the participation of many U.S. scientists. The United States supports individual science programs as well as secretariat operations and coordination activities. IGBP and the other international global change research programs add value to national and other international research through scientific integration; design and implementation of international research frameworks agreed by the scientific community; efficient strategies for international resource allocation; and international networking, standardization of methodologies, intercomparisons, and syntheses.

The IGBP focuses on an integrated biogeochemical approach to Earth system science. It is currently moving from its first phase of research activities into a second phase of integrative projects that have as their emphasis the interfaces between various components of the Earth system – for example, land-ocean, ocean-atmosphere, etc. The IGBP undertakes a wide variety of activities to bring the international scientific community together to promote understanding of the Earth system.

Priorities for calendar years 2004 and 2005 included launching the Integrated Land Ecosystem-Atmosphere Processes Study, the Global Land Project, and the Ocean Research in Earth System Science project; restructuring the task force on Earth System analysis; integration and modeling; enhancing links to the observation community (e.g., via the Integrated Global Observing Strategy); assimilating data into models; and contributing to and supporting ESSP.

DIVERSITAS. DIVERSITAS is the international global research program for the study of biodiversity science. The program is predicated on the understanding that it is essential to characterize and understand ecosystems in order to fully understand the sensitivity and adaptability of those ecosystems. Such understanding of ecosystem composition, function, vulnerability, and resilience is critical to determining the potential impacts of a variety of potential environmental perturbations, including climate change. This understanding is at the heart of U.S. support of the DIVERSITAS program and biodiversity science in general. The DIVERSITAS program is supported by U.S. scientists involved in its core projects and related activities, and by CCSP support for the secretariat's central coordination, outreach, and other roles.

DIVERSITAS is now focusing on the implementation of its 2002 Science Plan, which articulates the structure and scientific objectives of DIVERSITAS for the next decade. In 2004, DIVERSITAS published implementation plans for two of its three core projects and worked on establishing an International Project Office (IPO) for each of these projects. The bioDISCOVERY project, dedicated to “taxonomy, monitoring,



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and drivers of biodiversity change,” established an IPO in Caracas, Venezuela, which opened in September 2004. The ecoSERVICES project is dedicated to “biodiversity, ecosystem functioning, and services.” The bioSUSTAINABILITY project, dedicated to the “science at the basis of conservation and sustainable development,” has funded and established an IPO in the United Kingdom. The first DIVERSITAS Open Science Conference is scheduled to take place in Oaxaca, Mexico, in November 2005.



International Human Dimensions Programme. IHDP is the major international program that coordinates research related to human contributions and responses to global change. IHDP and other international programs provide international coordination of research on a variety of climate-relevant issues and provide important leadership in developing interdisciplinary research frameworks for other national and international programs. IHDP has garnered substantial scientific interest in research on the human dimensions of global change involving a number of U.S. scientists and agencies.

IHDP is implemented through its four established core research projects – Global Environmental Change and Human Security (GECHS), Institutional Dimensions of Global Environmental Change (IDGEC), Industrial Transformation (IT), and Land-Use Land-Cover Change (LUCC) – as well as a number of joint efforts with the other major international global change research programs. The LUCC project is engaged in synthesizing much of the research that has been undertaken, highlighting research products and activities, because it will be phased out at the end of 2005. GECHS, IDGEC, and IT are entering their second phase and priorities for the next 5 years for these projects are being discussed within IHDP.

IHDP initiated an internal mid-term review of its main contributions to key questions of global change research in 2003. The review includes a comprehensive synthesis of IHDP’s contributions to cross-cutting questions on Vulnerability/Resilience/Adaptation and Thresholds/Transitions regarding climate change. In addition to IHDP’s internal assessment, the program’s sponsors (ICSU and the International Social Science Council) are undertaking an external assessment of IHDP to be finalized in late 2005. The Sixth Open Meeting of the Human Dimensions of Global Environmental Change Research Community took place in Bonn, Germany, from 9-13 October 2005.

World Climate Research Programme. With its focus on climate prediction and determining the extent to which human activity influences climate, the WCRP directly addresses CCSP goals in climate change research. As a result, the United States and U.S. scientists have long been supportive of the WCRP’s extensive activities, including hosting the U.S. Climate Variability and Predictability (CLIVAR) project office, the International Global Energy and Water Cycle Experiment (GEWEX) Project Office, and the Stratospheric Processes and their Role in Climate (SPARC) data center.

The WCRP was established in 1980, under the joint sponsorship of the WMO and ICSU, and has also been sponsored by UNESCO's Intergovernmental Oceanographic Commission since 1993. The two major objectives of the WCRP are to determine the extent to which climate can be predicted and the extent of human influence on climate. To achieve these objectives, the WCRP promotes essential research into the basic behavior of the physical climate system, and its relation to the broader Earth system and the needs of society. Outlined below are examples of activities from the WCRP's CLIVAR Programme, GEWEX, and the SPARC project.

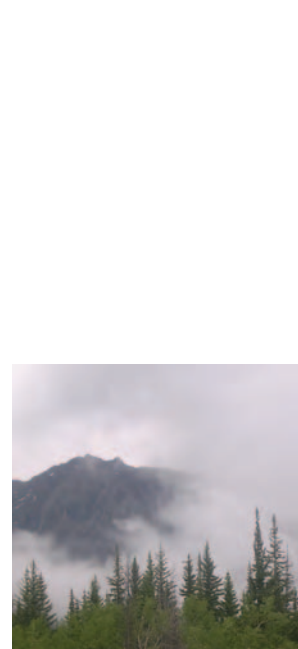
The First International CLIVAR Science Conference was held on 21-25 June 2004 in Baltimore, Maryland. More than 640 scientists from 56 different countries attended, making it the largest WCRP conference to date. It addressed a number of themes central to CCSP efforts including short-term climate prediction; monsoons; the challenge of decadal prediction; understanding long-term climate variations; the role of the oceans in climate; human influence on climate; and application of climate science.

GEWEX is an international program within the WCRP initiated to observe, understand, and model the hydrological cycle and energy fluxes in the atmosphere, at the land surface, and in the upper ocean. There is large overlap between GEWEX's foci and those of CCSP, including a component to extend research products and results to applications. GEWEX has panels concentrating on "Radiation," "Hydrometeorology," and "Modeling and Prediction." Each panel consists of researchers from the global community. As an example, the GEWEX Americas Prediction Program, supported by NOAA and NASA, is considered a component of the Hydrometeorology panel of GEWEX, which helps coordinate similar international projects (called Continental-Scale Experiments).

Major outputs of GEWEX include the International Satellite Cloud Climatology Project, the Global Precipitation Climatology Project, the Global Water Vapor Project, and the International Satellite Land-Surface Climatology Project I and II data sets. A critical current program of GEWEX is the Coordinated Enhanced Observing Period that collects *in situ*, satellite, and model data necessary for critical climate research objectives and monsoon system studies. In recognition of interest in GEWEX, the United States hosts the International GEWEX Project Office.

The WCRP established the SPARC project in 1992 to consolidate knowledge on the role that the stratosphere plays in Earth's climate system. The initial goal of SPARC was to stimulate research in areas connecting the stratosphere and climate, which had not been receiving sufficient attention during the earlier international research focus on stratospheric ozone.

SPARC has initiated the GCM-Reality Intercomparison Project, is compiling a stratospheric reference climatology against which model results can be compared using global satellite data, and is providing best estimates of the temporal variability of climate forcing due to changes in stratospheric ozone and aerosols. The United States



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hosts the SPARC data center, whose objective is to facilitate data exchanges between participating scientists.

International Group of Funding Agencies for Global Change Research

(IGFA). Through participation in IGFA, the United States is able to engage representatives from 20 national funding agencies with responsibility for funding global change research. Through annual plenary meetings, regular steering committee and staff group meetings, and other activities, member agencies are regularly informed about global change research programs, new initiatives, research infrastructure, and related issues. Topics of mutual interest are identified, and solutions determined and implemented through the relevant national processes, and, in some cases, through coordinated international effort. The United States, represented by Dr. Margaret Leinen, NSF, was elected Chair of the group for calendar years 2005 and 2006. During its chairmanship, the United States intends to maintain and improve communication internationally between agencies that fund global change research.

SysTem for Analysis Research and Training (START). START provides an international framework for outreach and capacity building by establishing and fostering regional networks of scientists and institutions in developing regions of the world. These networks conduct regional environmental change research, assess the vulnerabilities to and impacts of that change, and provide information to policymakers. In the course of their work, these networks enhance the scientific capacity of the regions in which they operate.

START has accomplished much during its relatively short existence. START has established five regional centers throughout Asia, Africa, and Oceania and has conducted over 70 regional meetings and training workshops. Sixty research collaborations are in process, many of them linked to U.S. institutions, such as IRI, the National Center for Atmospheric Research (NCAR), and various universities. Some 64 young scientist, 136 visiting scientist, and 24 doctoral fellowship awards have been made. Approximately 1,000 developing country scholars participate in START activities annually.

The quality of climate change science in the United States has benefited extraordinarily from these linkages with developing country scientists throughout the world, particularly in understanding potential impacts, coping and adaptation potentials, and strategies for building greater scientific and institutional capacities. The presence of young scientists from developing countries in many U.S. universities has also advanced American scientific and assessment capacities. The United States determined that START's capacity building and outreach efforts are sufficiently important to its interests that it hosts the international START secretariat in Washington, D.C.



Inter-American Institute for Global Change Research (IAI). The IAI is an intergovernmental treaty organization established in 1994 to promote collaborative research to understand and predict the integrated impact of present and future global change. The Institute allows the Western Hemisphere's scientists and their institutions to participate in collaborative research programs that they would not otherwise be able to afford, and allows regional observation coverage efforts that directly contribute to the goals of CCSP.

During FY 2005, the IAI carried out a merit-based peer review of proposals for a second round of Collaborative Research Networks (CRN). During FY 2006, this \$10 million, 5-year program will begin funding approximately 10 networks involving over 50 scientists from 14 countries in projects ranging from the effects of climate change on emissions in mega-cities to ocean circulation changes in the South Atlantic. Each of these projects explicitly includes physical and social sciences in a closely integrated effort to provide information to decisionmakers, to train students as multidisciplinary Earth systems scientists, and to contribute to research efforts of the major global change research networks like the Earth Systems Science Partnership (DIVERSITAS, IGBP, IHDP, and WCRP). The IAI is a member of the international scientific planning committees of the 2005 open meetings of IHDP and DIVERSITAS.

At the Organization of American States Ministerial Summit in Lima, Peru, ministers of science and technology endorsed the IAI as a hemispheric initiative to be supported and strengthened. In addition to providing support for the CRN-2 program, the United States, through CCSP and NSF sponsorship of the IAI, will support a set of IAI scholarships for IAI-member state students in the Advanced Studies Programs at NCAR in FY 2006.

Under the leadership of the newly elected director, Dr. Holm Tiessen of the University of Göttingen, the IAI will continue its series of highly successful training institutes, now entering their sixth year. In FY 2005, two institutes were held. In October 2004, jointly with the IHDP, the IAI organized a Global Environmental Change Institute on Globalization and Food Systems in Costa Rica, and an Institute on Urbanization and Global Environmental Change in Latin America in Mexico City. In FY 2006, two additional institutes will be held: a Training Institute on Vulnerability Associated with Climate Variability and Climate Change in the Americas in Asunción, Paraguay, and jointly with the Pan-American Health Organization, a Training Institute on Climate and Health in the Americas in Kingston, Jamaica.

The Asia-Pacific Network for Global Change Research (APN). The APN's Scientific Programme Group and Intergovernmental Meeting (IGM) in April 2005 marked the end of APN's first decade of activity with a number of significant actions. These meetings reviewed and approved the Evaluation Report that had been prepared covering the APN's first decade and, building on this evaluation, the meetings



Highlights of Recent Research and Plans for FY 2006

approved the APN's Second Strategic Plan covering the period 2005 to 2010. The IGM approved 24 projects for implementation in 2005-2006 under the APN regular program and an additional four projects for implementation under the APN program on Scientific Capacity Building and Enhancement for Sustainable Development in Developing Countries (CAPaBLE). One of the CAPaBLE projects, the Pacific Islands Institute on Climate and Extreme Events, has begun a series of in-country training programs in Samoa and Kiribati. The APN also recently launched its two calls for proposals for this year under its regular program and its CAPaBLE program.

The Northern Eurasia Earth Science Partnership Initiative (NEESPI). The NEESPI is a strategically evolving program of internationally supported Earth systems science research, which has as its foci issues in northern Eurasia that are relevant to regional and global scientific and decisionmaking communities. During 2004, the NEESPI developed a Science Plan (available at neespi.gsfc.nasa.gov). More and more partners in the United States, Europe, and Asia are getting involved in NEESPI activities. A U.S. Interagency Science Review meeting on NEESPI was held in December 2004. The goal was to brief representatives of U.S. and European agencies on the NEESPI Science Plan and attract more partners to NEESPI activities.

A boreal-zone data capacity workshop was held during 2004 and a non-boreal zone workshop is planned. The outcome of these workshops will be a comprehensive inventory of available space-borne and ground-based data sets for the region. This will facilitate preparation of a NEESPI Implementation Plan anticipated in the 2005-2006 time frame. The first NEESPI Science Session was held at the 2004 American Geophysical Union Fall meeting in San Francisco.

The NEESPI Science Team is being formed and the first projects for this team were selected in 2005 as a result of the Carbon Cycle Science NASA Research Announcement. More projects are likely to be selected in 2005 and 2006 from the proposals in response to the Water and Energy Cycle NASA Research Announcement, which included Terrestrial Hydrology and Land-Cover/Land-Use Change programs. The NEESPI leadership is working on formally including projects funded by other U.S. agencies and the European Commission under NEESPI auspices.

BILATERAL COOPERATION IN CLIMATE CHANGE SCIENCE AND TECHNOLOGY

In June 2001, President Bush committed the United States to developing with our international partners an effective and science-based response to the issue of climate change. Today the United States remains committed to working with others, including both developed and developing country partners, to promote cooperative and



O U R C H A N G I N G P L A N E T

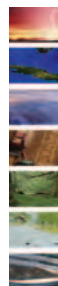
collaborative approaches to address the global challenge of climate change. To that end, the U.S. Department of State is leading a major interagency effort to advance international cooperation in climate change science and technology.

Since June 2001, the United States has launched bilateral climate partnerships with 15 countries and regional organizations that, combined with the United States, account for almost 80% of global greenhouse gas emissions. Partnerships have been established with Australia, Brazil, Canada, China, Central America (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama), the European Union, Germany, India, Italy, Japan, Mexico, New Zealand, Republic of Korea, Russian Federation, and South Africa. These bilateral initiatives seek to build on key elements of CCSP and CCTP, including research, observations, data management and distribution, and capacity building.

Substantive project-level work plans are now in place with each of these countries. Successful joint projects have been initiated in areas such as climate change science; clean and advanced energy technologies; carbon capture, storage, and sequestration; and policy approaches to reducing greenhouse gas emissions. The United States is also assisting key developing countries in efforts to build the scientific and technological capacity needed to address climate change.

Highlights from 2004 include a number of highly successful workshops convened under the auspices of the U.S. bilateral climate partnerships. Of particular note were the workshops held in cooperation with Japan, India, and Italy. Through the U.S.-Japan High Level Consultations on Climate Change, the United States and Japan hosted a workshop on the nexus of energy and climate issues, which took place in March 2004 in Kuala Lumpur, also in cooperation with the Government of Malaysia. In July 2004, the United States and India convened a workshop on climate change science in Manesar, India. Topics discussed at the workshop included seasonal forecasting, radiative effects of atmospheric aerosols, measurement and monitoring infrastructure enhancement, and ocean observations. In October 2004, the United States and Italy held a workshop on climate science and clean energy technologies in Venice, Italy.

Over the coming year, two key objectives for the bilateral activities will be the continued advancement of results-oriented programs and the fostering of substantive policy dialogs within all 15 of the bilateral climate change partnerships. In order to broaden U.S. cooperative efforts to advance a practical and effective global response to climate change, the United States will expand outreach and support to the developing country community, utilizing a regional approach where feasible.



ADDITIONAL CLIMATE-RELATED INTERNATIONAL ACTIVITIES



11th U.S.-Japan Workshop on Global Climate Change. The United States and Japan, through the U.S.-Japan Agreement on Cooperation in Research and Development in Science and Technology, have conducted a series of climate-related workshops since 1990. These workshops are planned and managed by the CCSP Interagency Working Group on International Research and Cooperation and on the Japanese side by the Ministry of Education, Culture, Sports, Science, and Technology. The series has covered a wide variety of mutually agreed topics including Land-Use/Land-Cover Change (Fourth Workshop, held in 1996), Health and the Environment (Eighth Workshop, held in 2000), Climate and Water (Tenth Workshop, held in 2003), and many others. There have been many follow-up activities and publications as a result of this highly successful workshop series.

Planning is currently underway for the 11th Workshop, “Biodiversity, Ecosystem Function, and Dynamic Human-Nature Interactions,” which will focus on the interactions among biodiversity, ecosystem function, and global change; summarize the recent achievements by ecological studies in the United States and Japan; and discuss how to advance U.S.-Japan collaborations in the future. This workshop will result in recommendations to improve long-term ecosystem monitoring, intercomparison of ecological models, establishment of a biodiversity database, satellite monitoring, and other topics. Future joint cooperative projects in this field between the United States and Japan will also be discussed.

Asia-Pacific Partnership on Clean Development and Climate. On July 27, 2005, the United States joined with Australia, China, India, Japan, and South Korea to create a new Asia-Pacific partnership on clean development, energy security, and climate change. This new results-oriented partnership will allow our nations to develop and accelerate deployment of cleaner, more efficient energy technologies to meet national pollution reduction, energy security, and climate change concerns in ways that reduce poverty and promote economic development. The six Asia-Pacific partners will build on our countries' strong history of common approaches and demonstrated cooperation on clean energy technologies.

Regional Cooperation on Global Change Research in Africa. A workshop on Regional Cooperation on Global Change Research in Africa was held on 22-24 September 2005 in Nairobi, Kenya, under the aegis of the ESSP. Over 50 scientists from 23 countries across Africa met with scientists from other countries to consider needs and opportunities for such regional cooperation. Participants supported developing an African network for global change research to focus on the following suggested key scientific themes: water and climate modeling; desertification; land degradation, biodiversity, and food security; health and pollution; and marine ecosystems.