Annual Report

2011

NOAA SATELLITE AND INFORMATION SERVICE

Our mission is to deliver accurate, timely, and reliable satellite observations and integrated products and to provide long-term stewardship for global environmental data in support of the NOAA mission.

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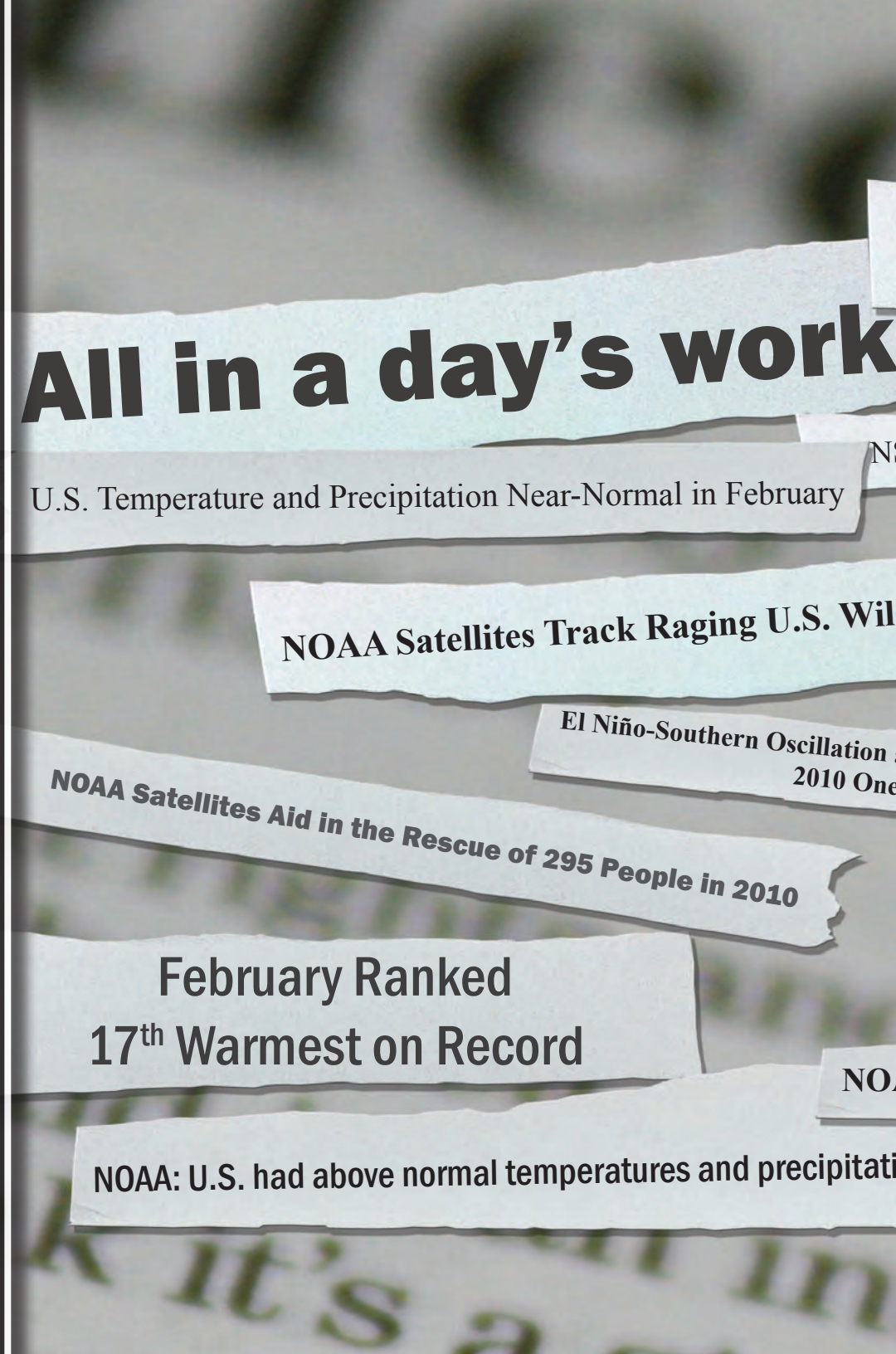
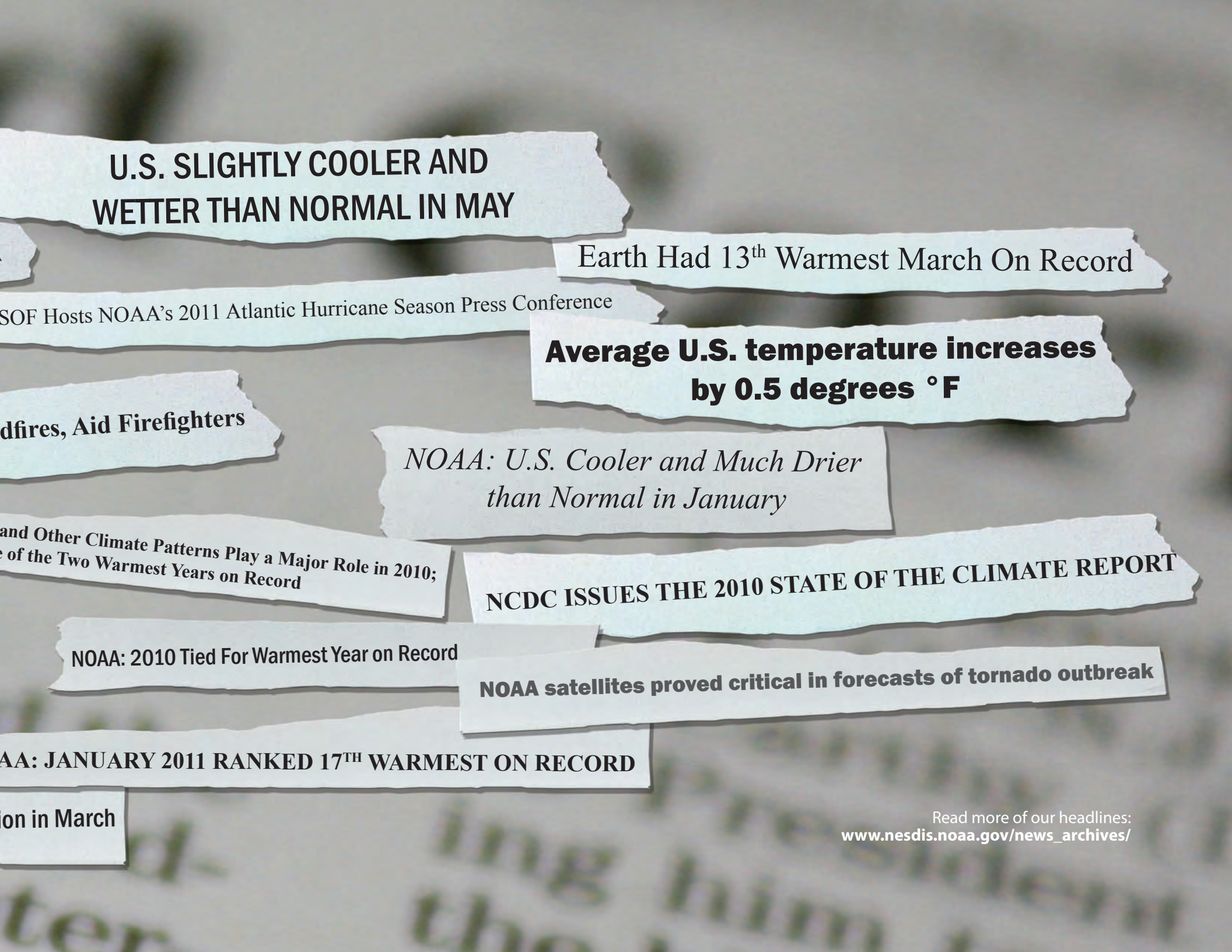
The NOAA MISSION

Climate, Weather, Oceans, and Coasts: The NOAA Mission
NOAA's mission is to understand and predict changes in Earth's climate, weather, oceans, and coasts; share that knowledge and information with others; and conserve and manage coastal and marine ecosystems and resources. NOAA works to make new discoveries and expand its understandings of the oceans and atmosphere, and apply this understanding to issues such as the causes and consequences of **climate** change; the physical dynamics of high-impact **weather** events; the dynamics of complex ecosystems and biodiversity; and the ability to model and predict the future states of these systems. NOAA services include climate predictions and projections; **weather** and water reports, **forecasts**, and warnings; nautical charts and navigational information; and the continuous delivery of a range of **Earth observations** and **scientific data** sets for use by public, private, and academic sectors. Stewardship is NOAA's direct use of its knowledge to protect people and the environment as the agency exercises its direct authority to regulate and sustain marine fisheries and their ecosystems; protect endangered species; protect and restore habitats and ecosystems; conserve marine sanctuaries and other protected places; respond to environmental emergencies; and aid in disaster recovery.




U.S. SLIGHTLY COOLER AND WETTER THAN NORMAL IN MAY
Earth Had 13th Warmest March On Record
SOF Hosts NOAA's 2011 Atlantic Hurricane Season Press Conference
Average U.S. temperature increases by 0.5 degrees °F
dfires, Aid Firefighters
NOAA: U.S. Cooler and Much Drier than Normal in January
and Other Climate Patterns Play a Major Role in 2010; e of the Two Warmest Years on Record
NCDC ISSUES THE 2010 STATE OF THE CLIMATE REPORT
NOAA: 2010 Tied For Warmest Year on Record
NOAA satellites proved critical in forecasts of tornado outbreak
AA: JANUARY 2011 RANKED 17TH WARMEST ON RECORD
ion in March
Read more of our headlines:
www.nesdis.noaa.gov/news_archives/

Office of Satellite and Product Operations Director Kathy Kelly, Fairbanks CDA Station Manager Larry Ledlow, Senator Mark Begich, NOAA Administrator Dr. Jane Lubchenco, and NOAA Satellite and Information Service Assistant Administrator Mary Kicza at the Fairbanks Alaska Satellite Operations Facility ribbon cutting in August 2011.

A Letter from the Assistant Administrator

Dear Colleagues:

NESDIS has risen to the challenge of providing uninterrupted operations of the Nation's civil environmental satellite systems, providing data collection and archiving services, and developing the next generation systems to meet critical National priorities even in this austere budget environment.

We remain the world's best at ensuring a continuous uninterrupted flow of environmental data from satellites to weather forecasters and other users. This function is recognized as a primary mission essential function, or one that is essential to support the continuity of Government. Satellite observations are the foundation on which the Nation's forecasts, warnings, and environmental observational systems are based. Our environmental satellites are key national infrastructure that helps protect lives and property and add immense value to the national economy.

Our next generation polar-orbiting and geostationary satellite programs are poised to deliver enhanced observations for the future. NOAA is investing today to ensure that the Nation can continue to rely on these critical observations in the future. This key national infrastructure is essential to our Nation's ability to prepare for and deal with severe weather and other environmental phenomena.

We forged new international partnerships to meet the growing demand for environmental information to take advantage of a shift in the traditional paradigm of operational satellites. We are positioning ourselves to meet the rising demand for information through our satellite architecture and data centers. We look to our users and stakeholders to help prioritize our observational requirements; we look to our partner domestic and international space organizations to ensure open sharing of environmental data; and we look to our industry colleagues for new and innovative ways to meet our earth and space monitoring needs in a fiscally responsible way.

The Nation needs environmental information in order to make informed decisions to save lives and protect property, and promote economic prosperity and protect national security. NESDIS will continue to provide the assets and services to meet this critical national need.

Reflecting over the past year, with the record number of weather and climate disasters causing $1 billion or more in damages and most regrettably, loss of human lives, now is the time to reaffirm the importance of the Nation's investments in environmental monitoring and prediction. NESDIS will continue providing the invaluable services upon which the Nation has come to rely while planning and implementing a more efficient and sustainable future for the Nation's environmental satellite infrastructure.

Mary E. Kicza

Introduction to the NOAA Satellite and Information Service

National Environmental Satellite, Data, and Information Service (NESDIS)
NESDIS is dedicated to providing timely access to global environmental data from satellites and other sources to promote, protect, and enhance the Nation's economy, security, environment, and quality of life. To fulfill its responsibilities, NESDIS—informally known as the NOAA Satellite and Information Service—acquires and manages the Nation's operational environmental satellites, operates the NOAA National Data Centers, provides data and information services including Earth system monitoring, performs official assessments of the environment, and conducts related research.

Our vision is to be the world's most comprehensive source and recognized authority for satellite products, environmental information, and official assessments of the environment in support of societal and economic decisions. To achieve our vision, we collaborate with other agencies and organizations to describe changes to our climate and the implications of those changes. We continue to lead the effort with other agencies and countries in establishing a global observing system to meet the world's information needs for weather, climate, oceans, and disasters and developing a skilled, energetic, and dedicated workforce through training, motivation, and teamwork.

NOAA maintains two primary constellations of environmental satellites: polar-orbiting and geostationary satellites. These are part of NOAA's integrated observing system, which includes satellites, radars, surface automated weather stations, weather balloons, sounders, buoys, instrumented aircraft, and other sensors, along with the data management infrastructure needed for this system. This integrated system is the foundation upon which NOAA works towards achieving our four main goals—a weather-ready Nation, climate adaptation and mitigation, healthy oceans, and resilient coastal communities and ecosystems.

Office of Satellite and Product Operations (OSPO)

Location: Suitland, Maryland; Camp Springs, Maryland; Fairbanks, Alaska; Wallops Island, Virginia; Director: Kathleen A. Kelly; Employees: 292

OSPO manages critical environmental satellite information that is the foundation on which the Nation's weather forecasts and warnings are built. From four command and control centers across the United States, OSPO operates 17 satellites and provides uninterrupted environmental data and services to users such as the National Weather Service, U.S. Air Force, and U.S. Navy. These products are used for predicting and tracking hurricanes, tornadoes, floods, and other severe weather. In addition, the office manages NOAA's Search and Rescue Satellite Aided Tracking system, which detects and locates mariners, aviators, and recreational enthusiasts in distress. OSPO also manages the NOAA Ice Center, a multi-agency organization that observes and forecasts sea and lake ice in the western hemisphere for operational requirements of U.S. national interests.

Center for Satellite Applications and Research (STAR)

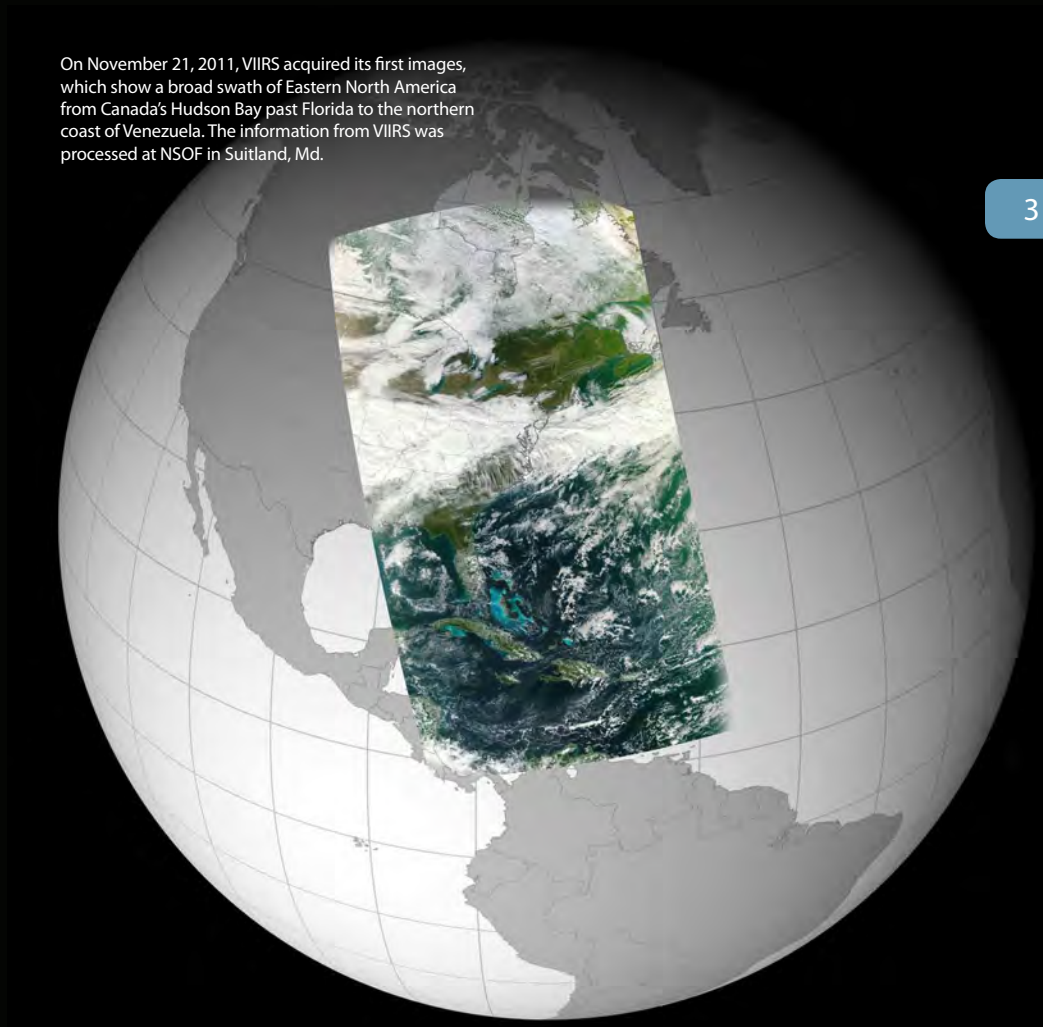
Location: Camp Springs, Maryland; Director: Al Powell; Employees: 84

STAR, NESDIS's science arm, conducts applied research activities that improve the application of satellite and other environmental data in forecasts, watches, and warnings. STAR researches and develops algorithms that turn satellite data into useful environmental observations and forecasts. In addition, the center investigates both enhanced and new sensor technology for future NOAA satellite missions. STAR scientists examine which products users will need—including ocean, ecosystem, climate, and weather products—to carry out NOAA's mission goals. Then they collaboratively develop efficient methods and technology to transfer new products from research to operations. STAR supports the calibration and validation of all data in NOAA's satellite operations and is widely acknowledged to be the international authority on the calibration and validation of satellite data.

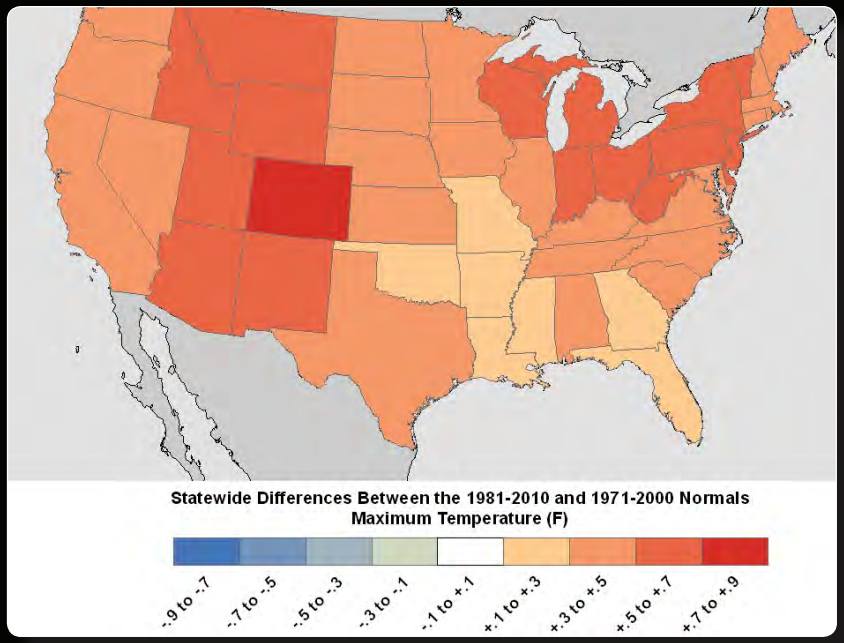
Office of Space Commercialization (OSC)

Location: Washington, D.C.; Director: Charles S. Baker (Acting); Employees: 4

OSC's mission is to foster the conditions for the economic growth and technological advancement of the U.S. space commerce industry. As the lead for space commerce policy activities within NOAA and the Department of Commerce, OSC is active in the areas of satellite navigation, commercial remote sensing, space transportation, hosted payloads, and potential NOAA use of commercial space services. The office also advocates the role of the commercial space sector in broad governmental discussions of national space policy and other space-related issues. OSC also hosts the National Executive Committee for Space-Based Positioning, Navigation, and Timing, which addresses policy matters related to the Global Positioning System for the Federal Government.



On November 21, 2011, VIIRS acquired its first images, which show a broad swath of Eastern North America from Canada's Hudson Bay past Florida to the northern coast of Venezuela. The information from VIIRS was processed at NSOF in Suitland, Md.



NOAA's NCDC released the 1981-2010 Normals on July 1, 2011. Climate Normals are the latest three-decade averages of climatological variables, including temperature and precipitation. This new product replaces the 1971-2000 Normals product.

Commercial Remote Sensing Regulatory Affairs Office (CRSRA)

Location: Silver Spring, Maryland; Director: Tahara Dawkins; Employees: 6

The CRSRA office regulates the operation of private earth remote sensing space systems subject to the jurisdiction of the United States, ensuring their international competitiveness while preserving essential national security interests, foreign policy, and international obligations. The office is committed to supporting commerce and technology growth, and helping the security of our homeland by ensuring U.S. commercial remote sensing satellite firms operate in accordance with U.S. laws, regulations, and license terms and conditions. CRSRA also manages the NOAA Advisory Committee on Commercial Remote Sensing (ACCRES), which advises the Under Secretary of Commerce for Oceans and Atmosphere on matters relating to the U.S. commercial remote sensing industry.

International and Interagency Affairs Division (IIAD)

Location: Silver Spring, Maryland; Director: D. Brent Smith; Employees: 15

IIAD leads NESDIS' efforts to develop partnerships with foreign counterpart space and international user organizations as well as with other U.S. Government agencies. IIAD negotiates Memoranda of Understanding and letter agreements with foreign and other Federal agencies in support of NOAA to ensure continued foreign instrument contributions to NOAA satellites and cost sharing provision of satellite services; to obtain full operational access to foreign satellite and ground-based data; and to actively promote international acceptance of the U.S. data policy of full and open international data sharing. It also develops NOAA's position in connection with a number of international organizations, including the intergovernmental Group on Earth Observations, the Committee on Earth Observation Satellites and the Coordination Group on Meteorological Satellites.

National Climatic Data Center (NCDC)

Location: Asheville, North Carolina; Director: Thomas R. Karl; Employees: 163

NCDC is the world's largest archive of weather and climate data. NCDC provides long-term preservation, management, and access to the Nation's resource of global climate and historical weather data, and continuously monitors and assesses climate change. As the steward of the Nation's climate information, NCDC conducts climate research, develops climate products, provides access to climate data, and provides regular analysis on the climate in the United States and the world. The center operates the World Data Center for Meteorology, co-located at NCDC in Asheville, North Carolina, and the World Data Center for Paleoclimatology, located in Boulder, Colorado. NCDC's data and products are used in a variety of applications including agriculture, energy sector, insurance, city planning, and transportation to fulfill needs ranging from developing building codes to forecasting energy usage and planning crop planting schedules.

National Geophysical Data Center

Location: Boulder, Colorado; Director: Christopher Fox; Employees: 40

NGDC manages over 850 digital and analog environmental data sets for the Nation, providing scientists, industry, and the public with

The Operational Linescan System sensor onboard the U.S. Air Force DMSP satellite has a unique capability to detect the visible and near-infrared energy associated with lights at night. NOAA manages the orbit and data acquisition of this satellite and the NOAA National Geophysical Data Center in Boulder, CO analyzes and archives the data. The Nighttime Lights of the World is one such analysis. Shown here are comparisons of how nighttime lights have changed over the planet from 1992 to 2009. White areas indicate no change, yellow indicate an increase in nighttime lights, and purple indicate a decrease in nighttime lights over the 17 year period.

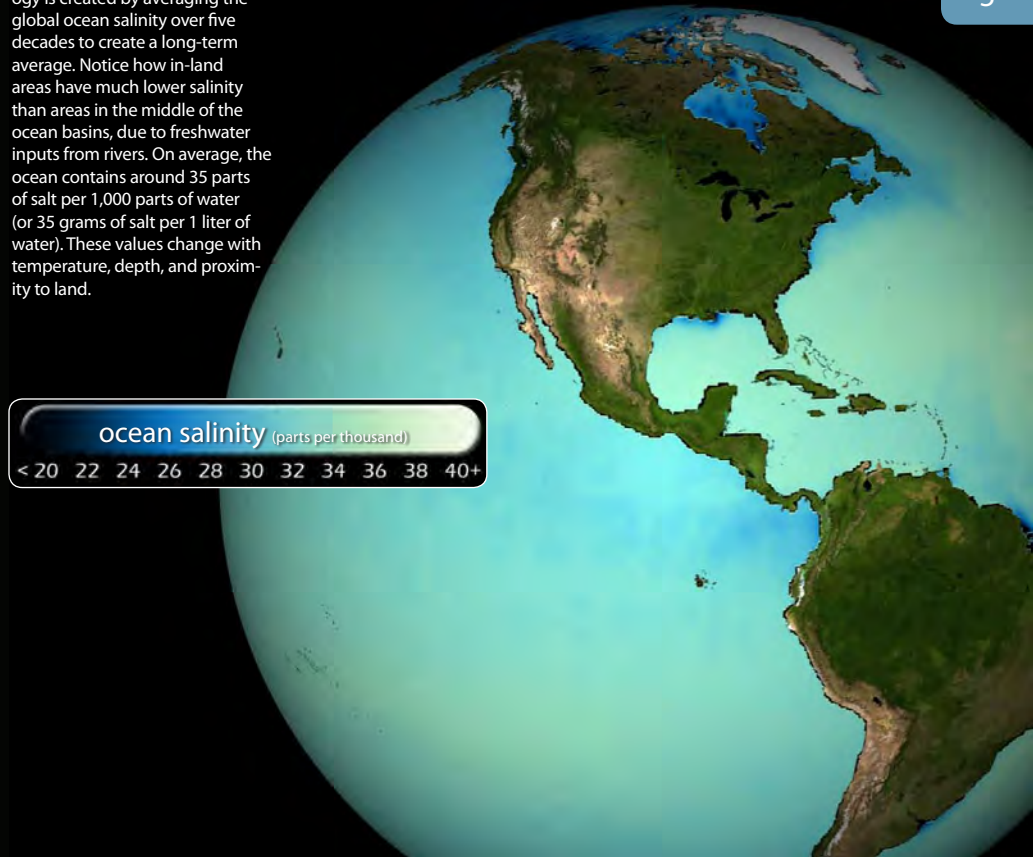
access to this information. NGDC stewards data for quality and longevity, and creates products to address arising national needs. The space weather data archived at NGDC are critical to the analysis and prediction of space weather events that affect satellites, aircraft routing, and the Nation's power grid. NGDC develops and maintains the World Magnetic Model for the Department of Defense. This model, based on worldwide magnetic field data, describes the Earth's constantly changing magnetic field in time and location. The model is included in GPS devices, cell phones, cameras, and computing tablets that use Earth's magnetic field for direction; it is paramount for safe navigation and the military's war fighting ability.

National Oceanographic Data Center (NODC)

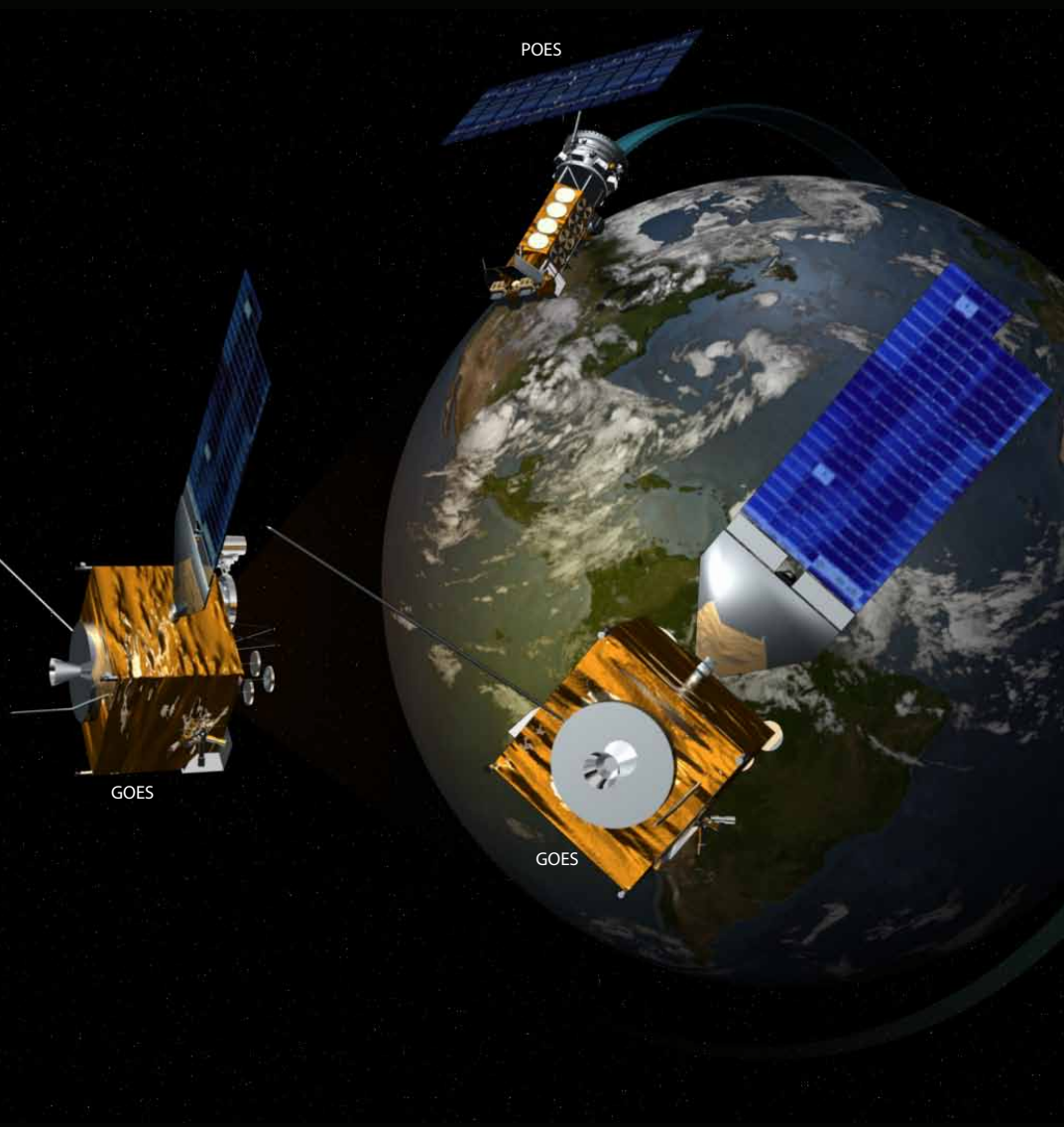
Location: Silver Spring, Maryland; Director: Margarita Gregg; Employees: 67

NODC manages marine data, provides a record of Earth's changing environment, and supports numerous research and operational applications. NODC maintains and updates a national ocean information archive with environmental data acquired from national and international activities. This information includes physical, biological, and chemical measurements derived from in situ oceanographic observations, satellite remote sensing of the oceans, and ocean model simulations. In addition, NODC manages and operates the World Data Center for Oceanography, also located in Silver Spring, Maryland. Working cooperatively, the data centers provide products and services to scientists, engineers, policy makers, and other users in the United States and around the world.

Shown here is a rendering of the average annual global salinity at the ocean's surface. This climatology is created by averaging the global ocean salinity over five decades to create a long-term average. Notice how in-land areas have much lower salinity than areas in the middle of the ocean basins, due to freshwater inputs from rivers. On average, the ocean contains around 35 parts of salt per 1,000 parts of water (or 35 grams of salt per 1 liter of water). These values change with temperature, depth, and proximity to land.



Spotlight on SATELLITES



GOES and POES: Two Orbits, One Mission

NOAA's environmental satellites are key tools for forecasting weather, analyzing climate, and monitoring hazards worldwide. This 24-hour global coverage provides scientists and managers with a never-ending stream of information used in preparation for events that will impact our climate, weather, and oceans. NOAA manages and operates two groups of environmental satellites: Geostationary Operational Environmental Satellites (GOES) and Polar-orbiting Operational Environmental Satellites (POES). GOES continuously monitor the Western Hemisphere by circling the Earth in a geosynchronous orbit 22,000 miles above the equator, meaning they remain over one position of the surface by orbiting at a speed matching the Earth's rotation. Information from GOES is used for short-term weather forecasting and severe storm tracking. GOES imagery is also used to estimate rainfall during thunderstorms and hurricanes for flash flood warnings, as well as estimate snowfall accumulation and overall extent of snow cover. This information helps meteorologists issue winter storm warnings and spring snow melt advisories. POES circle the Earth in an almost north-south orbit at an altitude of approximately 517 miles, passing close to both poles. The Earth constantly rotates counterclockwise underneath the path of the satellite, allowing a different view with each orbit. It takes the satellite approximately 1.5 hours complete a full orbit. In a 24-hour period, the 14 orbits of each polar satellite provide two complete views of weather around the world. POES provides full global coverage with advanced sensors for weather and climate data, collecting information on temperature, atmospheric conditions, wind speed, cloud formation, and drought conditions over the entire Earth.

Development

Office of Systems Development (OSD)

OSD is responsible for planning NOAA's future spacecraft, instruments, launch services, and ground systems through defining observation requirements; designing space and ground segments; and managing the development, construction, and check-out of those systems.

Production

Joint Polar Satellite System (JPSS)

JPSS is the Nation's next-generation polar-orbiting satellite system. Continuing NOAA's 40-year record of polar-orbiting satellite observations, the JPSS Program is the successor to the National Polar-orbiting Operational Environmental Satellite System (NPOESS) Program, which was dissolved by the President in early 2010. Expected to launch in 2016, JPSS will ensure that NOAA continues providing the satellite data necessary for monitoring the earth, managing resources, and supporting the Nation's economy for many years to come.

NOAA made considerable progress on the JPSS Program in 2011. Following the NPOESS decision, NOAA completed a reorganization that established a new NESDIS office to manage the JPSS Program. In addition, NOAA entered into a JPSS partnership with NASA, a proven developer of spaceflight systems. NOAA and NASA have successfully transitioned all JPSS contracts for spacecraft, instruments, and the ground system from U.S. Air Force to NASA management, which allows for proper Government oversight of the work to ensure it meets NOAA and NASA standards. Despite uncertain funding levels in 2011, NOAA and NASA were able to fully staff the JPSS Program Office and continue activity on development of the first JPSS spacecraft while ensuring the successful launch of the JPSS precursor, NPOESS Preparatory Project in October 2011.

POES

JPSS: THE FUTURE OF POLAR-ORBITING SATELLITES

Keeping our citizens safe from extreme weather events through storm tracking, enhanced weather prediction capabilities, and long-term climate monitoring is the cornerstone of the Joint Polar Satellite System (JPSS) mission. JPSS's new instruments will provide environmental monitoring that will advance weather forecasting and environmental prediction, which will improve the ability of the public, Federal Government, first responders, and businesses to plan for the future. The first JPSS spacecraft, JPSS-1, will take advantage of technologies developed through the NPOESS Preparatory Project, launched in October 2011. JPSS will produce many benefits on a daily basis including early warnings of hazardous weather conditions; enhanced weather prediction capabilities that will enable advanced planning by Government and industry for extreme weather events; and real-time storm tracking that will provide airline pilots with the most current and accurate weather information available to ensure the safety of their passengers and crew.

An artist's rendering of the JPSS.

On October 28, 2011, the NPP satellite was launched from Vandenberg Air Force, California, at 2:48 a.m. PDT aboard a United Launch Alliance Delta II rocket. At approximately 3:45 a.m. PDT, the spacecraft separated from the Delta II to the delight of NOAA and NASA officials. The satellite will orbit 512 miles above the Earth's surface, circling the globe every 102 minutes. The successful launch of NPP ushers in the next-generation of Earth-observing satellites.

Images credit: NASA/Bill Ingalls

NOAA reached a major milestone with the launch of the NPP satellite, which is carrying five instruments developed for JPSS. NPP is designed to continue operational observations from NOAA's Polar-orbiting Operational Environmental Satellite and NASA's Earth Observing System, and will enhance NOAA's ability to collect critical data. This will improve short-term weather forecasting and increase NOAA's understanding of long-term climate change. Data from NPP are processed and distributed at the NOAA Satellite Operations Facility in Suitland, Maryland and sent to the National Weather Service and other users around the world. Paving the way for JPSS, NPP will enable NOAA to continue issuing accurate forecasts and disaster warnings as the satellite takes crucial images and measurements to track atmospheric changes that can lead to floods, blizzards, storms, and tornadoes. NOAA and NASA completed the final phase of testing on the ground system for NPP in August 2011. The ground system will support satellite operations, data processing, and data distribution for the NPP, JPSS, and DWSS satellites.

NESDIS STRIKES AGREEMENT FOR JAPANESE SATELLITE DATA

NESDIS entered into an agreement with the Japan Aerospace Exploration Agency (JAXA) for satellite information that will assist scientists understand water circulation and climate change. NOAA will receive access to data from the Global Change Observation Mission-Water 1 (GCOM-W1) satellite in exchange for ground system support to JAXA. GCOM-W1 carries the Advanced Microwave Scanning Radiometer 2 (AMSR2) instrument, which observes water-related targets such as precipitation, water vapor, and snow depth. AMSR2 data will complement data from NOAA's Joint Polar Satellite System (JPSS) and meet key NOAA observational requirements in areas such as total water vapor content, cumulative cloud and water volume, and rainfall. GCOM-W1 data will provide continuity of microwave radiometer data that was supplied by the AMSR-E sensor on the NASA AQUA mission before AMSR-E reached the end of its operational life on October 5, 2011. GCOM-W1 data will contribute to a range of environmental data products used routinely in weather forecasting. Access to the data will allow NOAA to have improved forecasting skill without having to build and launch a similar satellite.

Geostationary Operational Environmental Satellites Series R

GOES-R, the next generation of geostationary weather satellites, is scheduled to launch in 2015. The program is a collaborative development and acquisition effort between NOAA and NASA. The GOES-R satellite will provide continuous imagery and atmospheric measurements of Earth's Western Hemisphere as well as space weather monitoring. It will be the primary tool for the detection and tracking of hurricanes and severe weather and provide new and improved applications and products for fulfilling NOAA's goals of understanding and predicting changes in the Earth's climate, weather, oceans, and coasts.

The GOES-R Program is managed by NOAA with an integrated NOAA-NASA program office, staffed with personnel from NOAA and NASA and co-located at NASA's Goddard Space Flight Center. The Flight Project oversees the development of the Space Segment, which consists of the spacecraft, instruments, the launch vehicle, and the auxiliary communication payloads. The Ground Segment Project manages acquisition of the entire ground system and the Remote Backup Facility. This includes the facilities, antenna sites, and software/hardware for satellite command and control needed for processing, creating, and distributing end user products.

WEATHER

a weather-ready nation

Antarctica Station Doubles Data Delivery

On June 10, 2011, the Antarctica Data Acquisition (ADA) Station successfully began receiving images from Metop satellites for the first time in history, allowing NOAA to process and deliver information from the polar orbiting satellites approximately twice as fast. Operated by EUMETSAT, the Metop series records meteorological and environmental data used by U.S. and European weather services for analyses of fires, tropical cyclones, volcano plume, and precipitation and general weather pattern observations. NOAA's Office of Satellite and Product Operations (OSPO) implemented technology at the ADA Station—located at the U.S. National Science Foundation's (NSF's) McMurdo Station—that lets it download images from a Metop satellite when it reaches the South Pole. Previously images from a Metop satellite were only downloaded at the Svalbard Ground Station at the North Pole.

Environmental Satellite Processing Center Gets Stronger Security and Alert System

NOAA's Office of Satellite and Product Operations (OSPO) produces satellite-derived products and services from the Environmental Satellite Processing Center (ESPC) to support weather forecasting; watches and warnings for severe weather, floods, and volcanic-ash; coastal and resource management; and climate analyses. ESPC's critical data are accessed regularly by a wide variety of users, from weather forecasters to local officials and decision makes to the U.S. military. In 2011, ESPC established a highly effective security system that will result in less down time, improved use of computer resources, and a better understanding of system strengths and weaknesses. The new system allows ESPC to be better protected from intentional and unintentional disruptions of core services, such as data loading, product generation, and product delivery. OSPO is working on implementing additional controls. In addition, OSPO recently implemented Customer Relationship Management software that sends e-mail alerts to system users when a satellite malfunction causes a disruption in the delivery of data. Customers such as the National Weather Service can customize their notifications so they only receive the information they want. The new software also assists in incident tracking and assessing the impact of planned or unplanned outages faster.

Office of Satellite and Product Operations Director Kathy Kelly gives Deputy Administrator, Dr. Kathy Sullivan a tour of the NOAA's Office of Satellite and Product Operations Office.

New Center Aims to Improve Weather Forecasting

The Center for Satellite Applications and Research (STAR) made an important move towards improving NOAA's weather, climate, and ocean forecasting abilities with the creation of a center that will fine-tune global satellite data. The National Calibration Center (NCC), located at the NOAA facility in College Park, Maryland, will coordinate, develop, and apply techniques to calibrate data from other U.S. Government agencies, partners, and space agencies around the world across various satellite programs. By providing a single source of well-calibrated satellite data, NCC saves users the cost and burden of having to understand the instrument specifics and scientific details associated with satellite measurements. In addition, NCC will endeavor to continually improve calibration techniques through research and community collaboration in order to make the data more accurate, precise, and reli-

able. The center is also providing cross-cutting support to our satellite programs and leveraging technical expertise from other agencies.

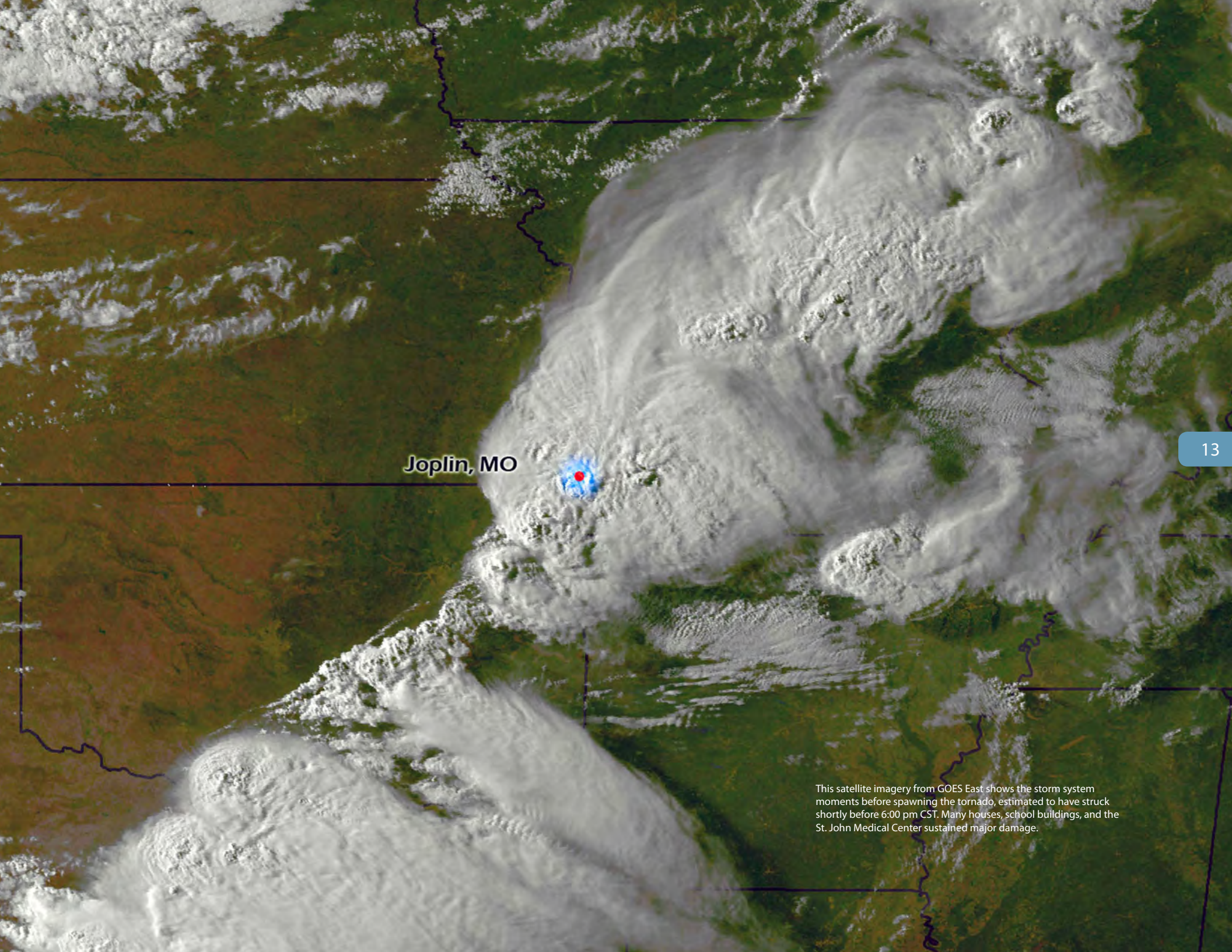
STAR Enhances Hurricane Intensity Forecasting

NOAA's Center for Satellite Applications and Research (STAR) improved the operational statistical models used to predict changes in hurricane and tropical cyclone intensity. The average number of errors was reduced by about six percent due to these upgrades. Among the improvements were more advanced statistical techniques and better use of satellite data. Better storm forecasts are beneficial to coastal residents, emergency managers, and law enforcement officials. STAR collaborated with the Office of Atmospheric Research and the National Weather Service to implement the changes to the models used by the National Hurricane Center for the 2010 Atlantic hurricane season, which was the third most active season ever. The forecasts for the 2010 season that were derived from the new intensity models were the most accurate of any of the operational hurricane models used by NHC. STAR used numerous methods to develop the enhancements such as increasing the database of infrared imagery from the Geostationary Operational Environmental Satellites. STAR also identified new factors that affect storm intensity changes, including changes in wind direction with height and regions of high winds in the middle levels of the atmosphere surrounding the storm.

GOES Data Used in South Eastern U.S. Tornado Monitoring

The Office of Satellite and Product Operations (OSPO) provided information and products in late April 2011 to aid in the emergency response to the tornado outbreak in the lower Mississippi Valley, one of the most severe tornado incidents in recent history. The National Weather Service (NWS) Storm Prediction Center access to data from the Geostationary Operational Environmental Satellite 13 (GOES-13)—the GOES-East satellite that covers the United States with a focus on the eastern portion of the country—for Rapid Scan Operations (RSO) prior to and during the tornadoes. NWS needed imagery and data from the satellite to help their forecasters track the storm. OSPO successfully supplied the necessary GOES imagery for 12–14 hours every day from April 25 to 28, making additional data and products available to NWS, other customers, and the public. NWS usually performs RSO for only a few hours at a time. Since the late 1990s, NESDIS has maintained multiple satellite schedules for the GOES satellites in order to facilitate extra data gathering to meet requests from NWS, which routinely makes such requests during periods of severe weather or land falling hurricanes. These extra data allow for refresh of data approximately every 7.5 minutes instead of every 15 minutes in normal operations.

A picture of damage from the tornado that hit Joplin, MO, on May 22, 2011.



This satellite imagery from GOES East shows the storm system moments before spawning the tornado, estimated to have struck shortly before 6:00 pm CST. Many houses, school buildings, and the St. John Medical Center sustained major damage.

CLIMATE

climate adaptation and mitigation

NCDC Releases 1981–2010 Climate Normals

NOAA's National Climatic Data Center (NCDC) released data in June 2011 that showed average temperatures in the continental United States have increased over the past 30 years. According to the 1981–2010 Climate Normals, annual maximum and minimum temperatures across the country were approximately 0.5 degree °F warmer on average than the time period from 1971 to 2000. Climate Normals are three-decade averages of many climatological variables, most notably temperature and precipitation. Regularly seen on television weather reports, Climate Normals are used every time someone compares the current temperature to the historical average normal. In addition, they are used in many other industries, serving as a point of reference for typical climate conditions at a given place. Builders, insurers, and engineers use Climate Normals for planning and risk management and energy companies use the data to predict fuel demand. In addition, farmers rely on the information to help make decisions on both crop selection and planting times. This once-a-decade release updates the Climate Normals for more than 7,500 locations across the United States. The 2011 release included data from more than a thousand new stations. NCDC produced hourly, daily, monthly, seasonal, and annual Climate Normals for variables such as temperature, precipitation, and snowfall. Data were also calculated for significant quantities, such as heating and cooling degree days and the number of days per month above or below certain thresholds. NCDC made numerous improvements and additions to the methods used to calculate the 1981–2010 Climate Normals, including better quality control and statistical techniques. NCDC engaged state and regional climatologists as well as industry users before and after releasing the Climate Normals and incorporated new products based on stakeholder feedback, specifically for the agriculture and energy industry.

1981–2010 CLIMATE NORMALS

To learn more about the 1981–2010 Climate Normals, visit:
www.ncdc.noaa.gov/oa/climate/normals/usnormals.html

NCDC Delivers State of the Climate Report in 2010

The National Climatic Data Center's (NCDC's) *2010 State of the Climate Report* highlighted the major role that climate patterns played in 2010 and showed that the year was one of the two warmest on record. The annual peer-reviewed *State of the Climate Report* provides an updated "physical" of the climate system as well as insights into our capacity to measure it. The report tracked 41 climate indicators—four more than the previous year—including temperature in the lower and upper atmosphere, precipitation, and humidity. The indicators show a continuation of the long-term trends scientists have seen over the last 50 years, consistent with global climate change. According to the report the El Niño-Southern Oscillation, the Arctic Oscillation, and other major cyclical climate patterns contributed to numerous significant weather events in the world, including blizzards in February 2010. In addition, the report showed greenhouse gas concentrations continued to rise and annual average temperatures in the Arctic continued to rise at about twice the rate of the lower latitudes. The *State of the Climate* series has been a trusted source of the most current and reliable information on the world's climate and its changes since 1990. It has grown in scope to become a leading and highly anticipated publication. For the 2010 report, NCDC compiled contributions from 368 scientists from 45 countries. The *State of the Climate Report* is published as a special supplement in the *Bulletin of the American Meteorological Society* (BAMS). Published in the June 2011 BAMS, the 270 page supplement was the longest ever.

STAR Releases Extensive Climate Change Record

Using observations from seven historical NOAA satellites, the Center for Satellite Applications and Research (STAR) developed a 27-year data record of climate change in the stratosphere (the second major layer of Earth's atmosphere). It is the first well-documented data record available to the public that is capable of determining accurate trends of stratospheric temperature change both regionally and globally. The dataset allows researchers to detect the rate of climate change, validate climate simulations, and improve forecasts of future climate change. A record of stratospheric temperature trends is an important indicator of global warming and ozone depletion and recovery. In addition, this information helps officials make policy decisions regarding ozone layer protections.

OCEANS

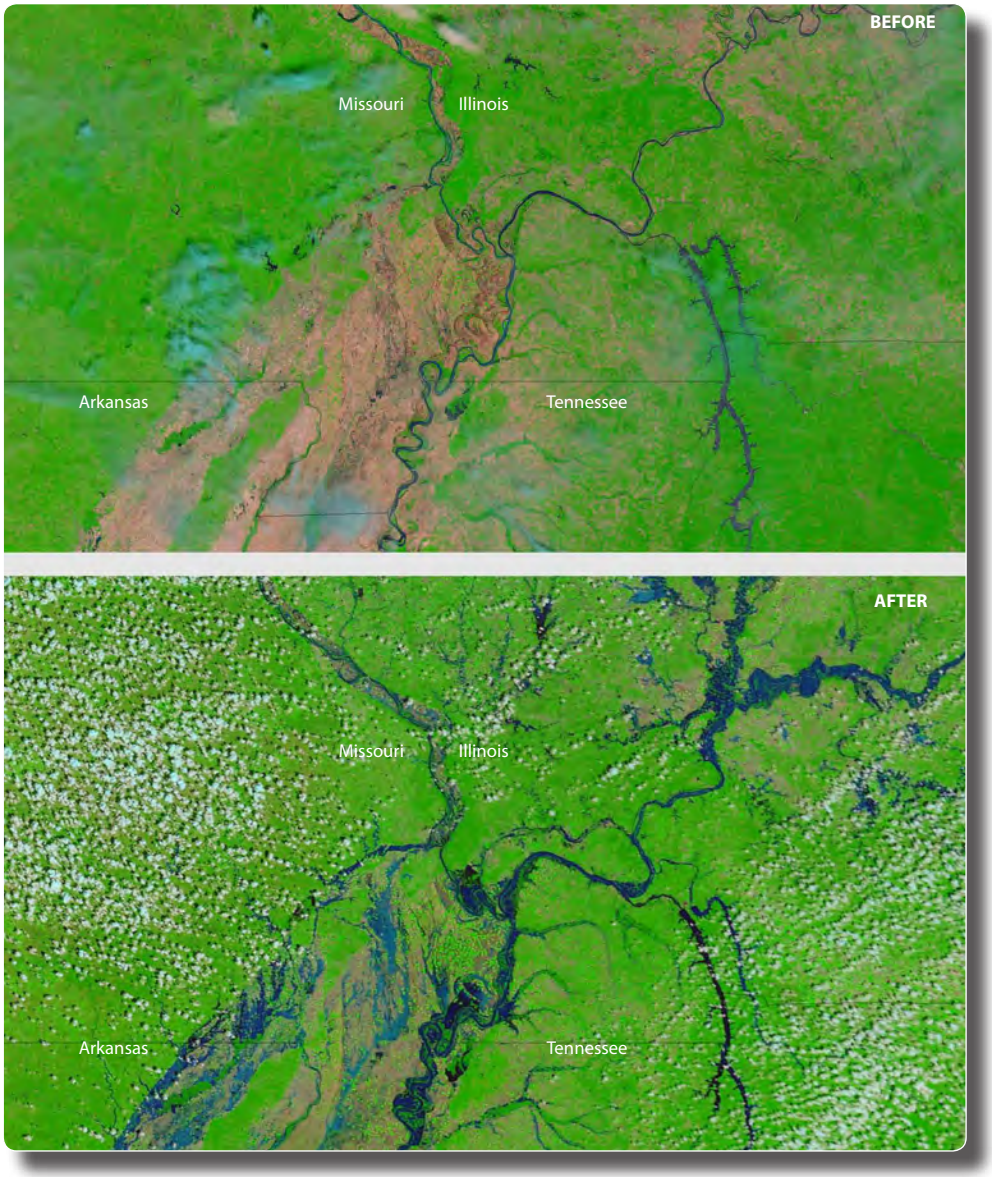
healthy oceans

NODC Celebrates 50th Anniversary

The National Oceanographic Data Center (NODC) celebrated 50 years of managing marine environmental and ecosystem data. With 29 employees, NODC opened its doors on November 1, 1960, under the United States Navy Hydrographic Office, ready to take on the challenge of compiling, sorting, and organizing the disparate collections of oceanographic data into a single system. This data consisted of approximately three million observations of ocean temperatures, waves, currents, and depths. In 1970, NODC was formally transferred from the U.S. Navy Hydrographic Office to the newly formed NOAA, under the Department of Commerce. NODC now maintains the world's largest and most comprehensive collection of oceanographic data with more than 86,000 archived original datasets and hundreds of different ocean data types.

STAR Provides Flood Imagery for Major Disasters

NOAA's Center for Satellite Applications and Research (STAR) provided real-time flood maps to support emergency response to the March 2011 tsunami in Japan and the May 2011 flooding in the U.S. Midwest. The STAR Geostationary Operational Environmental Satellite Series R land application team used satellite images to create a product to detect flooding and standing water. The imagery was rapidly disseminated to decision makers and the public to permit informed flood response, which involves developing plans to be prepared when a threatening flood approaches and monitoring active floods. After the flood in Japan, STAR created a flood map for the coast line of Sendai, Japan in a quick response to a request from the U.S. Government. This map was used online through the NOAA, NESDIS, and STAR Web sites as well as by other agencies including NASA. STAR also created a map of the levee breach near the confluence of the Ohio and Mississippi Rivers. The flood images were widely used in presentations to the U.S. State Department and NASA.



These two false colored images from the NASA Terra satellite show the Cairo, IL region on April 28, 2011 and April 29, 2010. The differences are stark. Blue colors indicate water, while green and brown is dry land. MODIS, the visible and infrared sensor on Terra, is the precursor to the visible and infrared sensors to be flown on NOAA's future geostationary and polar-orbiting satellites, GOES-R and JPSS.

COASTS

resilient coastal communities and ecosystems

NGDC Manages Data for National Project

NOAA's National Geophysical Data Center (NGDC) is the data management lead for a multi-agency task force created to identify the full extent of the U.S. continental shelf beyond the current 200 nautical mile Exclusive Economic Zone. In 2011, NGDC collaborated with scientists and data experts from several Federal agencies and academic centers to develop an Extended Continental Shelf (ECS) Catalog Tool to track, integrate, and link data used in the U.S. ECS Project. This tool allows experts from offices in various locations to work together by viewing and tracking data for the seven different regional areas with potential ECS for the United States and will aid in generating the U.S. ECS submission to the Commission on the Limits of the Continental Shelf.

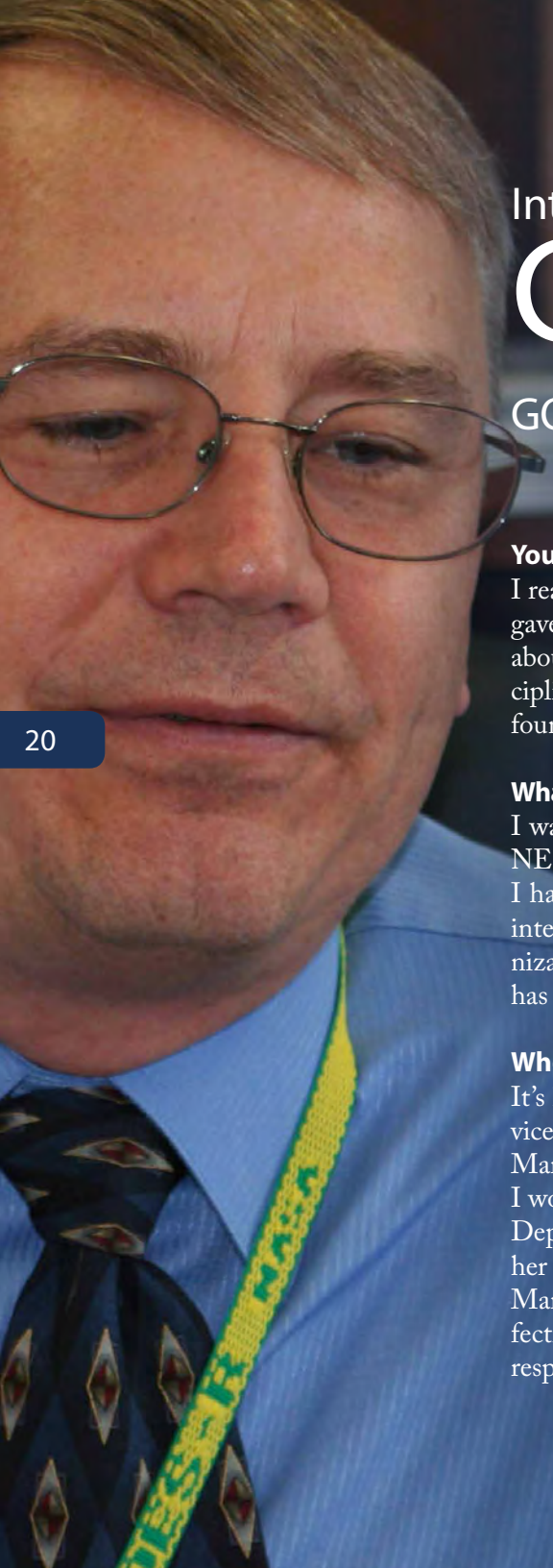
NGDC Improves NOAA's Forecasts of Coastal Flooding

NOAA's National Geophysical Data Center (NGDC) supported the agency's tsunami and coastal flooding forecast and warning efforts by developing 11 high-resolution digital elevation models (DEMs) of threatened U.S. coastal communities. NGDC's DEMs—three dimensional representations of a terrain's surface—integrate ocean seafloor and land topography. DEMs are essential to modeling coastal processes such as tsunami inundation, storm surge, sea-level rise, contaminant dispersal. They are also a base layer for ecosystems management and habitat research; coastal and marine spatial planning; and hazard mitigation and community preparedness. In addition to the new models, NGDC also has more than 100 high-resolution, coastal DEMs including integrated seafloor and land DEMs of the U.S. Virgin Islands and coastal Louisiana, as well as communities in North Carolina, Washington, Hawaii, and several in Alaska. NGDC has been building DEMs across the shoreline for more than 20 years. The center is now a leader and source of expertise for NOAA and Federal agencies concerned with coastal ecosystems, community resilience, and informed management. DEM's generated by NGDC are used by NOAA's Pacific Marine Environment Laboratory to forecast tsunami height and run up. Coastal states are using the DEMs to model coastal inundation from hypothetical events from which they can make inundation and evacuation maps for hazard mitigation and planning purposes. NGDC also developed interactive "flip book" DEM Catalogs of U.S. coastal areas that inform the public about the usefulness of digital elevation models. These flip books are available in print form, a downloadable PDF, or online interactive form, providing the public with a much more engaging format of information about the location, data, and motivation for the DEMs of a given region. They are a significant and innovative leap towards public engagement.

WALLOPS STATION IMPLEMENTS ENVIRONMENTAL MANAGEMENT SYSTEM

The Wallops Command and Data Acquisition Station (WCDAS) operates one of NOAA's two 24-hour, 365-days-a-year satellite operation centers. NESDIS has about 90 employees and contractors at our Wallops facility, located about 170 miles from Washington, D.C. near Chincoteague, Virginia. The station cut energy costs 14 percent—a projected savings of approximately $60,000 per year—through adopting a new Environmental Management System (EMS) that covers all of WCDAS' activities, products, and services. Officially implemented on January 18, 2011, the EMS provides environmental planning and pollution prevention principles. WCDAS staff immediately put into effect numerous energy saving measures including the installation of energy-efficient chillers that provide necessary cooling for their satellite data center. In addition, the station began using energy efficient dehydrators, motion detection light switches, tankless water heaters, hands-free towel dispensers, and low-flow faucets. The system is expected to result in increased efficiency, cost savings, and improved relations with regulatory agencies.

Digital elevation model for the area around Mobile, Alabama.



Interview with

Greg Mandt

GOES-R Program Director

You have many talents and skills, how did you choose engineering as a career field?
I really enjoyed math in high school and took all the math and technical classes that were offered. My classmates even gave me the label "math wizard" under my senior photo in the yearbook—this is something my kids love to tease me about to this day! At the Air Force Academy, we had three semesters of core courses, which exposed me to every discipline. When I took my intro to engineering mechanics class—where we got to design and build things—I knew I found my calling and off I went.

What was your first position at NOAA and how have things changed since you first arrived?
I was hired as an engineer for the Polar-orbiting Operational Environmental Satellite (POES) in 1992. At the time, NESDIS seemed like a little organization with a big mission. A few experts seemed to make the whole operation work. I hardly realized there was more to NOAA. Bringing major pieces of NOAA together, combined with the efforts to integrate overall NOAA planning, has been a major change. I think most NOAA employees feel part of the larger organization more so than they did 20 years ago and they certainly understand the other components much better. NESDIS has a much bigger role than just operating satellites and data systems.

Who influenced you the most in your career and why?
It's hard to say that any one person has had the most influence. I've had a lot of mentors whom I've sought out for advice and also a lot of role models to follow, both good and bad! Since NOAA Deputy Under Secretary for Operations Mary Glackin recently retired, I have to say I have been thinking about how she has influenced me so I'll talk about her. I worked with and for Mary in her numerous roles at the National Weather Service (NWS), NESDIS, and as NOAA's Deputy Under Secretary. She has influenced me as both a positive role model and as a senior leader in NOAA. I see her success in her sincere personal relationships and quality professional interactions—inspiring people to do their best. Mary developed and maintained very positive relationships with those around her, setting the stage for leadership effectiveness. When I worked with her on difficult issues, she connected with me in a way that made me feel she fully respected the knowledge and experience that I have and she skillfully combined her knowledge with what I have to of-

fer. When we finished discussions, she had the ability to summarize her understanding of the issue and decision, ensuring that communications were clear and complete. I try hard to emulate these qualities.

What were some significant turning points in your career?

My career has been full of sharp turns. I certainly couldn't have imagined doing what I am doing now back when I was driving tractors all day long as a kid on the farm. Somehow I was the only one of six kids who went to a private catholic high school (I think my grandmother prayed hard on my potential religious vocation)! This gave me the rigorous education background needed for college. Since my family couldn't pay the tuition, I did janitorial services for four years (including summers) at school to pay my way. I took a sharp turn and left the "priest track" to go to the Air Force Academy—after working so hard through high school I figured this was the cheap way to go! This led me to the engineering track I mentioned before, and I ended up doing satellite development at the U.S. Air Force (USAF) Space Division in Los Angeles, CA. I was really enjoying myself running the spacecraft development activities for the Defense Meteorological Satellite Program (DMSP) when, one day in 1987, I got a call from the "Executive Suite" to come talk to the General. I was so naïve that I hardly knew that there was a General! I went up and he talked to me about needing an executive officer. He liked my performance record and, after the interview, he said I was what he needed and asked when I could start. I said I'd have to ask my boss. He said, "Who does your boss work for?" Well I quickly figured out that, through various levels of management, my boss really worked for him. I changed my answer to "Right away, Sir!" So I leaped from a simple little project officer into a job with a bird's eye view of a 10,000 person, $8 billion per year organization. From that day forward I learned the senior level perspective of the space business, and that set me up for the other senior positions I have been lucky to have over my career.

As the GOES-R Program Director, how do we ensure that the products/services from the satellites are meeting the needs of our stakeholders?

Greg Mandt reflects on his career at NOAA.

One thing I've learned through the years is that the operational users have a difficult time thinking and planning on the timescales needed for satellite planning. In addition, most are focused on making the best forecasts with what they can see and have a difficult time thinking of what could make it better. That means we need to work closely with our stakeholders and understand their problems and come up with ways to show how our new capabilities can improve their products and services. That is why I have been working hard with our Proving Ground activities to bring potential new products and services into the actual operational environments. We have developed proxy data sets to actually show the users what the new Geostationary Operational Environ-

Greg Mandt talks to a GOES-R employee at the GOES-R Program Office.

mental Satellite Series R (GOES-R) data and products will look like so our users can learn how to most effectively improve their operations and we can get feedback on how we can improve our products and services for them. I feel strongly that only through this close cooperation, working with our users in their facilities, can we really meet the needs of our stakeholders.

How do we manage expectations in the current budget environment?

That certainly is a challenge. I think foremost we need to use our strong linkage with our users to ensure that the Administration and Congress recognize the criticality of the satellites NOAA has as part of its mission. With that said, we need to keep costs at a minimum to maintain continuity of the critical missions. We have kept a very close and continuous dialog going with all our stakeholders (including data users, NOAA management, the Presidential Administration, and Congress) to make sure everyone understands where things are right now, what options exist for moving forward, and the impacts of potential changes so that we avoid the "unintended consequences" of abrupt changes in these very complex system developments.

What is the most challenging part of your job?

As an engineer I'd like to be able to say the technical problems, but I can't as I have many talented folks working those problems. The real challenge I face is ensuring all necessary work in this large complex task is being covered by someone, all the managers working the various pieces are on the same page with our overall strategy, and we clearly understand the interfaces between the pieces. I call this "keeping everyone in synch."

You have managed satellite programs inside and outside of NESDIS. How are these programs similar or different across government?

I have been at NESDIS quite a few years so my USAF experience is a bit old. I know when I first came to NESDIS in 1992, I was stunned at the ad hoc nature of the way NESDIS did business. Compared to the big bureaucracy that was the Air Force, it seemed NESDIS just gave money to NASA to build the satellites and all the NESDIS activities were just minor adjustments to the status quo with not a lot of planning involved. Things have changed dramatically from then to the way we run GOES-R. We have a large systems engineering organization ensuring quality processes are being followed and all efforts are being worked—much more like my experience in the Air Force.

What do you think will be NESDIS's biggest challenge in the next five years?

The next five years represent the "peak" years for GOES-R and Joint Polar Satellite System development. Getting adequate funding to get these developments done is going to be a huge challenge. I spent many years in the Defense Meteorological Satellite Program (DMSP) and on POES, where both programs had a long term relationship with RCA (a precursor company to Lockheed-Martin), and we avoided large and

expensive development activities using an evolutionary development approach. Somehow we need to get back to that more sustainable and affordable approach.

What is GOES going to give us that we don't have right now?
Two things our users are going to notice immediately are the significantly faster scanning imager, which provides the pictures of the Western Hemisphere people are familiar with from their television weather forecasts, and the new Global Lightning Mapper (GLM), which will track every lightning event in the Western Hemisphere in near real time. People who are used to the beautiful hourly loops from GOES are going to see those same loops running at 15 minute intervals for the whole hemisphere and every five minutes over the contiguous United States. Forecasters will be able to see many more meteorological features and better integrate satellite data into their operations. I think the lightning mapper will have a dramatic improvement in severe weather warnings. Recent work on algorithms at the University of Huntsville using a lightning from three dimensional ground arrays (representative of what will be available from GOES-R) doubled tornado lead times and reduced false alarms by over a half. This will undoubtedly save lives when it is available.

How do you define success?
The greatest success for us all is in fulfilling the Great Commandment. Love God with all your heart, mind and soul and love your neighbor as yourself.

Tell us about a little known Greg Mandt fact…something that folks would be surprised to know about you?
Back in 2004, I discovered a relatively new activity called "geocaching." Basically, participants hide caches (called geocaches) for others to find. The caches are typically waterproof containers with a log sheet and pencil in them. The person hiding the geocache determines the location using a GPS receiver and then posts it on the geocaching.com web site. The "finder" then downloads the coordinates into their GPS receiver and goes out looking for the item. While most of the geocaches are fairly easy to find, some folks have taken pleasure in creating ones requiring a long hike to a mountain top, solving a complicated puzzle, or working through multiple stages. My kids have called it a hobby where "middle-aged men try to frustrate each other" but I like to refer to it as "using a multi-billion dollar satellite system to find Tupperware in the woods."

Outside of work, what is your favorite pastime?
Raising five kids to be loving, caring adults has certainly taken up most of my life outside work for the last 30 years! It seems like most of my adult life has been spent helping them in all their activities and efforts. As they've grown up I seem to have a little more time on my hands so I enjoy getting outdoors. I mentioned geocaching in the last question so I'll add biking. Recently, after helping two of my boys earning the bicycle merit badge in scouts, I've started riding more and last year bought a road bike and did a 100 kilometer ride on the Eastern Shore. It's flat there!

Greg Mandt at his desk at the GOES-R Program Office Headquarters, in Greenbelt, Maryland.

Awards

Employee of the Month

William Pichel

Mr. Pichel has played a key role advancing the practical use of synthetic aperture radar (SAR) satellite data for ocean science and management. Mr. Pichel's leadership as Chair of the NOAA/NESDIS/STAR Sea Surface Roughness Science Team and in various projects ongoing in STAR and NESDIS to develop ocean applications of SAR data have in particular led to the current efforts within NESDIS to implement two SAR-derived operational products: oil spill mapping and high-resolution coastal winds.

Andrew Heidinger

Dr. Andrew Heidinger was recognized for his work with the National Climatic Data Center to develop new processes and procedures for climate data record software, data sets, and documentation. After years of work, he created an 8-terabyte data set derived from NOAA's polar orbiting satellites covering the period 1978–2009, satisfying a NESDIS goal for the year. The data set, called PATMOS-x, has already been applied to various areas of study. For example, Dr. Heidinger and one of his graduate students used the PATMOS-x dust climatology to demonstrate that a majority of the sea surface warming in the Tropical Atlantic can be directly linked to a general decrease in the amount of dust in the atmosphere over the past 30 years. This finding, published in *Science*, added critical insight into the raging debate on the impact of global warming on hurricane characteristics.

2010 NOAA David Johnson Award

Lidia Cucurull

Dr. Lidia Cucurull received the 2010 NOAA David Johnson Award for her innovative contributions to weather prediction. Dr. Cucurull is a NOAA Program Scientist for GPS Radio Occultation data at the Joint Center for Satellite Data Assimilation in Suitland, MD. She helped develop and implement a process for incorporating data from Global Positioning System satellites into the National Weather Service's weather forecasts.

American Meteorological Society's Satellite Meteorology, Oceanography, and Climatology Committee Award

Gary Davis

Gary Davis, Director of the Office of Systems Development, received the first American Meteorological Society's Satellite Meteorology, Oceanography, and Climatology Committee Award. This award recognizes outstanding career accomplishments leading to new concepts, research, regular operations, and practical application of satellite measurements to meteorological, oceanographic, and climatological problems. The award also recognizes Gary's 35 years of exemplary service, leadership, and tireless efforts toward the development and operations of our Nation's geostationary and polar-orbiting operational environmental satellites.

2010 Fellow - American Association for the Advancement of Science (AAAS)

Sydney Levitus

Noted oceanographer and researcher Sydney Levitus was elected as a 2010 Fellow by the American Association for the Advancement of Science (AAAS). Levitus, supervisor of the National Oceanographic Data Center's Ocean Climate Laboratory, is being honored for his distinguished contributions to the field of ocean sciences, particularly in the area of data archaeology and the analysis of the impacts of climate change on the upper ocean.

Gold Medal

Office of Oceanic and Atmospheric Research

Thomas Knutson, Morris Bender, Steven Garner, Isaac Held, James Kossin, Christopher Landsea, Shian-Jiann Lin, Joseph Sirutis, and Gabriel Vecchi

For excellence in research and data stewardship leading to a more confident assessment of the influence of human-induced climate change on hurricanes.

Silver Medal

Donald W. Hillger and Timothy J. Schmit
For revolutionizing NOAA Science Tests for geostationary satellites, significantly reducing the likelihood of a single satellite configuration.

Administrator's Awards

Mark Mulholland
NESDIS and USSTRATCOM team who enabled exchange of vital space debris collision avoidance data with NOAA's European mission partner.

David McAdoo
For scientific excellence and international leadership in the development of satellite-based methods for monitoring the thickness and volume of Arctic sea ice.

Doug Kluck, Thomas C. Peterson, David R. Easterling, Michael J. Brewer, and Jason Symonds
For support to the Interagency Working Group addressing flooding and development of a NOAA Decision Support System for Devils Lake.

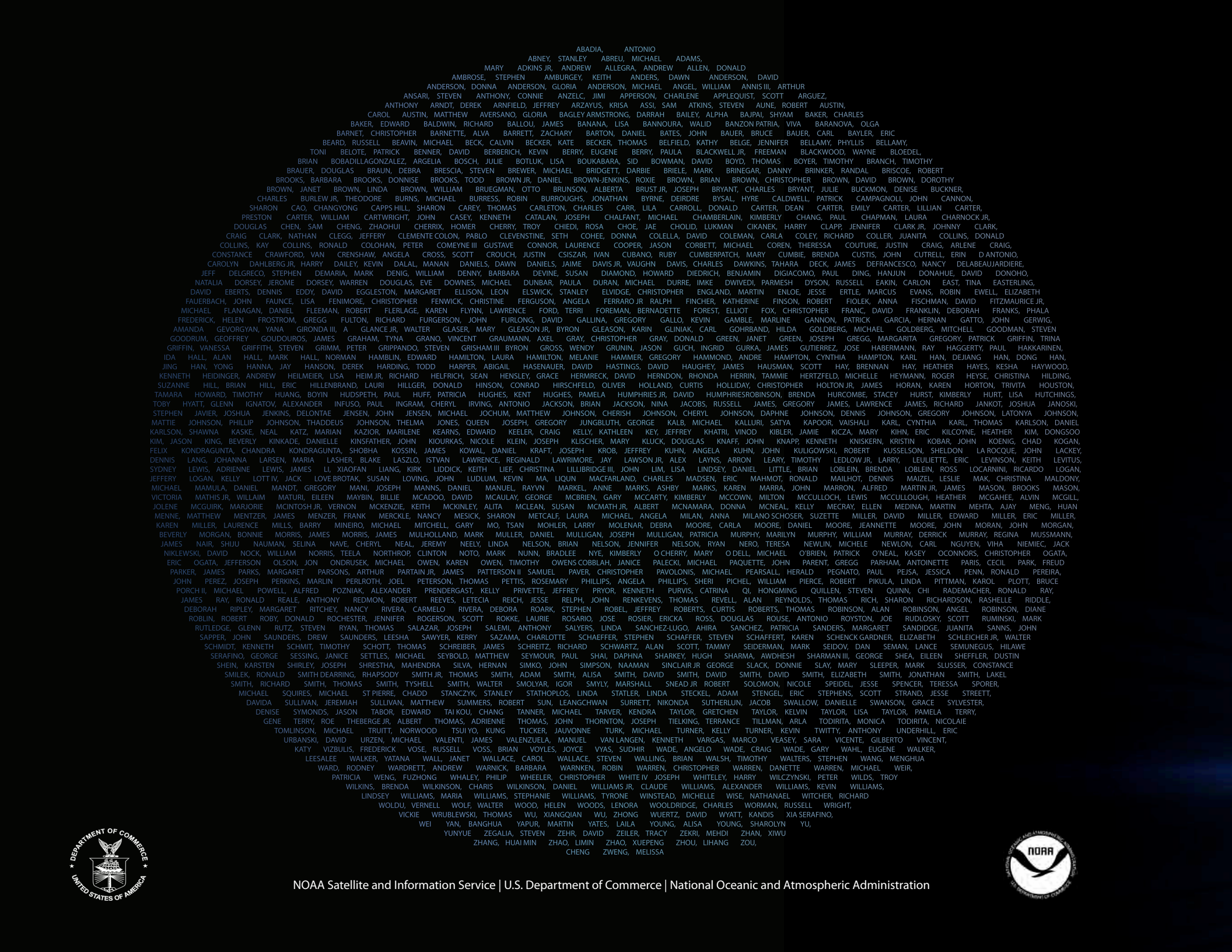
Distinguished Career

Catherine Nichols
For her outstanding efforts ensuring accurate and timely satellite data processing and distribution throughout 33 years of service to NOAA.

Bruce H. Ramsay
For excellence in enhancing NOAA/NESDIS show and ice mapping capabilities from satellites during the past 15 years.

Peter M. Steurer
For sustained professional climate service to the Nation including customer service, product development, data stewardship, partnerships, and economic studies.


NOAA



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