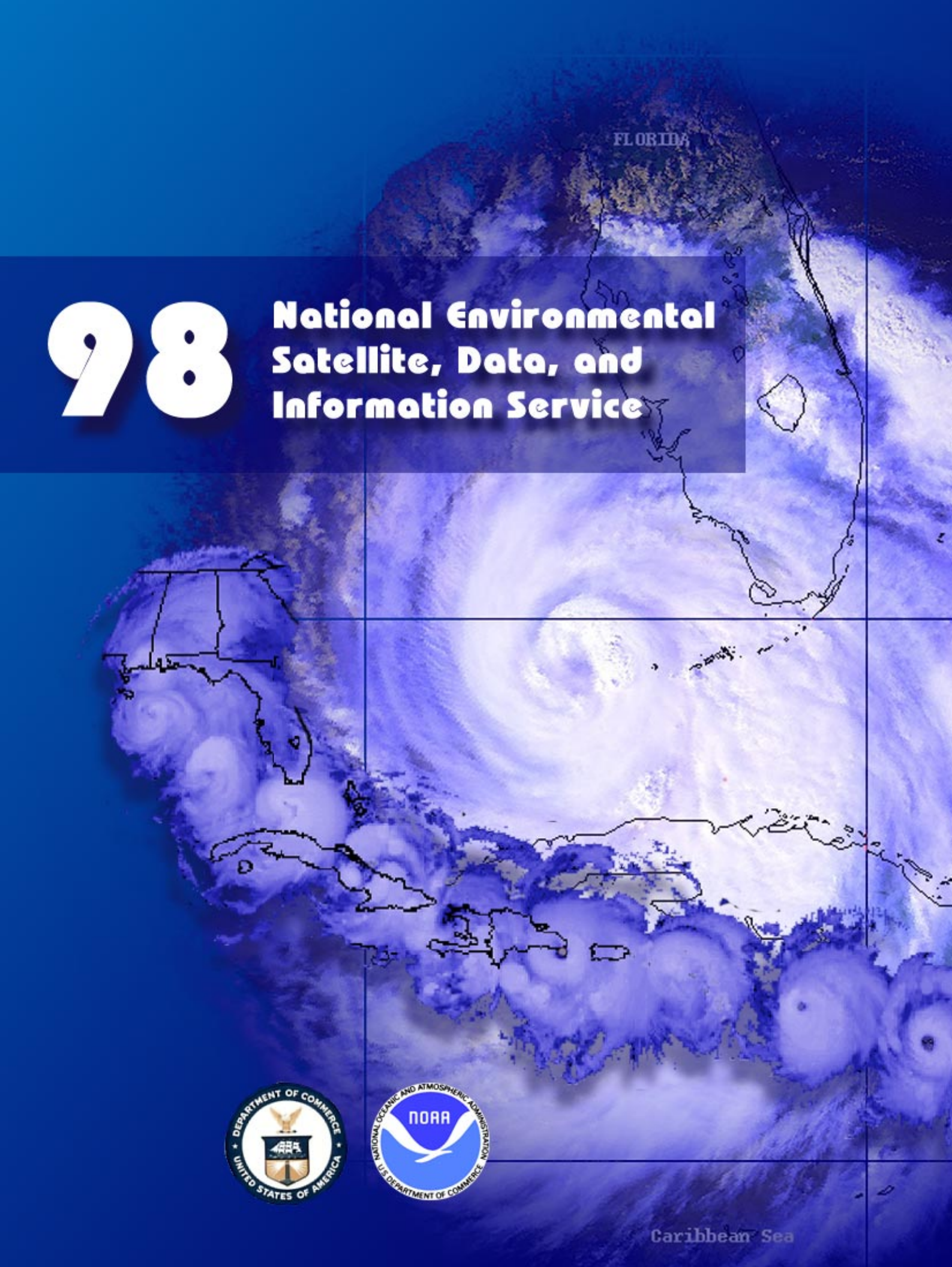
98 National Environmental Satellite, Data, and Information Service



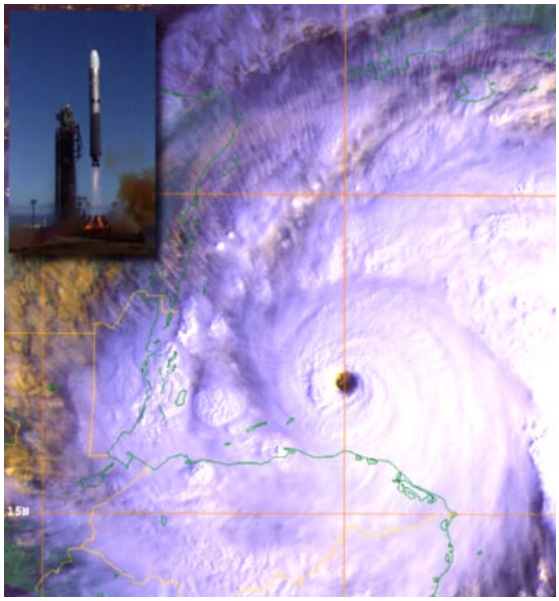
U.S. DEPARTMENT OF COMMERCE
William M. Daley, Secretary

National Oceanic and Atmospheric Administration
D. James Baker, Under Secretary

National Environmental Satellite, Data, and Information Service
Robert S. Winokur, Assistant Administrator

On the cover: A montage of GOES-8 infrared images from Hurricane Georges from September 18-28, 1998.

National Environmental
Satellite, Data, and
Information Service



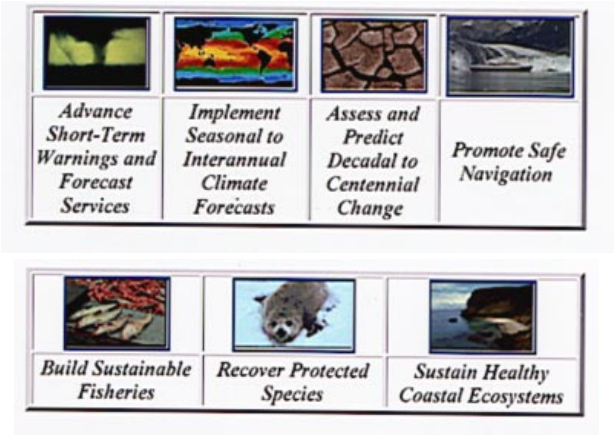
Highlights of 1998

Visit our web site at
http://www.nesdis.noaa.gov

nesdis

NOAA Strategic Goals:

Environmental Assessment and Prediction



NOAA's Strategic Plan

The National Oceanic and Atmospheric Administration's (NOAA) mission is to describe and predict changes in the Earth's environment and conserve and wisely manage the Nation's coastal and marine resources. NOAA's strategy consists of seven interrelated Strategic Goals for environmental assessment, prediction, and stewardship presented on web site: ***http://www.pmel.noaa.gov/noaa-strategic/***

Click picture to see movie "Fishing From Space?"

A Robust, Integrated Environmental Satellite, Data, and Information System

NESDIS' Mission

The National Environmental Satellite, Data, and Information Service (NESDIS) manages the U.S. civil operational Earth-observing satellite systems and global data for meteorology, oceanography, solid-earth geophysics, and solar-terrestrial sciences. From these sources, it develops and provides environmental data and information products and services critical to the provision of weather warnings and forecasts, protection of life and property, national economy, energy development and distribution, global food supplies, and development and management of natural resources.

Foreword

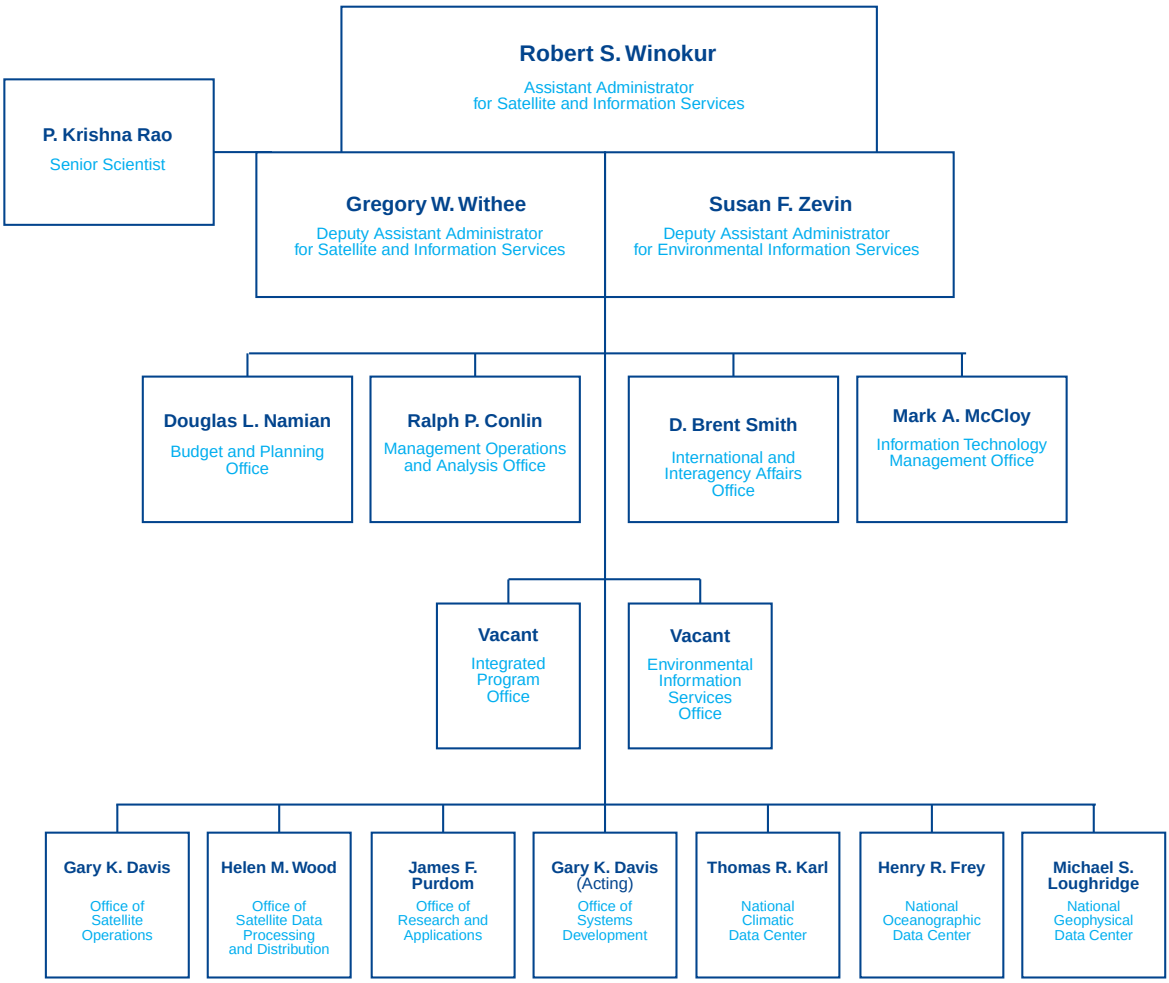
During 1998, with the support of our parent organizations, the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Department of Commerce, the National Environmental Satellite, Data, and Information Service (NESDIS) met or exceeded all the milestones for the year. These milestones were based on our commitment to providing continuous, vital environmental satellite observations and environmental data required for public safety, protection of property, national security, sustainable development, and environmental security.

NESDIS is proud of its accomplishments during 1998. They include the successful launch and activation of NOAA-15 with its enhanced sounding capabilities, the recovery of the GOES-10 satellite and its smooth transition from on-orbit storage to activation as GOES-West, and the transfer from the U.S. Air Force to NESDIS full operational responsibility for the Defense Meteorological Satellite Program satellite operations.

The number of customers served by the national data centers continued to increase, significant progress toward the realization of NOAA's Virtual Data System was made, and a number of the data sets in highest demand have been made available online. In addition to its normal services, NESDIS resources and expertise were called upon in response to the exceptional fire seasons in Mexico, Florida, and Brazil and in monitoring the string of record setting high temperatures during the year. None of these accomplishments would be possible without the diligent and dedicated efforts of the employees of NESDIS.

I hope you find this report informative and useful. We look forward to continuing to serve our broad-based constituency with the highest quality products and services.

National Environmental Satellite, Data, and Information Service



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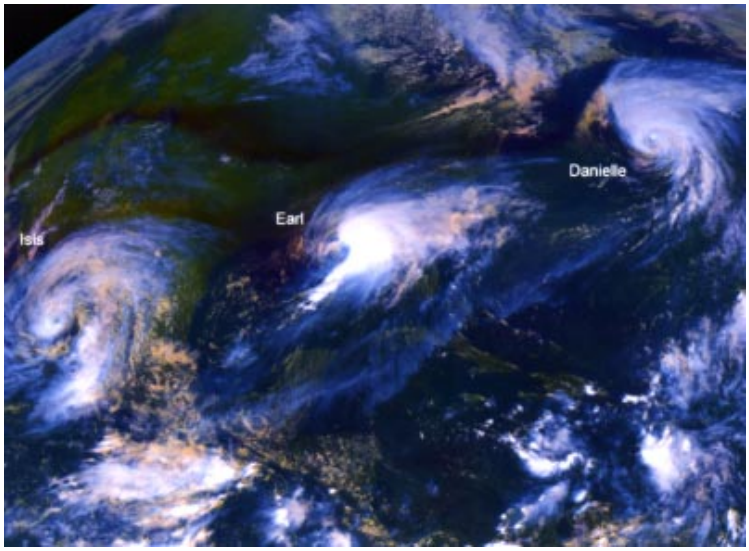
Geostationary Operational Environmental Satellites

Geostationary Operational Environmental Satellites (GOES I-M series) provide continuous weather imagery and radiometric data. They circle the Earth in geosynchronous orbit (22,240 miles above the Earth) which means they orbit the equatorial plane of the Earth at a speed matching the Earth's rotation. This allows them to remain continuously over one position on the surface. Because these satellites stay on a fixed spot on the surface, they provide a constant vigil for atmospheric "triggers" for severe weather conditions such as hurricanes, tornadoes, and severe storms resulting in flash floods. When these conditions develop, these satellites monitor storms and track their movements.

The GOES system performs the following functions: 1) acquisition, processing, and dissemination of imaging and sounding data, 2) acquisition and dissemination of Space Environment Monitor (SEM) data, 3) continuous relay of Weather Facsimile (WEFAX) data, and 4) relay of distress signals from people, aircraft, or marine vessels to the search and rescue ground stations.

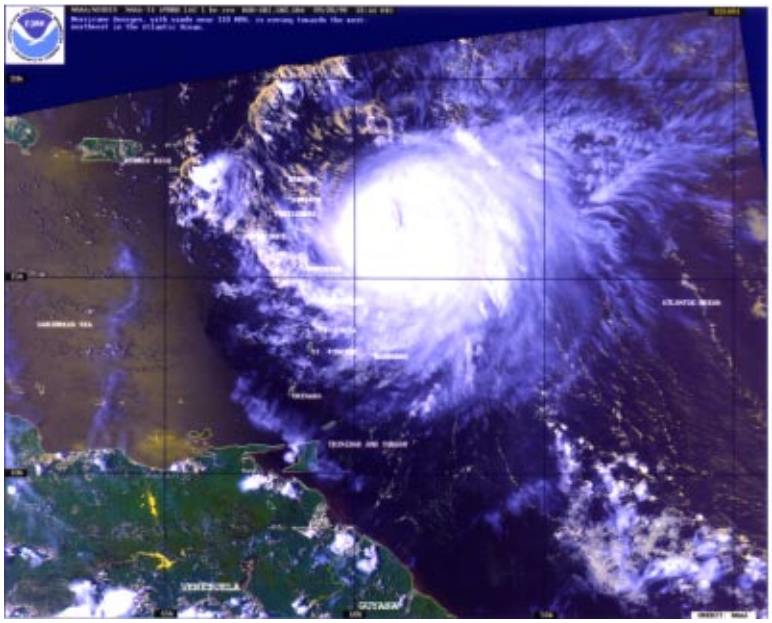
The United States operates two meteorological GOES: GOES-East located at 75° west longitude and GOES-West at 135° west longitude. The combined GOES system covers the central and eastern Pacific Ocean; North, Central, and South America; and the central and western Atlantic Ocean. Pacific coverage includes Hawaii and the Gulf of Alaska. The two operate together to send overlapping full-face pictures of the Western Hemisphere, both day and night.



GOES-8 depicts three Atlantic hurricanes in progress simultaneously on September 2, 1998.

Each satellite carries two major instruments: an Imager and a Sounder. These instruments acquire high resolution visible and infrared data, as well as temperature and moisture profiles of the atmosphere. Some of the data products are 1) day/night cloud imagery, 2) upper and lower tropospheric water vapor imagery, 3) land and sea

Click on picture to view satellite wind movie



Hurricane Georges with winds near 110 mph moving towards the west-northwest in the Atlantic Ocean.

surface temperatures, 4) winds from cloud motions, and 5) detection and monitoring of forest fires. GOES images are seen daily during television weather broadcasts. In addition, GOES imagery is used to estimate rainfall during thunderstorms and hurricanes for flash flood warnings, as well as snowfall accumulations and overall extent of snow cover. Such data help meteorologists issue winter storm warnings and spring snow melt advisories. The GOES imager is used to map snow and ice.

GOES-8 (East) was launched on April 13, 1994, while GOES-9 (West) was launched on May 23, 1995. GOES-10 followed in 1997, being launched on April 25. This satellite was initially stored at 105° west longitude to act as an on-orbit backup should one of the two operational satellites fail (i.e., GOES-8 at 75° and GOES-9 at 135°).

On July 27, 1998, due to engineering concerns about markedly increasing bearing temperatures and the possibility of momentum wheel failure, GOES-9 instrument functions were terminated. GOES-10 was activated from storage mode and replaced GOES-9, reaching its new position at 135° on August 25, 1998, and was reclassified as GOES-West.

Further information on GOES is available at web sites:

http://www.goes.noaa.gov/

http://www.wrh.noaa.gov/wrhq/satell.html

http://www.nnic.noaa.gov/SOCC/SOCC_Home.html

http://goeshp.wwb.noaa.gov/links.html

http://rsd.gsfc.nasa.gov/goes/

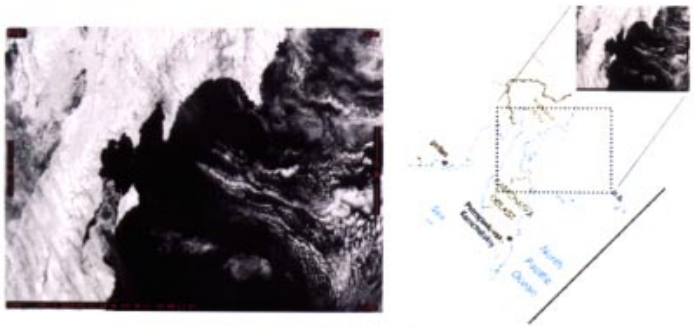
Polar-orbiting Operational Environmental Satellites

The NOAA Polar-orbiting Operational Environmental Satellites (POES) system series has been providing continuous observations of the Earth since April 1960. This highly successful program continues today with two satellites providing a variety of meteorological, oceanographic, climatic, and other specialized data collection services. NOAA operates two polar-orbiting environmental satellites: NOAA-15, the morning satellite and NOAA-14, the afternoon satellite (launched December 1994). NOAA-15 was one of NOAA's most successful launches of a weather satellite occurring on May 13, 1998, at 11:52 a.m. EST from Vandenberg Air Force Base, CA. NOAA-15 was launched into a near-polar orbit 516 miles above the Earth on a U.S. Air Force Titan II space launch vehicle. The first NOAA-15 image was received less than five hours after the launch. Together the two satellites provide environmental observations for every location on the Earth at least four times per day allowing data from the satellites to be used for short- and long-range weather forecasting.

The polar satellites circle the Earth every 102 minutes, passing over the North and South Poles on each orbit providing images of cloud cover; surface parameters such as sea surface temperature, snow, ice, and vegetation; temperature and moisture data from its sounders; climatically important variables such as ozone, earth radiation budget, and aerosols; and space environment parameters. The satellite carries search and rescue instruments that are used internationally in locating ships and aircraft in distress. The use of satellites in search and rescue has been instrumental in saving about 9,000 lives since the inception of the Search and Rescue Satellite-Aided Tracking (SARSAT) system.

NOAA-15 is the first in a series of five satellites which represent a new generation of polar-orbiting spacecraft. These satellites starting with NOAA-15 with improved imaging and sounding capabilities will carry new microwave sounding instruments (AMSU-A and AMSU-B) and improved versions of the visible/infrared imager/

First NOAA-15 Image taken 13 May 1998



AVHRR Image of a portion of the Kamchatka Peninsula.

radiometer (AVHRR/3) and infrared sounder (HIRS/3). Like other NOAA satellites, NOAA-15 will collect meteorological data and transmit the information to users around the world to enhance weather and climate forecasting.

In the United States, the data will be used primarily by the National Weather Service (NWS) for its operational long-range weather and climate forecasts. Further information on this new series of polar-orbiting satellites is available on the following web sites: ***http://www2.ncdc.noaa.gov/docs/intro.htm***

http://poes2.gsfc.nasa.gov/

Our longer-term plans call for increasing cooperation with the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT). Through a joint cooperation agreement, EUMETSAT's new polar-orbiting satellite, known as METOP, will carry NOAA instruments and serve as our morning satellite.

National Polar-orbiting Operational Environmental Satellite System

In response to a Presidential Decision Directive signed in 1994, the National Polar-orbiting Operational Environmental Satellite System (NPOESS) was created. NOAA in cooperation with the U.S. Department of Defense and NASA developed NPOESS for 2008 and beyond. This system will meet the United States' civil and national security requirements for remotely-sensed environmental data.

Five critical sensors are being developed for NPOESS. These instruments are on contract and proceeding, thus ensuring availability as needed for the first NPOESS launch. Teams of scientists and engineers from government laboratories and centers, Federally Funded Research and Development Centers (FFRDCs), and universities have been established and funded to identify technologies and techniques applicable to meeting NPOESS requirements and objectives through our operational Algorithm and Science Teams.

NOAA-15 launched May 13, 1998, from Vandenberg Air Force Base, CA.

Click here to see the NOAA K Users Guide

In anticipation of the NPOESS era, the Defense Meteorological Satellite Program (DMSP) satellite control was transferred to a joint-operational team at NESDIS on May 29, 1998.

Three satellite-antenna systems were dedicated at NOAA's facility in Fairbanks, AK. The three 13-meter antennas installed at NOAA's Command and Data Acquisition (CDA) station are designed to operate continuously in severe, cold weather regions and are capable of serving both DMSP, POES, and future NPOESS.

Close coordination and development with the Department of Navy's Naval Research Laboratory and the U.S. Air Force Space Test Program will result in launch of a prototype instrument to measure the ocean surface wind field as early as 2001. NESDIS' Integrated Programs Office (IPO) has been instrumental in promoting this program (including fund sharing and technical assistance). The satellite will be named "Coriolis" and will serve as a risk reduction effort for one of the NPOESS instruments. System level studies with three major contractors continue at a modest level as part of the Advanced Technology Support Program.

http://www.ipo.noaa.gov/

Satellite and Information Services

Systems Development

http://osdacces.nesdis.noaa.gov/

Future Polar-orbiting Spacecraft. A contract for three European METOP spacecraft was awarded in January 1998 to Matra Marconi, with the first scheduled for launch in mid-2003. NOAA's instruments for the METOP spacecraft include AMSU-A, AVHRR/3, HIRS/4, the Space Environment Monitor (SEM), and the Search and Rescue Repeater and Processor (SARR and SARP). It is anticipated that EUMETSAT will later join NOAA in the combined polar-orbiting system. The addition of METOP would create a three-satellite constellation of spacecraft near equatorial crossing times of 5:30, 9:30, and 1:30, (both a.m. and p.m.). Launch of the first satellite is expected in 2003.

Future GOES N-O-P-Q. NASA and NOAA awarded, in January 1998, a firm fixed-price contract to Hughes Space and Communications, of El Segundo, CA, for SEM instruments, ground system, and the manufacture, launch, and delivery on-orbit of up to four Geostationary Operational Environmental Satellites (GOES-N-O-P-Q). There are separate,

Click picture to view the NOAA K launch

fixed-price options of two additional spacecraft, GOES-P and GOES-Q.

Concept Studies for Future GOES Instruments. A conceptual design for a new GOES imager, which could fly on GOES-Q and beyond, was developed by the Jet Propulsion Laboratory for NESDIS. The Advanced Baseline Imager (ABI), is conceived to meet draft observational requirements for the National Weather Service. The imager concept includes seven infrared channels with 2 km horizontal resolution, one visible channel with 0.5 km resolution, as well as high-speed scanning that would eliminate current conflicts between global and mesoscale duty cycles on the GOES I-M imagers.

NESDIS obtained comments on specific technological and programmatic issues associated with an ABI through a Request for Information released to industry in May. Responses indicate that such an instrument could be built with few, if any, technological advances needed. Similar to the ABI effort, a concept study for a future GOES interferometer sounder was conducted by Massachusetts Institute of Technology (MIT) Lincoln Laboratory. The interferometer concept study, which will yield a spectral resolution of over 1,400 infrared bands, is to be delivered early in fiscal year 1999.

In an attempt to respond to requirements for high-resolution observations of the coastal zone and other environmentally active areas (e.g., volcanoes, floods), MIT Lincoln Laboratory is developing a design for a compact, versatile spectrometer for a future GOES. The instrument, known as the Special Events Imager, could be built and flown as early as GOES-N. The narrow field-of-view instrument would provide 300-meter multispectral imaging in visible and near infrared bands on demand as an adjunct payload. While funding remains elusive, NASA and NOAA scientists have developed and submitted a full program proposal to NASA's Earth Science Enterprise office in late 1998.

Command and Data Acquisition (CDA) Station Backup. Construction of the Wallops Island, VA, CDA station backup continues at the NASA Goddard Space Flight Center, MD, with completion expected by the end of 1999. Once online, the backup facility will provide, for the first time, protection against loss of vital meteorological data from NOAA's Geostationary Operational Environmental Satellites should the Wallops CDA suffer a long-term outage.

New antenna installed at the Suitland, MD, facility.

Operations

http://www.nnic.noaa.gov/SOCC/SOCC_Home.html

NOAA's Satellite Operations Control Center (SOCC).

Polar-orbiting Environmental Satellite Launched. Along with the normal complement of instruments, AVHRR (Advanced Very High Resolution Radiometer), HIRS (High resolution Infrared Radiation Sounder), SAR (Search and Rescue), and a new SEM (Space Environment Monitor), two new instruments were added to NOAA 15: AMSU-A and AMSU-B (Advanced Microwave Sounding Unit). The AMSU instruments replace the MSU (Microwave Sounding Unit) and SSU (Stratosphere Sounding Unit) on previous NOAA satellites. The AMSU-A will be used to calculate global atmospheric temperature and humidity. Data from the AMSU-B instrument will allow the calculation of vertical water vapor profiles from the Earth's surface to about 7.5 miles in the atmosphere. After the final data calibration from the new AMSU instruments, NOAA-15 became the prime morning polar-orbiting satellite replacing NOAA-12.

Transfer of the DMSP Operations. On May 29, 1998, the DMSP Satellite Control Authority was officially transferred to NESDIS. The NESDIS Satellite Operations Control Center, in Suitland, MD, assumed prime support responsibility for command and control of the DMSP satellite constellation from the 6th Satellite Operations Squadron at Offutt Air Force Base. The Offutt Air Force Base DMSP control facility officially ceased operations on June 30, 1998. A new DMSP backup facility was prepared at Schriever Air Force Base in Colorado Springs, CO, with operational availability in late 1998.

Maneuver of GOES-10. In July 1997, GOES-10, suffered a solar array malfunction potentially rendering the satellite inoperable. In an attempt to save the ailing spacecraft, a radical procedure was performed to invert the satellite and run the solar array in the reverse direction, thus providing adequate power to the spacecraft and ultimately saving the mission. The inversion of GOES-10 presented a series of unprecedented technical challenges not accommodated by the current system design. In particular, numerous modifications were required for both the spacecraft and ground system software in order to meet Image Navigation and Registration (INR) system requirements and more importantly to make GOES-10 images appear as if they were taken from a spacecraft which was "right-side up." This was no

minor feat! Shortly after the GOES-10 inversion, the Satellite Operations staff and support contractors studied the impact of inverting GOES-10, identifying and modifying algorithms in the flight software and ground system as needed to meet user requirements. During this phase, a "GOES-10 Inverted Operations System Requirements Document" was developed serving as a point of reference for identifying and tracking all relevant spacecraft flight software and ground system changes. This document will serve as a reference for GOES N-Q Program, ensuring that the knowledge and lessons learned on GOES-10 will be easily migrated to our next generation satellite program. Also, a long-term phased development/testing schedule was implemented which enabled the programming teams to efficiently make needed software modifications and perform unit testing while other system requirements were still being finalized, greatly decreasing the amount of time required to make the system operational. After approximately 3 months of requirements definition, algorithm evaluation, and software modifications, a comprehensive test plan was initiated to numerically validate all spacecraft and ground system modifications. During the 6-week verification phase, numerous ground system software efforts were identified and technical consultation was provided to software developers to ensure that fixes were made expeditiously. As a result of the expedient verification effort, Office of Satellite Operations (OSO) was able to have the ground system changes in place to support specially requested NOAA science testing, providing the National Weather Service with unprecedented rapid-scan imagery. GOES-10 has been repositioned to 135 degrees west longitude replacing GOES-9 as the western operational satellite.

Data Processing and Distribution

http://psbsgi1.nesdis.noaa.gov:8080/OSDPD/OSDPD.html

Hazard Support. In 1998, NESDIS took the lead in supporting the Nation and the world in the detection and monitoring of hazardous environmental conditions. Development of an interagency Hazard Support System continued, with NESDIS coordinating and refining NOAA's and United States Geological Survey requirements for volcanic eruptions and ash reports. Additional environmental observations were provided by the development of the Operational Significant Event Imagery (OSEI)/Special Event Support. The OSEI was utilized to support the State Department, the Executive Office of the President, and other federal, state, and local agencies, as well as the media (printed and televised). Events covered included fires in Indonesia, Mexico, and Florida. The OSEI web page can be viewed at ***http://www.osei.noaa.gov***. NESDIS provided international leadership in hazard monitoring in several areas. NESDIS chaired the Committee on Earth Observation Satellites (CEOS) Disaster Management Support Project and led an international Disaster Workshop.

PHOTO COURTESY OF FEMA.

Flooded homes along the Flint River in Albany, GA.

Technical staff provided briefings and training to a critical Meteorological Watch Office in Mexico City in support of the International Airways Volcano Watch. Finally, NESDIS (along with NWS/National Centers for Environmental Prediction (NCEP)) implemented the Washington Volcanic Ash Advisory Center (VAAC), which is now operational within NESDIS' Satellite Analysis Branch (SAB). The VAAC home page can be reached at ***http://www.ssd.noaa.gov/SSD/ML/vaac.html.***

Search and Rescue Satellite-Aided Tracking (SARSAT). NESDIS operates the U.S. Mission Control Center (USMCC) for the COSPAS-SARSAT system, and in this role processed and distributed alert messages to the U.S. Coast Guard and the U.S. Air Force centers, which resulted in saving the lives of more than 400 U.S. citizens. In 1998, technical staff developed software for the 4th Generation United States Mission Control Center, which is now functioning with complete success. New Mission Control Centers (MCCs) in Brazil, China, Taipei, as well as a new nodal MCC in Japan, were assisted and certified by SARSAT NESDIS managers. More information about SARSAT can be obtained from the home page: ***http://psbsgi1.nesdis.noaa.gov:8080/SARSAT/homepage.html***

Satellite Active Archive (SAA). Distribution of polar-orbiting data through NOAA's SAA continues to grow at near exponentional rates. Actual online customer orders for satellite data sets has grown from 1,576 orders per month in June 1997 to 9,951 orders per month in June 1998. The number of interactive accesses to the system increased from an average of 2,200 per month to 4,400 per month during Fiscal Year 1998. The SAA may be accessed from the World-Wide Web at ***http://www.saa. noaa.gov.***

NWS Modernization Support. Several new high-priority products and services were developed and implemented during 1998 to meet mission requirements of the NWS. The GOES High Density Wind Product, the ASOS Satellite Cloud Product (SCP), and an operational AVHRR Normalized Difference

SARSAT-aided rescue.

Vegetation Index (NDVI) product were among those added, improved, or upgraded.

CoastWatch. The CoastWatch Program delivers high resolution near real-time NOAA environmental satellite data products to federal, state, and local coastal resource managers, marine scientists, educators, and the general public. Data from the AVHRR on NOAA's polar-orbiting spacecraft are collected and processed using a set of NOAA-developed multi-channel atmospherically corrected algorithms for determination of sea surface temperature. Data are mapped and sectored to predefined coordinates specified for each CoastWatch region. Digital, high resolution data products are passed on to CoastWatch Regional Nodes. The Internet is used as the primary telecommunications pathway for digital data distribution. Once data are delivered to the CoastWatch Regional Nodes, they become available for use. Visit the CoastWatch web site at ***http://coastwatch.noaa.gov***.

Year 2000 (Y2K) Readiness. NESDIS' Y2K effort has commenced with the design and development of a database to track the nearly 400 systems throughout the organization for compliance and readiness. Specific tasks have been performed including the identification and documentation of all external data exchanges that may affect operations and the coordination with major international meteorological satellite centers. Hardware, both mainframes and PCs, has been evaluated for Year 2000 compliance, and necessary procurement actions for hardware have been initiated. The most overwhelming task of all was completion of the assessment of more than 11 million lines of code.

Research and Applications

http://orbit-net.nesdis.noaa.gov/ora

Marine Optical Buoy (MOBY)/ Marine Optical Characterization Experiments (MOCE). In continued support of NASA's Earth Observing System (EOS), NOAA's MOBY successfully measured the visible and infrared solar radiation entering and emanating from the ocean. MOBY,

deployed off the coast of Lanai, HI, produced a continuous time series of observations used to adjust the initial calibration coefficients and monitor the stability of NASA's Sea-Viewing Wide Field-of-View Sensor (SeaWiFS) launched in August 1997. The MOCE Team, comprised of scientists from NESDIS, San Diego State and San Jose State Universities, and the Universities of Hawaii and Miami completed a 21-day initialization cruise around the Hawaiian Islands to collect bio-optical, physical, and atmospheric measurements in support of SeaWiFS. These data are being used to evaluate and improve the SeaWiFS, atmospheric correction algorithm for ocean color applications. MOBY data were also used to validate the Ocean Color Temperature Sensor on Japan's Advanced Earth Observing System (ADEOS) satellite, and Taiwan, Republic of China, has requested the data in support of their Ocean Color Imager to be launched January 27, 1999. ***http://orbit29i.nesdis. noaa.gov/~mot/***

Marine optical buoy deployed off the coast of Lanai, HI.

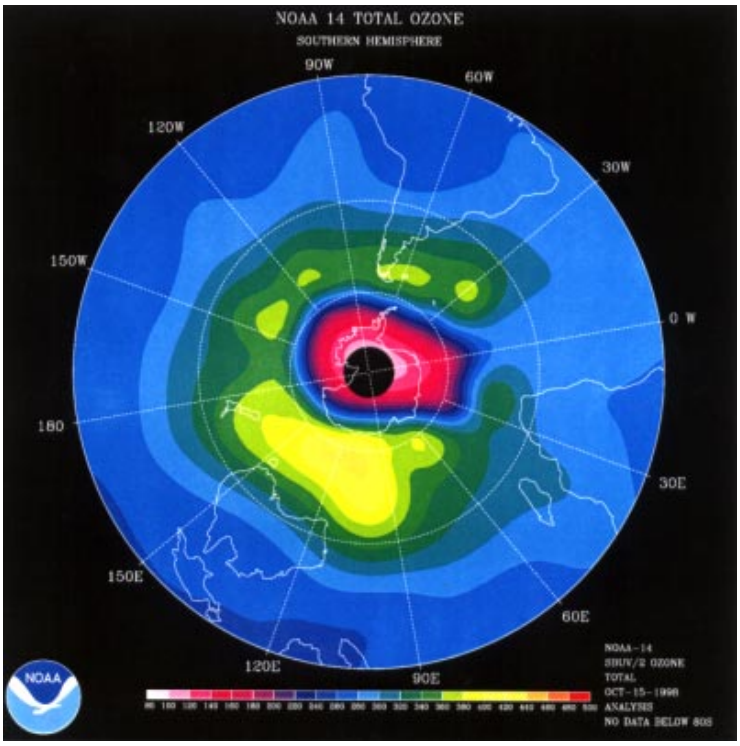
New Suite of Polar Products. NOAA-15, with AMSU instruments, has led to the development of a new suite of products. The Microwave Surface and Precipitation Products System will generate global rain rate, cloud liquid water, total precipitable water, snow cover, and sea ice concentrations. These products are in addition to the traditional atmospheric sounding profiles and radiances available from NOAA polar-orbiting satellites. ***http://poes.nesdis.noaa.gov*** ***http://orbit-net.nesdis.noaa.gov/arad2/*** ***http://orbit18i.nesdis.noaa.gov***

Antarctic Ozone Hole Sets New Record. NOAA and NASA observations of this year's "ozone hole" over Antarctica showed an area greater than those observed in previous years during the Austral Spring (September-October). The "hole," a region of ozone depletion over Antarctica, is the result of complex chemical and meteorological processes occurring in the stratosphere. This year's ozone hole is the largest measured since it was first observed in the early 1980s. In its early stages, it maintained an area of about 26 million square kilometers, larger than the area of North America. NOAA scientists use satellite instruments and balloons to measure the ozone hole. The NOAA satellite measurements were made with the Solar Back-scatter Ultraviolet instrument on

the NOAA-14 environmental satellite. NASA scientists obtained their data from the Total Ozone Mapping Spectrometer (TOMS) instrument aboard NASA's Earth Probe satellite.

http://nic.fb4.noaa.gov/products/stratospherewinter_ bulletin/sh_98/

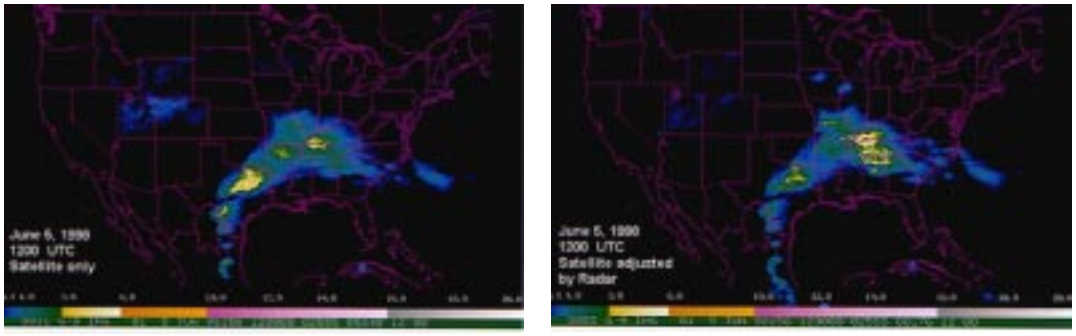
http://www.cmdl.noaa.gov/spozone.html



Antarctic ozone hole is larger than observed in previous years.

Automated Precipitation Estimates Provide U.S. Coverage. A new automated precipitation estimation product from GOES is poised to replace the labor intensive Interactive Flash Flood Analyzer (IFFA). Only one storm system could be monitored at a time using the IFFA. The new automated precipitation estimate program can monitor all precipitating storms across the United States every half hour. The resulting precipitation estimates are provided to the National Weather Service for use in issuing flash flood watches and warnings.

http://orbit-net.nesdis.noaa.gov/arad/ht/ff



Automatic Satellite Rainfall Estimation (Flash Flood Application)

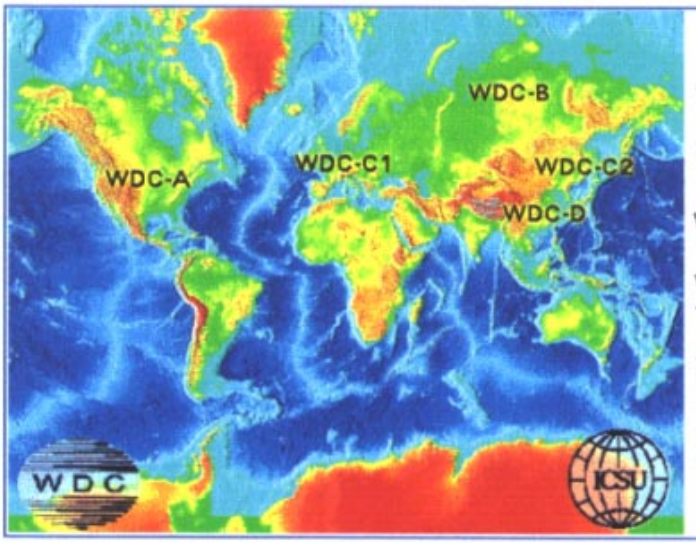
Ancillary precipitation information, is used for real time adjustment of the satellite-only rainfall estimates (left). Results (right): Overestimates due to cirrus contamination are reduced, and underestimates due to warm cloud tops are increased.

Environmental Information Services

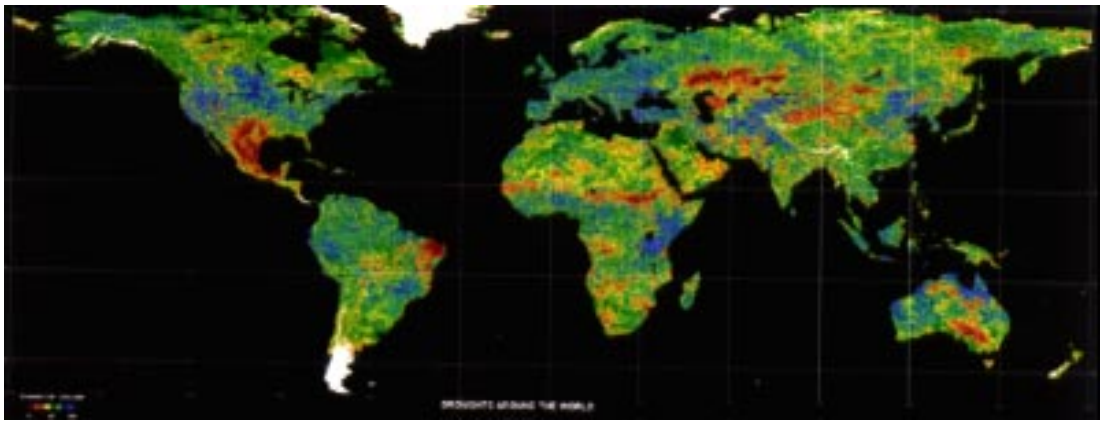
NESDIS is pleased to welcome Susan F. Zevin. Dr. Zevin joined NESDIS on July 27, 1998, as Deputy Assistant Administrator for Environmental Information Services. She will oversee NOAA's National Data Centers, the Environmental Information Services Office, the Information Technology Management Office and will continue to work across NOAA elements planning for and evaluating requirements for NOAA observing systems.

NOAA National Data Center. The NOAA National Data Center's (**NNDC**) objective is to provide the public with access to the extensive data holdings of NESDIS' three data centers: National Climatic Data Center (NCDC), National Geophysical Data Center (NGDC), and National Oceanographic Data Center (NODC). These three NESDIS centers hold the national resource for meteorological and climate data and information; marine geology and geophysics, paleoclimatology, solar-terrestrial physics, solid Earth geophysics, and glaciology data and information; and global oceanographic data and information, respectively. These data are used in every economic and social sector of the Nation. NESDIS' data centers are also World Data Centers. For additional information visit the NNDC web site at ***http://www.nndc.noaa.gov.***

World Data Centers. The World Data Centers (WDCs) were established in the United States and elsewhere as a means to manage and archive the data gathered during the International Geophysical Year. Since their creation in 1957, the WDCs have been the formal mechanism for the international exchange of data in disciplines related to Earth, its environment, and the sun. Today they provide comprehensive services to identify, gather, organize, archive, and



The World Data Center System



Droughts around the world.

disseminate geophysical data to a broadly defined user community of researchers, policy makers, educators, advocates, and managers. There are 46 individual data centers within five major World Data Center complexes. All centers now have computer facilities and most use electronic networks to meet requests, exchange catalog information, and transfer data. Undoubtedly, the WDCs will remain vibrant and vital sources of data in the Geoscience fields. They can be looked upon to continue their role in leading the efforts to coordinate, identify, exchange, and archive critical data and information resources. The WDCs can also be expected to serve as dynamic centers, evolving in the future as they have in the past. Preserving current data exchange and dissemination policies, assuring access to critical data, and integrating new data sources, services, formats, and topics into the WDC framework will be the challenges that the WDC's face in the 21st century. ***http://www.ngdc.noaa.gov/wdc/wdcmain.html***

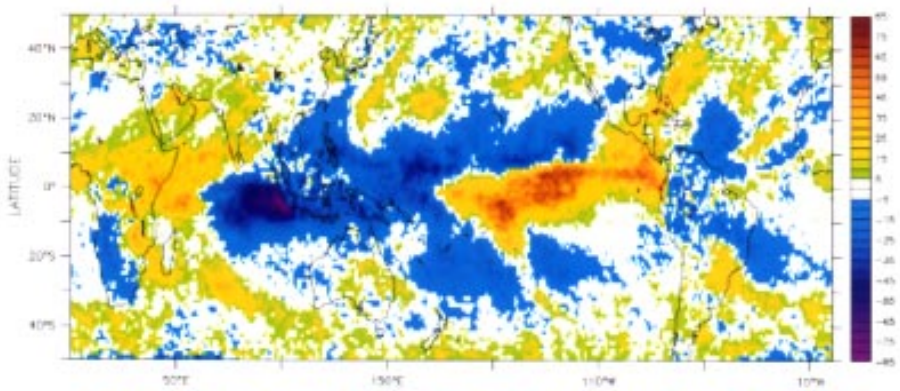
NOAAServer. The NOAA Distributed Data and Information Server (NOAAServer) System has been developed to use web technologies to provide unified data discovery and data access across 14 databases distributed across NOAA organizations and across the Nation. NOAA's databases are accessible through this system by anyone anywhere in the world with an Internet connection. In 1998, an advanced technology prototype was developed and released that introduces highly interactive graphics and capabilities to extract and integrate data from databases separated by thousands of miles. The prototype system represents a highly innovative use of Common Object Requests Broker Architecture (CORBA) network technologies and Java programming to address NOAA's public information dissemination needs.
http://www.esdim.noaa.gov/NOAAServer

Customer Order Management Processing System. To improve service and accounting, the Customer Order Management Processing System (COMPS) has been established. It will migrate the independent systems currently in use at NCDC, NODC, and NGDC used to perform inventory, automated order entry and tracking, maintenance of customer lists, billing of customers, and management of information systems support into a single enterprise information system. When fully deployed, COMPS will support an interface to the Internet, allowing users to place orders online. COMPS can now be utilized operationally at all three data centers.

Many Products Available Via NNDC Online Data Store. The NNDC Online Data Store is part of the NNDC modernization program under the NOAA Virtual Data System (NVDS) initiative to provide customers with direct electronic access, ordering, and retrieval of many data center products, data, and information. The Online Data Store concept enables customers to purchase major data sets online by charging the items to their major credit card accounts. The intent is to meet the data demands of our World-Wide Web customers and to reduce the staffing requirements for offline data delivery. ***http://www.nndc.noaa.gov/phase3/onlinestore.html***

Data Rescue Program. The Environmental Data Rescue Program (EDRP) objective is to prevent the loss of historical NOAA data due to deterioration or to the obsolescence of media or hardware. This year, EDRP will complete the rescue of the Royal Marine collection of oceanographic data contained on 165,000 index cards. Work will begin on the 800,000 cards of the Woods Hole oceanographic data collection. Other new projects include imaging meteorological observations,

Rescuing historical data, technicians wear masks when handling acetate-based film.



Anomalies in longwave component of cloud radiative forcing used to monitor El Niño.

bathymetric fishing maps, library documents, and rescuing solar and meteorological data into electronic media. In July, EDRP completed the rescue of the NCDC archive of 80,906 reels of microfilm.

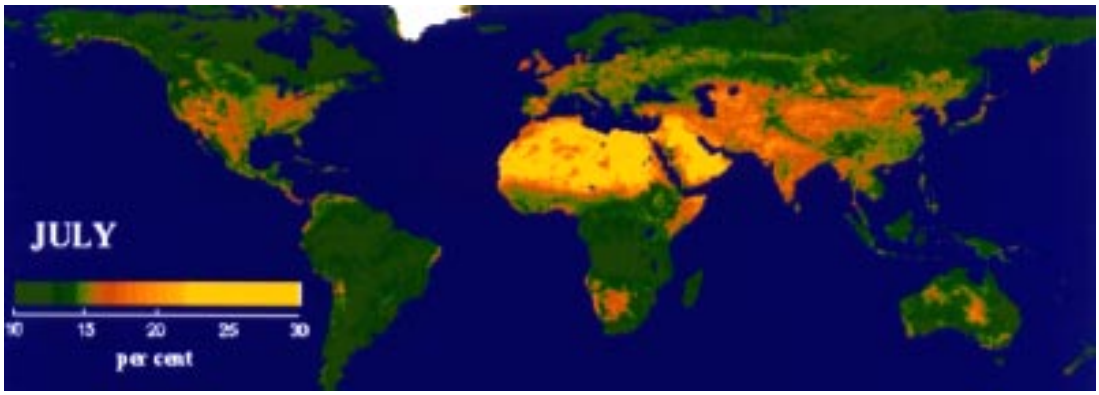
Climatic Data

http://www.ncdc.noaa.gov

New National Climatic Data Center Director. Thomas R. Karl, a well-known scientist whose work in climate change has been published in scientific journals around the world, has been named Director of the National Climatic Data Center in Asheville, NC. Mr. Karl has been with NCDC since 1980; most recently he served as the Senior Scientist, where he analyzed global climate change, extreme weather events, and trends in global and U.S. climate and the changing environment.

http://ww.ncdc.noaa.gov/ol/about/welcomefromdirector.html

Regional Climate Centers Move to National Climatic Data Center. Congress, in the FY98 NOAA appropriations bill, moved the Regional Climate Centers from the NWS to NESDIS. The six Centers represent a



Five-year average July albedo derived from visible and near-infrared measurements by the Advanced Very High Resolution Radiometer onboard the NOAA polar-orbiting satellites.

more regional approach to meeting the needs of the climate community. They are located in Ithaca, NY (Northeast); Columbia, SC (Southeast); Champaign-Urbanna, IL (Midwestern); Baton Rouge, LA (Southern); Lincoln, NE (High Plains); and Reno, NV (Western).

Climate Perspective. A rapid response capability for placing global land and sea surface temperature data and U.S. temperature and precipitation data in century-scale perspective has been developed. The materials produced were placed on the web and have been used by the White House and others for press briefings. The unprecedented anomalies observed in 1997 and 1998 were instrumental in focusing public attention on the global environment. The analyses for global land surface temperature data represent fully peer-reviewed science that maximizes station coverage and eliminates errors and subjectivity.

http://www.ncdc.noaa.gov/ol/climate/research/1998/oct/oct98.html

New Climatic Extremes Web Site. A new web page has been developed entitled "Climatic Extremes and Weather Events." The new web page provides a one-stop location for online data and information related to climatic extremes, weather events, severe weather, climate change, and El Niño. Numerous climatological maps and tables, special reports, satellite images, and similar material are linked through this system. Examples of items available include five reports regarding this winter's weather, over 40 satellite images of El Niño enhanced severe weather systems, and long-term climatology for various extremes (e.g., tornadoes). There has been a great increase in the number of inquiries regarding these topics, from the national news media, government agencies, and many others. This system provides an easy mechanism for providing data and reports to users. Users

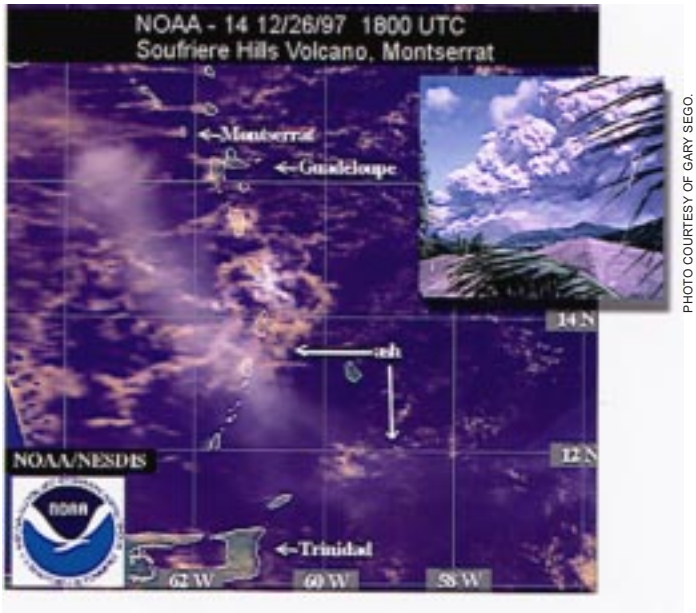


PHOTO COURTESY OF GARY SEGO.

NOAA-14 image of the Soufriere Hills Volcano, Montserrat
December 26, 1997

can access this page via NCDC's web site within the "Climate Resources" system, and under "Products and Publications."

http://www.ncdc.noaa.gov/ol/climate/severeweather/severeweather.html

Geophysical Data

http://www.ngdc.noaa.gov

Gridded Coastal Relief Models. A coastal relief model of digital topography/bathymetry for the U.S. East Coast from Maine to Georgia was released as a demonstration CD-ROM for peer review. Data consist of gridded onshore elevations and offshore depths at 3 arc-second intervals of latitude and longitude. Onshore data are based directly on U.S. Geological Survey digital elevation models. Offshore data are based primarily on digital data from NOAA's National Ocean Service's (NOS) Coast Survey hydrographic database, supplemented by multibeam bathymetry where available. Gridding algorithms in the publicly-available Generic Mapping Tools (GMT) software package were enhanced to accomplish this project. A color poster of the coastal relief model for the U.S. East Coast is in development, and accompanying digital data will be released on CD-ROM and on the web. A second coastal relief model for the Gulf of Mexico and Florida is in progress.
http://www.ngdc.noaa.gov/mgg/bathymetry/relief.html

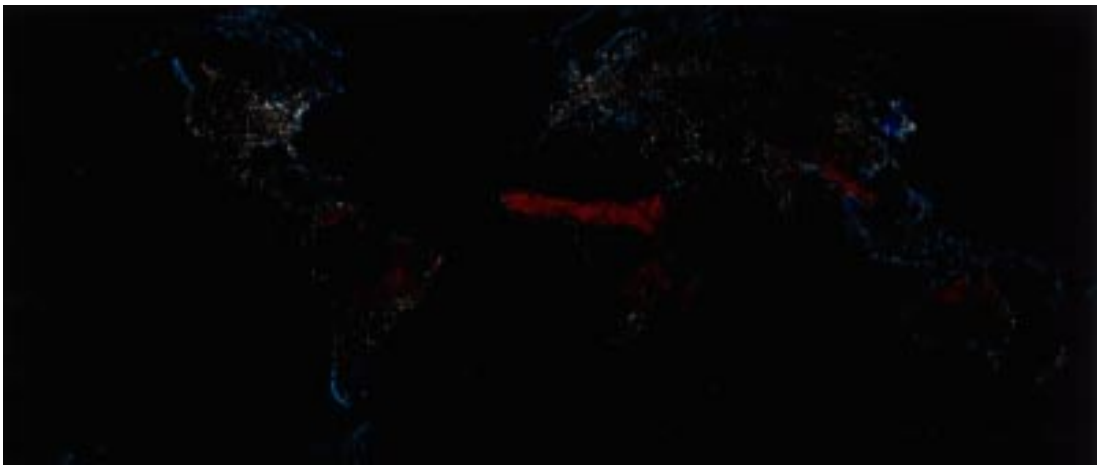
Natural Hazards Data Online. Several natural hazards databases are now available online including significant earthquakes, U.S. earthquake intensities, tsunami runup and event information, volcano eruptions, and digital hazards photos. Interactive search and retrieval capabilities are available for these datasets via the web. The online version of the *Natural Hazards Data Resources Directory* was updated and released as a web "book" for ease of reading and chapter-based searching. The directory includes descriptions of more than 230 organizations that provide data and information on geologic hazards, meteorologic hazards, and societal response. Most of these organizations now have web links included with the description of the organization. The directory also contains an extensive appendix that lists more than 500 state, federal, and other hazard-related organizations.

http://www.ngdc.noaa.gov/seg/hazard/hazards.shtml

http://www.ngdc.noaa.gov/seg/hazard/resource/

NESDIS has developed a brochure on *Hazards Support Activities*. This will be widely distributed at scientific meetings and natural hazards workshops, as well as provided to

Modeled relief of the U.S. coastal zone from Maine to Georgia.



Nighttime Lights of the world map. White pixels indicate cities; blue pixels are oil and gas flares; red pixels indicates a fire occurred at least once during the 6-month period (not continuous burning). Derived from DMSP-OLS imagery, October 1, 1994, to March 31, 1995.

visitors as part of NESDIS informational packets. ***http://www.outlook.noaa.gov/floods98/ndri.htm***
http://www.noaa.gov/public-affairs/pr98/mar98/hydro.html

Nighttime Lights of the World. The Defense Meteorological Satellite Program (DMSP) imager has the unique capability to view low-level sources of light at night including moonlit clouds, cities, towns, fires, gas flares, and fishing boats. Six months of nighttime images during new moon and cloud-free conditions were analyzed to develop a database of stable sources of visible and near-infrared emissions at nighttime. The data were placed into a 1 km grid and plotted in an equal area projection. The world map appeared in the August 1998, issue of *National Geographic* magazine.
http://julius.ngdc.noaa.gov:8080/production/html/BIOMASS/night.html

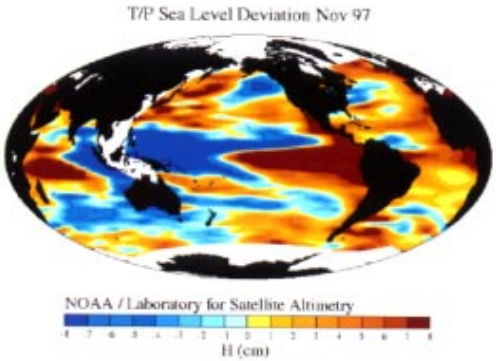
Spatial Data Transfer Standard Point Profile. Point Profile, now officially Part 6 of the Spatial Data Transfer Standard (SDTS), was developed in collaboration with the National Geodetic Survey (NGS), the Federal Geographic Data Committee (FGDC), and the U.S. Geological Survey (USGS). The Point Profile will facilitate the transfer of high-precision point data between Geographic Information System (GIS) software. Web access to high-resolution geodetic control data for the United States in SDTS Point Profile-compliant format is a joint effort of NGDC and NGS under the ESDIM-funded "Spatial Access to Framework Data" project. The data may be obtained from ***http://www.ngs.noaa.gov/*** (select Products and Services, then select DataSheet) and are retrieved on-the-fly directly from the continuously-updated database maintained by NGS. Effort is being coordinated to gain support for the Point Profile in GIS translators and in collaboration with the Environmental Systems Research Institute (ESRI) to develop ARC/INFO translators for the

SDTS Point Profile. ESRI has announced it will support the Point Profile in ARC/INFO Version 8.0, to be released in early 1999. ESRI's announced support for the Point Profile will allow users to easily import NOAA's SDTS-compliant point data into ARC/INFO's coverage data model. ***http://www.ngdc.noaa.gov/seg/tools/sdts/***

Oceanographic Data
http://www.nodc.noaa.gov

New Deputy Director. The National Oceanographic Data Center was pleased to welcome Kurt J. Schnebele as its new Deputy Director. Mr. Schnebele has over 30 years experience in oceanography and program management. He has considerable experience in operations at sea, in deploying oceanographic instruments, and processing oceanographic data. Most recently he served as the Executive Director of the NOAA Office of Oceanic and Atmospheric Research. ***http://www.nodc.noaa.gov/NODC-WNew/deputy.html***

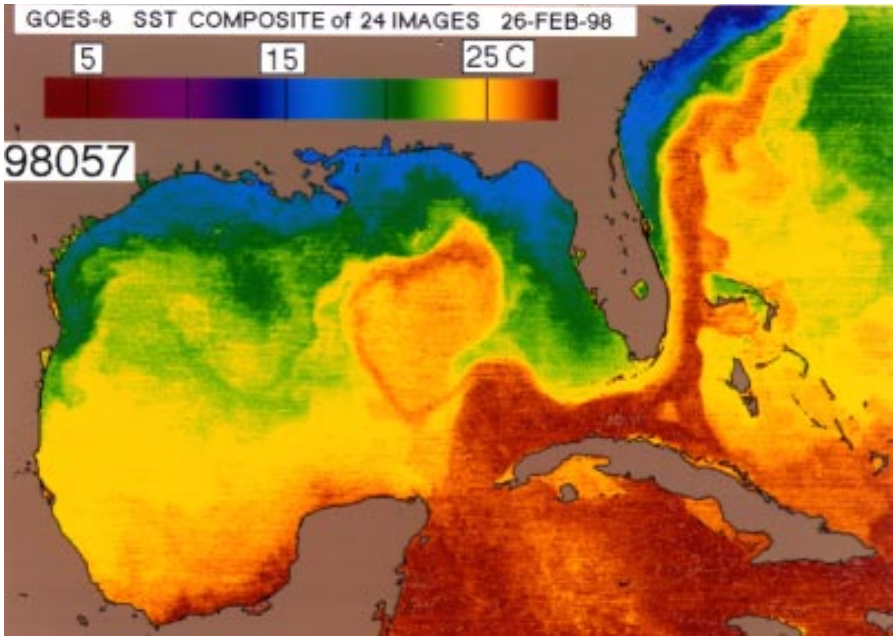
New Coastal Ocean Laboratory. The NODC Data Base Management Division was transformed into the Coastal Ocean Laboratory (COL) to balance coastal and deep ocean activities, centered in the existing Ocean Climate Laboratory (OCL). The establishment of the COL was in response to recommendations from the Coastal Ocean Working Groups formed in 1996-97 to increase NOAA's responsiveness to stakeholders in the coastal ocean community and promote formation of additional partnerships and joint ventures to support coastal ocean data management. Their recommendations included acquiring U.S. coastal data for marine resource management decisions, improving metadata documentation to improve quality assurance efforts, and production of monthly



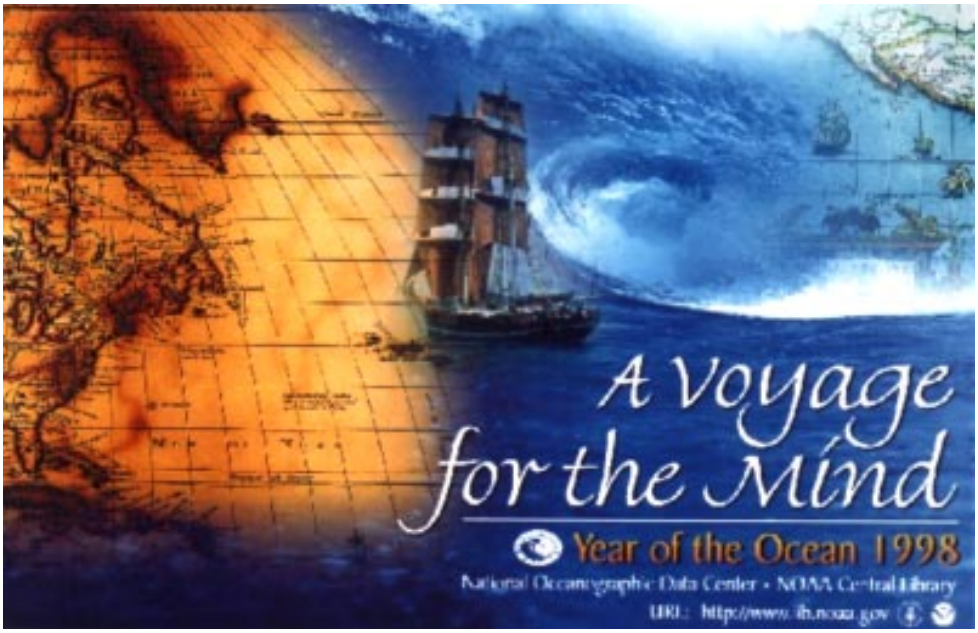
coastal climatologies and anomaly fields in support of coastal ocean forecast systems. These recommendations will be incorporated into a 5-year plan for COL in early 1999.

World Ocean Database 1998 (WOD98). The World Ocean Database 1998 (completed and distributed) is the largest collection of oceanographic profile data available internationally without restriction and represents unprecedented collaboration of the international oceanography community. Based on the utility of previous, more limited databases, WOD98 will be used by scientists in the U.S. Global Change Research Program as well as many other national and international scientific research and assessment projects such as the Intergovernmental Program on Climate Change (IPCC) and the World Climate Research Program (WCRP) Climate Variability and Prediction (CLIVAR) program. In particular, the database will be instrumental in describing and understanding seasonal-to-decadal variability of the state of the world ocean and the interaction between the ocean and atmosphere. WOD98 contains approximately 5.2 million temperature profiles as well as profiles of salinity, oxygen, nutrients, and plankton data. ***http://www.nodc. noaa.gov/OC5/prod.html***

World Ocean Circulation Experiment (WOCE) CD-ROM. Global ocean data from a 10-year, $1 billion observation program are available from NODC. The WOCE Data Products Committee released Version 1.0 of the complete data set in May 1998. The data are being distributed on 13 CD-ROMs which contain over 4.6 gigabytes of data, documentation, and product graphics. Types of observations



Composite of 24 hourly Sea Surface Temperature (SST) imasges of the Gulf of Mexico.



available include hydrographic Conductivity-Temperature-Depth (CTD) and water samples, current meter, surface drifters and subsurface floats, surface meteorology, sea level, upper ocean thermal, acoustic doppler current profiles, and sea surface height and temperature from satellite. The data set is also available online via the NOAA National Data Centers web site:

http://www.nodc.noaa.gov/

WOCE CD-ROM ***http://www.nodc.noaa.gov/woce-cd.html***

WOCE Project ***http://www.cms.udel.edu/woce/***

Library Services

http://www.lib.noaa.gov

The NOAA Central Library is the primary vehicle for prompt and accurate NOAA information. In 1998, the NOAA Central Library provided easier access to NOAA and NOAA-related information by creating WINDandSEA, an Internet resource locator at ***http://www.lib.noaa.gov/docs/windandsea.html***. WINDandSEA organizes more than 800 Internet sites by topic for quick selection and retrieval. Popular topics are El Niño, Year of the Ocean, State of the Coast, and Coral Reefs.

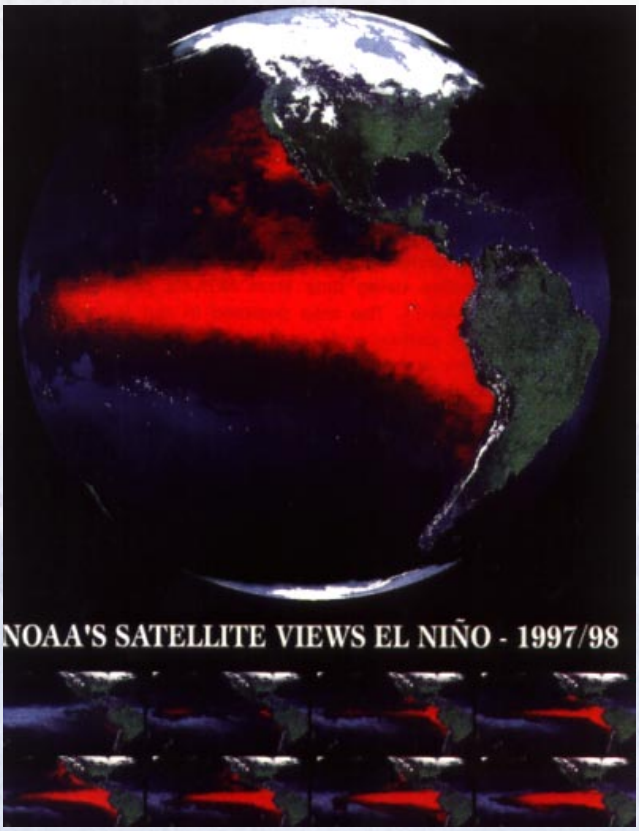
The NOAA Central Library expanded its NOAA Library and Information Network (NOAALINC) to 24 participating NOAA libraries. NOAALINC provides centralized electronic access to all the NOAA library collections nationwide through an integrated catalog available at ***http://www.lib.noaa.gov/uhtbin/cgisirsi/6GlyqBn7W4/9084007/60/30131***. The Internet increased the library's role to provide more information with greater speed and efficiency with more than 1 million users accessing the NOAA Central Library home page from October 1997 through the end of September 1998.

Satellites Support El Niño/ La Niña Forecasts

ROBERT CHENEY

The recently concluded El Niño was remarkable not only for its strength, duration, and impact on society, but also for the accuracy and long lead time with which it was predicted. As early as January 1997, the NOAA Climate Diagnostics Bulletin announced that rapid warming of the equatorial Pacific was expected over the following 6 months, even though surface waters were still anomalously cool at the time, and ocean temperatures would not peak for another year.

One of the keys to successful long-range El Niño forecast was the satellite observations of the ocean. Although ships and buoys also played a vital role in collecting information, the satellites provided the global view necessary for properly initializing and updating the ocean models.



Forecasts of the 1997-98 El Niño benefitted particularly from a recent addition to the flow of operational satellite observations: radar altimetry. The Topex/Poseidon (T/P) altimeter, launched in 1992 as a research mission of the American and French space agencies, provides observations of sea level with an accuracy of a few centimeters. From these data it is possible to estimate changes in the heat content of the upper ocean, an important model parameter. NESDIS researchers, working with NASA and Navy partners, developed methods by which the global T/P altimeter data could be processed, analyzed, and delivered to the National Weather Service with a delay of only 2 days. This allowed the altimeter data to be assimilated into a numerical ocean model together with other observations such as wind, sea surface temperature, and upper ocean thermal profiles to provide the basis for the long-range forecasts. Predictions are for La Niña conditions (the opposite of El Niño) to prevail during 1998-99.

The NESDIS Laboratory for Satellite Altimetry (within NODC) will participate in three upcoming satellite altimeter missions, all of which will have operational aspects. The Navy's Geosat Follow-On (GFO) satellite in 1998 will be followed 2

PHOTO COURTESY OF FEMA

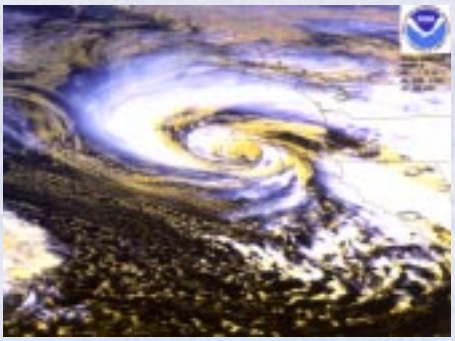
Thousands of acres of crops destroyed.

PHOTO COURTESY OF FEMA

Homes damaged on cliffs of Pacifica, CA.

PHOTO COURTESY OF FEMA

Flooding along the Flint River in Albany, GA.

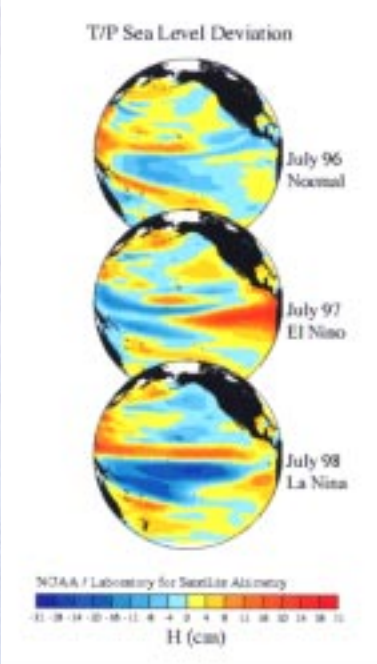


This February 6, 1998, storm was one of a series of potent El Niño storms that battered the Pacific Coast from January through April 1998 bringing high winds, heavy rains, deep mountain snows, flooding, and mudslides.

years later by Jason-1 (the successor to T/P) and the European Space Agency's Envisat. Radar altimetry will become a fully operational NOAA system with the inauguration of NPOESS late in the next decade.

Color maps of sea level from T/P and forecasts of sea surface temperature can be viewed at ***http://ibis.grdl.noaa.gov/SAT.*** Click on "1997-98 El Niño Viewed by Topex." ***http://manati.wwb.noaa/oppt/loops/goes_sst/*** for GOES Sea Surface Temperature (SST) La Niña movie loops.

An example of the GOES SST movie loops is available at ***http://www.goes.noaa.gov***



Monitoring Global Surface Temperatures

THOMAS R. KARL AND
ROBERT G. QUAYLE

Introduction

Beginning in mid-1997 the surface temperatures of the globe, both land and sea, began to exhibit unprecedented warmth. This inevitably raised questions about the policy relevant aspects of changes in global temperatures, particularly as related to climate change detection and attribution. As the world's largest climate archive and bearer of a congressional mandate to serve as the "Nation's climate scorekeeper," NCDC developed a series of global metrics that could place ongoing anomalies in century-scale perspective. To do this in a timely way, a blend of satellite data (AVHRR and SSM/I) and in situ climatic and real-time data are employed to create both time series and maps. The results are (A) Global surface maps (minus snow covered areas) of temperature anomalies with respect to a 1992-98 averaging period, available a few days after the end of the month (Fig. 1.); and (B) Global century-scale time series of a surface temperature index that closely parallels other widely published global surface temperature measurements and can be updated monthly a week or two after the end of a data month (Fig. 2).

Fig. 1. *http://www5.ncdc.noaa.gov/plwebapps/plsql/ssmimain*

Fig. 2. *http://www.ncdc.noaa.gov/ol/climate/research/1998/aug/augtriad_Pg.gif*

Surface Land Temperature climatology for time series (at instrument shelter height) is derived from the Global Historical Climatology Network data set which includes previously unavailable Colonial Era

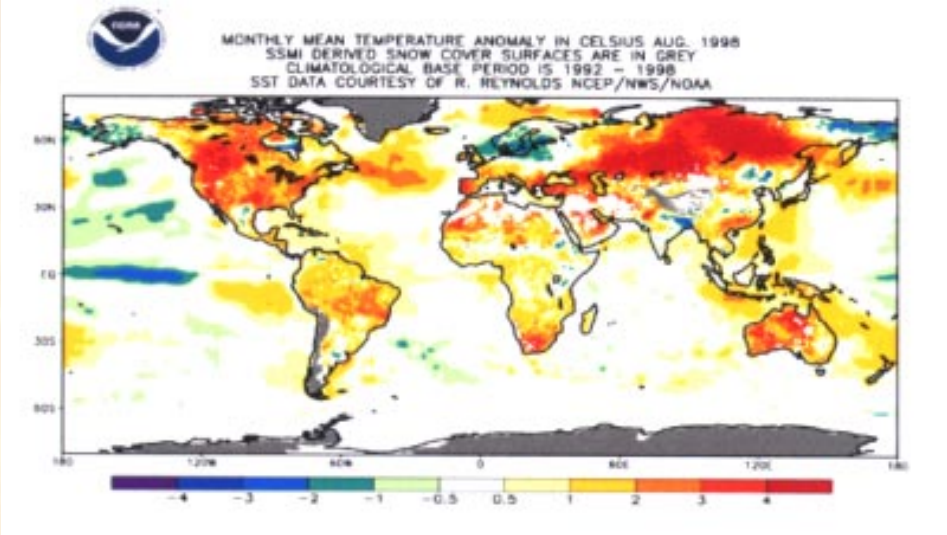


Figure 1. August 1998 global surface land and sea temperature anomalies from 1992-98 means.

data that fill in data sparse times and places. All data are processed via the Climate Analysis System developed at NCDC. The update system subjects the most recent data to a rigorous quality control. Data volume varies from several hundred stations per year to several thousand. For 1997, over 14,000 individual station monthly records are used in the analysis.

The global **Surface Land Temperature** data for maps is part of a suite of products that includes surface wetness and snow cover. It is derived from the Special Sensor Microwave Imager (SSM/I), a polar-orbiting satellite with global coverage. To measure temperature, numerous land surface types were identified and adjustments made for variations in emissivity. The global and U.S. networks of first order and cooperative stations, quality controlled by NCDC, serve as validation.

For **Sea Surface Temperatures** NCDC uses ship data from 1880-1981. For near real-time updates, the most timely and geographically complete data available are the NWS/NCEP Optimum Interpolation blended satellite Multi-Changed Sea Surface Temperature (MCSST), ship and buoy SST data set. Global averages and the accompanying anomaly series are produced from both data sets and fused via regression for global monthly mean anomalies for the years 1982-1997. These are updated shortly after the end of each data month. For plotting purposes, the data are adjusted to anomalies from the 1880-1997 averaging period.

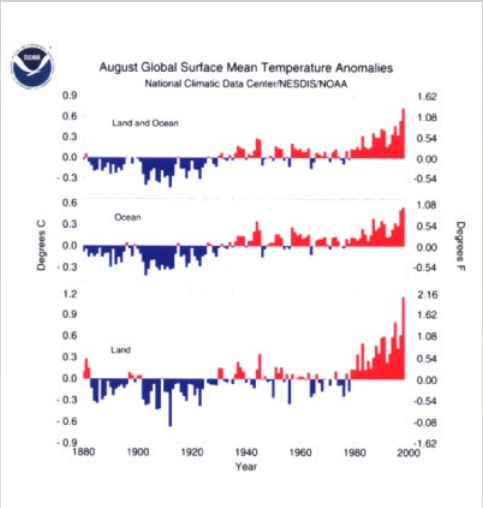


Figure 2. August land, ocean and combined land and ocean temperature index 1880-1998,

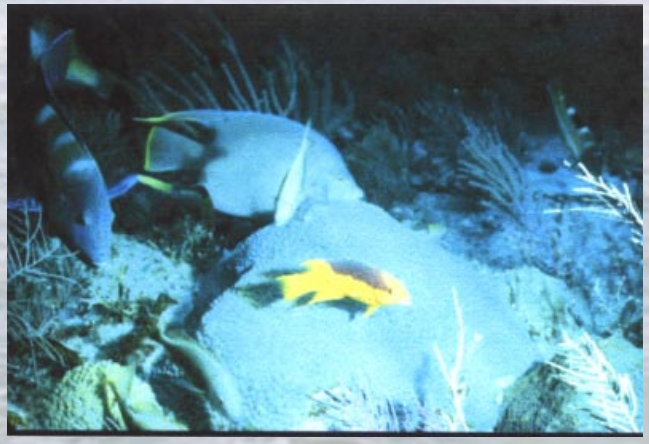
The **Global Blend** of Surface Land Air Temperature and global SST anomalies (time series and maps) through the latest month is produced shortly after the end of a data month. The land data set is independent from the ocean data, and the two are summarized independently of each other. To combine these data into a simple blend, the land temperature is weighted with a coefficient of 0.3 (since about 30 percent of the surface of the Earth is land) and the sea temperature with 0.7 (as the globe is about 70 percent ocean). When the time series blend is compared to similar data developed at the NASA Goddard Institute for Space Studies (GISS), the match is very good (r=0.95) for the period for which GISS has a land-ocean product (1950 to the present, also using NCEP OI SST).

Early Warning of Potential Bleaching in Our Coral Reefs

ALAN E. STRONG

The coral reef is a unique and rich ecosystem which supports a vast array of animal and plant species — the "rain forests of the sea." The fisheries dependent on coral reefs have supported many cultures for ages. Corals form the structural and ecological foundation of the reef system. Coral reefs flourish mainly in the tropical latitudes, extending at most to 30 degrees north or south of the Equator in only a few cases — requiring water temperatures that do not fall below 18°C. Every coral species, as well as numerous other reef inhabitants, maintains a special symbiotic relationship with a microscopic organism (algae) called zooxanthellae. These organisms provide their hosts with oxygen and a portion of the organic compounds they produce through photosynthesis. When stressed, many reef inhabitants have been observed to expel their zooxanthellae en masse. The polyps of the coral are left bereft of pigmentation and appear nearly transparent on the animal's white skeleton. This phenomenon is normally referred to as coral bleaching.

More severe bleaching events have dramatic long-term effects on the coral. The ability of the coral to feed itself in the absence of zooxanthellae may be very important to its survivability during and after a bleaching event. Recovery rates, however, appear to differ greatly from species to species, and time to full recovery of symbiotic algae may take as little as 2 months or as much as a year. When the level of environmental stress is high and sustained, however, death of the coral may result. In some instances, when additional stressors have accumulated during episodes of bleaching, the health of the reef ecosystem has been observed to deteriorate.

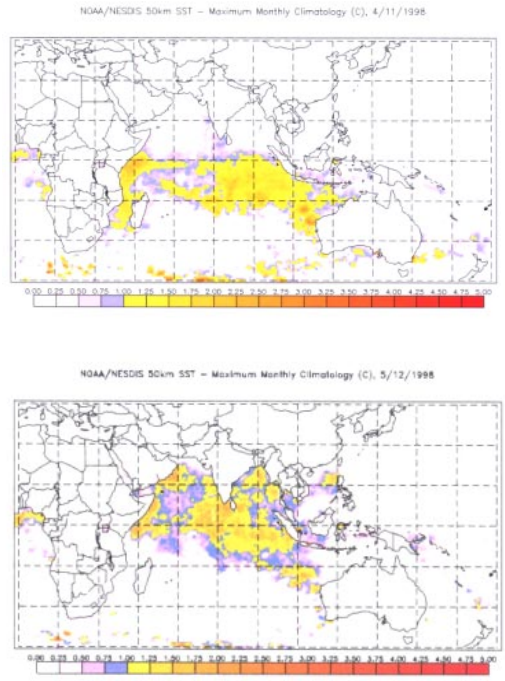


The bleaching events reported prior to the 1980s were generally attributed to localized phenomena such as major storm events, severe tidal exposures, sedimentation, rapid salinity changes, pollution, or thermal shock. Since 1980 it has become increasingly apparent that high water temperatures have a direct relationship with virtually all bleaching events.

Illustrations of these episodes of high Sea Surface Temperatures (SSTs), called "HotSpots" are provided. Experiments have shown that once SSTs exceed the maximum levels expected by only +1°C (or more) during the year (using monthly climatologies) reefs at those locations typically begin experiencing signs of bleaching. The larger this difference, the more extreme the stress on the coral becomes. Our new HotSpot chart ***http://psbsgi1.nesdis.noaa.gov:8080/PSB/EPS/SST/climohot.html*** displays "yellow/orange" colors where SSTs have reached, or exceeded, this annual maximum SST at that location. The colors pink and purple have been used to identify waters that are increasingly close to achieving this critical level to bring on bleaching conditions.

Example: Indian Ocean experiences an unprecedented round of bleaching in 1998. ***http://manati.wwb.noaa.gov/orad/al/hs-indian-jul98.html***

Apparently related to the El Niño pattern of globally affected atmospheric conditions, unusual sunshine and lighter than normal winds made for warmer than normal conditions



Indian Ocean experiences an unprecedented round of bleaching in 1998.

in the southern tropics of the Indian Ocean in early 1998. Coral reefs were seen to bleach, as delimited by the satellite-derived HotSpots, first in the southern reefs of Madagascar and Kenya. These HotSpots moved northward, with the sun to create bleaching conditions over virtually every reef in the Indian Ocean basin by the month of June. The last time conditions permitted such active bleaching was following the El Niño of 1987 — in the spring of 1988; however, the earlier end to that El Niño may have played a role in keeping bleaching conditions from moving into much of the northern Indian Ocean in 1988.

Florida Fires. PHOTO COURTESY OF FEMA

Monitoring U.S. and Global Disasters Through Significant Event Imagery and Experimental Products

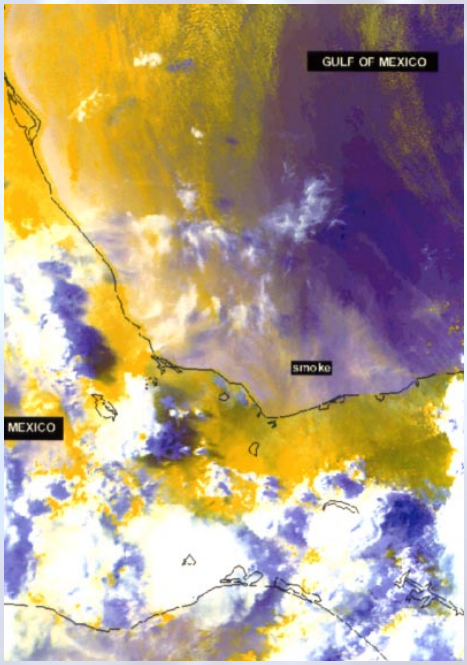
HELEN M. WOOD

In the past year, NESDIS activities in the area of wildfire detection, hurricane monitoring, volcanic ash, storms, oceanographic events, oil spills, and other natural and anthropogenic disasters have been used in international and domestic situations. Sensors on the Geostationary Operational Environmental Satellites (GOES), Polar-orbiting Operational Environmental Satellites (POES), and the Defense Meteorological Satellite Program (DMSP) have been used to develop a number of satellite images and satellite-derived products which depict these disaster events. Image and derived products created by NESDIS are provided free of charge to the user community through web site access.

NOAA-12 image depicts heat signatures and smoke plumes from fires in SE Georgia and NE Florida on June 15, 1998.

Significant event imagery support involves the production and analysis of remotely sensed images from satellite sensors of short-term natural and anthropogenic hazards. These products have been a mainstay of the National Oceanic and Atmospheric Administration's NESDIS for more than a decade. Severe tropical storms, floods, snow storms, fires, dust storms, volcanic eruptions and ash plumes, and oil spills in the United States and around the world have been monitored, images processed, and distributed.

One important program developed this year in support of event imagery production is the Operational Significant Event Imagery (OSEI) program. This program takes advantage of the knowledge, experience, and the around-the-clock availability of NESDIS meteorologists and analysts in the production of significant event imagery. This imagery is used by news media, state and local emergency planners, and Internet information sources for disaster event identification and monitoring. Data sets used to create significant event imagery include the Polar-orbiting Operational Environmental Satellite's Advanced Very High Resolution Radiometer (AVHRR),

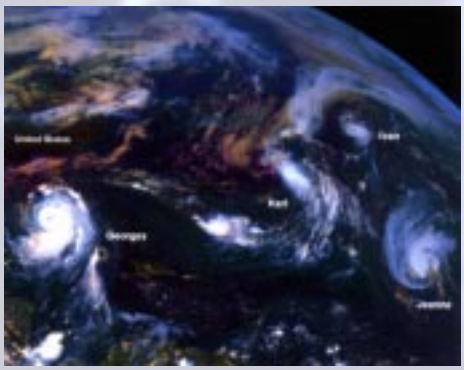


NOAA-12 image, June 17, 1998, smoke rises from fires in Southeastern Mexico as thunderstorms develop over the affected region.

Click on picture below to see movie of the 1998 Hurricane Season

Defense Meteorological Satellite Program's Special Sensor Microwave/Imager (SSM/I) and Operational Linescan Sensor (OLS), and the National Aeronautics and Space Administration's experimental Total Ozone Mapping Spectrometer-Earth Probe (TOMS-EP). Operational geostationary data sets include the GOES, the Japanese Geostationary Meteorological Satellite (GMS), and the European Meteorological Satellite (METEOSAT). The OSEI analyst uses image processing software to analyze, and where necessary, enhance the area of interest in the image through multispectral analysis or other image processing techniques. Once the image, or images, are created, they are made available on the OSEI web site for public access. The OSEI web site is located at ***http://www.osei.noaa.gov.***

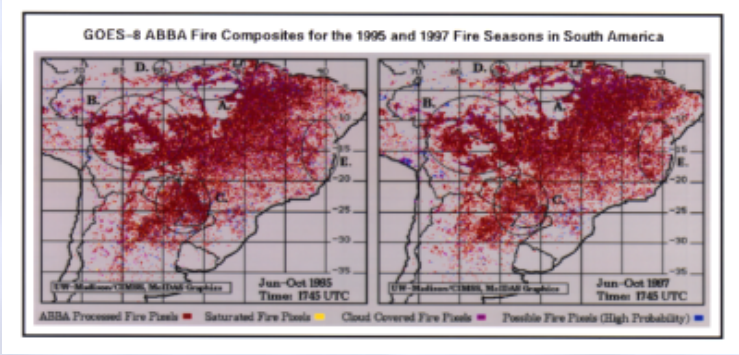
Significant event imagery is also developed for both operational, one-time, and experimental products. For example, the Automated Biomass Burning Algorithm (ABBA) was employed to support the real-time fire monitoring and fire fighting efforts in Mexico and Florida in 1998. DMSP/OLS data processed at NESDIS also created fire location information through the difference of the NESDIS city lights imagery from lights produced by fire. Visible and infrared (IR) imagery from DMSP Operational Linescan System (OLS) instruments are used to monitor the global distribution of clouds and cloud top temperatures twice each day during daytime and nighttime. Telescope pixel values are replaced by Photo Multiplier Tube (PMT) values at night. This allows for fire monitoring when the difference in light value from city lights is subtracted from the lights obtained from fires. These products



GOES-8 satellite depicts four Atlantic tropical systems simultaneously on September 25, 1998.

can be found at ***http://www.ngdc.noaa.gov/dmsp/fires/globalfires.html.***

NESDIS event imagery is created utilizing new experimental product algorithms. These algorithms, although not operational, provide an opportunity for the user community to obtain state-of-the-art derived products and give researchers the opportunity to receive valuable assessments of product performance before these products become operational. For example, during the fires in Mexico in 1998, special visible and infrared imagery products were created. Through using 1 kilometer visible imagery and a special infrared channel combination technique, a GOES experimental fire product was made available on the Internet to firefighters in Mexico. This web site is located at ***http://www.cira.colostate.edu/ramm/rmsdsol/mxfire.html.***



GOES-8 Automated Biomass Burning Algorithm (ABBA) Smoke/Aersol Detection in 1995 and 1997.

Environmental Leadership and Cooperation

Bilateral Cooperation. NESDIS has continued to improve its operational forecasting and monitoring capabilities through numerous arrangements with foreign partners in Asia, Canada, and Europe. On May 13, 1998, the United Kingdom's Advanced Microwave Sounding Unit B (AMSU-B) was launched on the NOAA-15 satellite to provide improved temperature and humidity soundings. With the NOAA-15 launch, NESDIS also continued the flight of French and Canadian search and rescue instruments and the French Argos Data Collection System. In the past year, NESDIS expanded U.S. government operational access to Synthetic Aperture Radar (SAR) data from Canada's RADARSAT satellite and continued its cooperation with the European Space Agency in the use of data from the ERS-2 satellite.

And, on behalf of the USGS/NASA/NOAA Landsat Program Management, NESDIS initiated agreement negotiations with numerous foreign partners for data reception from the Landsat-7 satellite, which will be launched in the spring of 1999.

EUMETSAT Cooperation. The Initial Joint Polar System (IJPS) agreement with the European Meteorological Satellite Organization (EUMETSAT) for cooperation in POES was signed on November 19, 1998, enabling NOAA instruments to fly on European METOP satellites beginning in 2003. The METOP series will replace the NOAA POES in morning orbit and, starting at the end of next decade, will be part of the three- satellite constellation making up the NPOESS program. Signature of this landmark agreement culminates more than 10 years of planning and negotiation with the Europeans to increase their contribution to the operational polar-orbiting satellite system.

Integrated Global Observing Strategy (IGOS) Activities Continue Under Broader Partnership. Efforts continued in 1998 to demonstrate the integration of space-based and in situ observation activities through further implementation of six prototype IGOS projects, with NOAA leading two of these: Upper Air Measurements for Numerical Weather Prediction and Disaster Management Support. The IGOS Strategic Implementation Team (SIT), formed under the Committee on Earth Observation Satellites (CEOS), met in Paris in March 1998 to refocus IGOS activities, commission the drafting of an IGOS space component strategic plan, and endorse efforts to broaden IGOS through partnership with a number of key international scientific and user organizations.

India Cooperation. NOAA cooperation with India took a major stride forward

on December 16, 1997, when the NOAA Administrator signed a Memorandum of Understanding (MOU) for Science Cooperation in the Areas of Earth and Atmospheric Sciences with the Secretary of the Indian Department of Science and Technology, the Secretary of the Indian Department of Space, and the NASA Administrator. The MOU provides for the real-time exchange of Indian geostationary satellite data (INSAT data) within the context of cooperative activities in the Earth and atmospheric sciences. Availability of these INSAT data fills a "hole" in geostationary meteorological data coverage over the Indian Ocean.

Commercial Remote Sensing. Pursuant to the 1992 Land Remote Sensing Policy Act and subsequent Administration policy, NESDIS is responsible for the licensing of private companies to operate space-based remote-sensing systems. NESDIS has expanded its licensing work in support of this burgeoning industry. On April 1, 1998, NESDIS held a public meeting to gather comments on revised regulations it proposed for industry, which were published in the *Federal Register* on November 3, 1997. Through revised regulations, NOAA intends to facilitate the development of the U.S. commercial remote-sensing industry and thus promote collection and widespread availability of Earth remote sensing data while preserving essential U.S. national security, international obligations, and foreign policy interests.

COSPAS-SARSAT. NESDIS continued partnership with respective agencies in Canada, France, and Russia to manage and operate the international Cospas-Sarsat Program. The Cospas-Sarsat system uses search and rescue payloads aboard NOAA satellites as well as Russian navigation satellites to detect and locate mariners and aviators in distress. The Cospas-Sarsat Program now includes participants from 6 continents and 30 nations. The governments of South Africa and Saudi Arabia have also expressed interest in joining the program. In 1998, the Cospas-Sarsat Council declared the Geostationary Earth Orbiting Search and Rescue (GEOSAR) satellite systems operational as a supplement to the existing polar-orbiting system. Studies have shown that the introduction of the GEOSAR systems will improve the response time of search and rescue forces and increase lives and property saved.

Constituents

The term constituent can be broadly defined as any individual or organization directly served by NESDIS. This includes the private sector, government at all levels — including the Department of Defense and the National Weather Service — as well as academia and foreign entities. For those who utilize our data, we interchangeably use the terms customers, data users, and constituents.

Constituents come from all areas of the globe and from nearly every business or industry group. Specifically, these include engineers, architects, national security analysts, manufacturers, researchers/scientists, attorneys, educators, and not the least of which is the general public.

NOAA-wide, each Line Office has designated a Constituent Affairs Representative who is mandated to coordinate outreach to the constituent community. Outreach efforts include briefings in the Washington, DC, metropolitan area as well as those in the regions. For more information on NOAA-wide constituent activities, visit the web site at: ***http://www.constituentaffairs.noaa.gov/***.

National Ocean Conference, Monterey, CA.

Satellite display at the Smithsonian Institution, Washington, DC.

Outreach Activities

Many NESDIS outreach activities are centered around serving customers and eliciting customer feedback. Others are an effort to inform and educate our constituents, or the general public, about our mission, our products, and our services. In the past year, NESDIS has participated in a White House conference on climate change to share with television weather forecasters the dramatic changes taking place in the Nation's climate, the National Ocean Conference which was to focus attention on issues affecting the Earth's oceans, and working with the Smithsonian to exhibit information and imagery on El Niño as well as the role satellites play in predicting the weather.

NESDIS participated in the American Meteorological Society's annual meeting, regional constituent workshops, and the American Geophysical Union's spring and fall meetings. We cooperated with the National Geographic Society for a television special on the *Storm of the Century* as well as the first printed publication of a composite image depicting *Global Night Lights*. In

American Meterological Society Meeting, January 11-16, 1998, Phoenix, AZ.

Visitors at the NOAA National Data Centers booth, American Geophysical Union, fall meeting, San Francisco, CA, 1997.

addition, NESDIS implemented a service of electronically sending dramatic imagery of weather events, such as Hurricane Georges, to national associations comprised of NOAA/NESDIS constituents. For additional information visit web sites:

http://www.lib.noaa.gov/docs/windandsea.html

http://www.nos.noaa.gov/ocrm/pcd/outreach.html#anchor451444

http://seaboard.ndbc.noaa.gov/educate/educate.shtml

http://bristol.wbox.noaa.gov/educations.html

http://www.nws.noaa.gov/er/btv/html/wxeduc.html

http://www.tas.noaa.gov

http://www.mdsg.umd.edu/NSGO/WhatisSeaGrant.html

http://www.met.fsu.edu/explores/IMAGE-IN/image-in.html

Diversity

As part of NOAA's organizational assessment, NESDIS participated in the NOAA-wide all employee survey, Survey Feedback Action (SFA). The purpose of the survey was to assist NOAA and NESDIS in identifying issues of concern and opportunities which may require change to improve the products, services, and the quality of worklife in the immediate workplace.

Managers and employees, by workgroups, received the results of the survey. In facilitated sessions, managers and employees identified actions. These actions are being incorporated in the 1999 NESDIS Diversity Action, Operating, Strategic, and/or Affirmative Employment Plans. For additional information visit:

http://www.rdc.noaa.gov/~Diversity/divplan98/divplan98.html

http://www.nadm.org

http://www.shrm.org

Financial Report

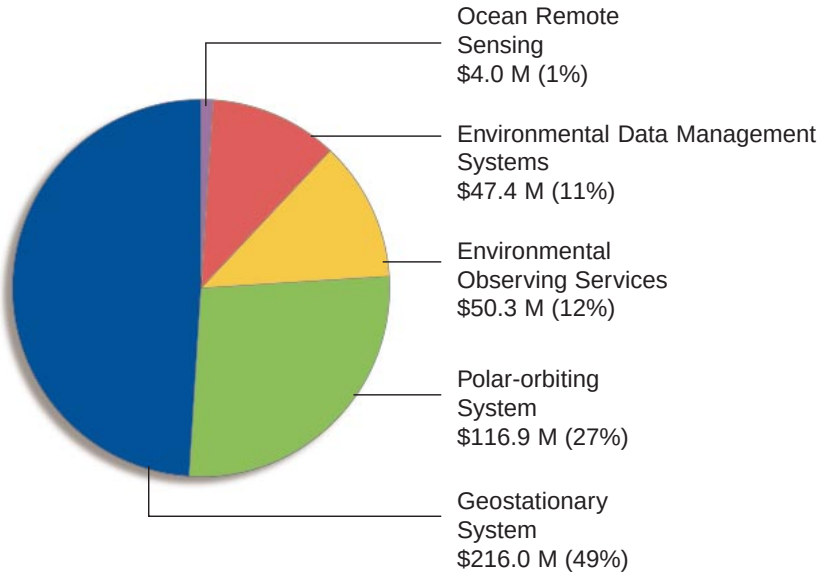
Fiscal Year 1998 Funding

NESDIS satellites are the mainstay of the Nation's weather information system and provide environmental data for federal agencies, state and local governments, and private users. NESDIS' goal includes the procurement, launch, and operation of the satellites required to maintain two environmental systems, as well as provide worldwide environmental data and information products and services. NESDIS has two budget subactivities.

Satellite observing systems account for 89 percent of the budget and include the polar-orbiting satellites and geostationary satellites. These systems obtain global environmental data and provide near continuous observations of the Western Hemisphere. Monitoring activities include ocean remote sensing, new and improved applications and products, improved atmospheric, oceanic, U.S. coastal observations, as well as data distributions are also included in the subactivity.

The Environmental Data Management System (EDMS) is the other subactivity that provides worldwide environmental data and information products and services in the atmospheric, marine, solid Earth, and solar-terrestrial sciences in order to meet the needs of users in commerce, industry, agriculture, science and engineering, the general public, and governments at all levels. The EDMS subactivity accounted for 11 percent of the NESDIS budget.

FY1998 NESDIS Budget



$434.6 Million

resources

Special Recognition

Each year the Department of Commerce and the National Oceanic and Atmospheric Administration honor employees who have performed exemplary work with Gold, Silver, and Bronze Medals and with the NOAA Administrator's Award. A list of NESDIS recipients of these awards and their achievements follows:

Gold Medal

Thomas R. Karl, Sydney Levitus, Jonathan Overpeck: For professional excellence and world-class scientific contributions which have advanced the understanding of the climate system and variability.

Nickalaus Pinkine, Andre Dress, Michael Weinreb, Diane Robinson, Cheryl King, Richard Reynolds: For engineering performance in the recovery of the GOES-10 spacecraft to full capability following its solar array failure.

Kathy Kelly, Timothy Walsh, Michael Surrano, Gus Comeyne, Cyril Settles, Greg Johnson: For GOES N-Q acquisition process.

Silver Medal

Linda Moodie: For creativity and leadership in achieving a negotiation breakthrough in securing the U.S. government real-time access to Indian satellite data.

Bronze Medal

Jerry Hardy: For personal and professional excellence and scientific achievement in the development of the Interagency Taxonomic Information System.

Peter Topoly, Larry Stowe, Nagaraja Rao, Herbert Jacobowitz, Alexander Kidd, Paul Pellegrino, Mitchell Goldberg, David Crosby, Ray Habermann: For generation of unique atmospheric data from 17 years of archived satellite observations that will increase understanding of global climate changes.

Ernest Daddio, Anne O'Donnell Ball, George Jamerson, Daniel Mannes: For significant contributions toward the development of the NOAAServer System, which greatly enhances public access to critical environmental information.

Carol Gerlitz, David Hastings, Allen Hittelman, Craig Larrimore, Mary Russell Oleson, Charles Schwarz: For leadership in pioneering developments for the National Spatial Data Infrastructure.

James Silva: For contributions in improving the dissemination of polar-orbiting environmental satellite data to NOAA's direct readout user community.

Albert Theberge, Dorothy Anderson, Janice Beattie, Elaine Collins: For outstanding contributions in creating WINDandSEA, a unique vehicle for customer service that increased the effectiveness of the NOAA Central Library.

Thomas Kleespies, Larry McMillin, Lawrence Crone: For pioneering development of optimal assimilation of satellite data into global forecast models and of fast, accurate radiative transfer.

Administrator's Award

Dawn Anders: For superior performance in providing NOAA customers immediate access to fixed-price products via the World-Wide Web by implementing NOAA's first fully automated online store.

Robert Fennimore, Bruce Ramsay, Thomas Renkevens, George Stephens, William Tseng: For significant contributions for the creation and implementation of the Operational Significant Events Imagery service.

Elaine Prins: For development of the first automated technique for detection of fires using geostationary satellite data which has proven to be a valuable tool in the detection and monitoring of fire outbreaks in the Western Hemisphere.

Robert Carey, Ralph Meiggs. For significant contribution to the National Year of the Ocean Conference. (No photo available.)

Next Year and Beyond

For the year 2005, NOAA envisions having integrated environmental observation, assessment, and forecast services that enhance public safety and the Nation's economic and environmental security.

To accomplish this mission, NOAA's strategy includes maintaining continuous operational satellite coverage critical for warning and forecast, enhancing global observations and data for model predictions of seasonal to interannual climate variations, and ensuring a long-term climate record.

NESDIS will continue to provide leadership, innovation, and knowledge for the development of new satellite systems, sensors, data products, and applications. NESDIS will maintain a high-caliber of talent to sustain the cutting edge of environmental science, applications, and informational services. This will cover a wide field that includes satellite applications to meteorology, oceanography, hydrology, climate monitoring and diagnostics, and other environmental applications. For additional information, visit the NESDIS web site at ***http://www.nesdis.noaa.gov***

Milestones for 1999

- QuickSCAT product processing system in place and ready to deliver ocean surface wind vectors to NWS.
- Operational access and distribution of INSAT geostationary data.
- Resolve U.S. instrument contribution for METOP-3.
- Launch GOES-L in the spring of 1999.
- Commission Wallops Backup capability at NASA/GSFC.
- Conduct first launch of DMSP (S-15) using the integrated NOAA SOCC for primary launch control.
- Publish final Commercial Remote Sensing regulations.
- Hold Environmental Data Rescue Workshop.
- Add NOAA-15 data to the Satellite Active Archive.
- Co-sponsor a workshop on coral reef data management in support of the President's Executive Order on Coral Reef Protection.
- Complete key entry of 600,000 pages of Cooperative Weather observations and Hourly Precipitation Data contained on microfiche and microfilm.

next year and beyond

- Produce Temperature Extremes CD-ROM using modeled output to project temperature extremes for the next 100 years.
- Validate the reprocessed NOAA-14 SBUV/2 ozone products.
- Complete survey of paleoclimate data for a centuries-long Northern Hemisphere surface-air temperature record.
- Convene symposium on Emerging Coastal and Marine Applications of Spaceborne Synthetic Aperture Radar.
- Produce detection of algal blooms product.
- Provide archived physical environmental data sets to assist in species assessment (ongoing).

Selected New Products

Hourly United States Weather Observations CD-ROM Released: NCDC has released a new CD-ROM entitled "Hourly United States Weather Observations (HUSWO), 1990-95." The CD contains more than 12 million hourly weather observations from 262 NWS stations nationwide. This updates an earlier set of CDs (Solar and Meteorological Surface Observation Network, SAMSON) which covered the period 1961-90. The HUSWO CD has a map interface and station list for data selection, or the user can copy the data files direct from the CD (without using the interface). The elements included are total and opaque sky cover, temperature and dew point, relative humidity, station pressure, wind direction and speed, visibility, ceiling height, present weather, Automated Surface Observing System (ASOS) cloud layer data, snow depth, and hourly precipitation. More information on CD-ROMs is available at the following web address: ***http://www.ncdc.noaa.gov/ol/climate/climateproducts.html***

Climate Change, Extremes, and Events Web Site: With the growing interest in climatic and weather extremes, NCDC now has a web system online which links to all NCDC web pages related to climatic extremes, weather events, climate change, El Niño, natural disasters, and U.S. climatologies for extremes. The recent surge in news media, government, and individual interest in these topics has led to numerous inquiries for data and information, and even the formation of a rapid response team at NCDC. Now, users can go to a single web page (***http://www.ncdc.noaa.gov/ol/climate/severeweather/severeweather.html***) to find what NCDC has to offer online regarding these topics. Within this system, users will find a wealth of data, maps, images (e.g., satellite and radar), and reports for each topic, such as El Niño, 1993-98 Weather Events, U.S. Tornadoes and Historical Global Extremes.

Monthly Serial Publications Available Online: The NCDC monthly serial publications, *Local Climatological Data* (LCD), *1997 Annual Local Climatological Data*, *1997 Comparative Climate Data* (CCD), and *Monthly Climatic Data for the World* (MCDW) are available electronically through the NCDC's home page: ***www.nndc.noaa.gov***. Access to these and other publications is the direct result of activities supported by the NOAA Virtual Data System (NVDS) *Online Data Store* project. The only software required to access these files is Adobe Acrobat Reader which can be obtained free at: ***http://www.adobe.com/prodindex/acrobat/readstep.html***.

Storm Data Publication Online: NCDC produces this publication from the NWS Paradox database. The 119 Local NWS Weather Forecast Offices populate the database with severe weather reports and

sends a monthly file to the NWS Office of Meteorology (OM). OM then relays the monthly file to NCDC via FTP. NCDC archives the Storm Data Set as TD-3910. NCDC developed and implemented the Storm Data Archive Subsystem that produces the ASCII archive text file from the Paradox database. The data are stored in a relational database format allowing queries to be made on a single or multiple fields. This publication is available online through the following NCDC home page web address: ***http://www.ncdc.noaa.gov/ol/climate/climateproductsstormdata.html***

Observation Station Photographs Added to WebCliServ: WebCliServ, the NCDC's online inventory system, has been modified to provide access to station photographs as they become available (currently limited to one station). NCDC has plans to ingest photographic images from the NWS ASOS sites along the East and Gulf Coasts and has also solicited funding to acquire and ingest photographs from approximately 8,000 Cooperative Observation Stations across the United States. Photographs are taken at 45-degree angle increments to show obstructions in each direction. To view an example of this new feature, access WebCliServ at ***http://www.ncdc.noaa.gov/ol/climate/stationlocator.html*** and search on station name Miami Opa Locka. After reaching the Miami Opa Locka screen, click on "ASOS Photographs" under the city/state/country line.

International Year of the Ocean CD-ROM: In recognition of the International Year of the Ocean (YOTO), NCDC has produced a CD-ROM entitled "The Maury Collection, Global Ship Observations, 1792-1910." This CD contains nearly 1.5 million historical observations collected of the global surface marine environment, with the majority taken during the period 1820-60. The observations include air and sea temperatures, currents, pressure, cloud cover, and present weather and wind direction and speed. The data were digitized from paper copies of hand written forms via the U.S.-Peoples Republic of China Protocol on Cooperation in the Field of Marine and Fishery Science and Technology, by the Joint Coordination Panel for Data and Information Cooperation facilitated by NOAA and the government of China. NCDC will later include the data in the Comprehensive Ocean Atmosphere Data Set (COADS.) More information on CD-ROMs is available at the following web address: ***http://www.ncdc.noaa.gov/ol/climate/climateproducts.html***

Louisiana-Texas Shelf Physical Oceanography Program (LATEX) CD-ROM. LATEX is a 6-year initiative to identify key dynamical processes governing the circulation, transport, and cross-shelf mixing of the waters on the Louisiana-Texas shelf. LATEX is sponsored by the Minerals Management Service, Department of Interior. Data from this project are available from NODC on a five-disc CD-ROM set. ***http://www.nodc.noaa.gov/NODC-cdrom.html.***

El Niño/Real-Time Products. NODC played an important role in monitoring and predicting the 1997-98 El Niño. Sea level variations measured by the Topex/Poseidon altimeter satellite were processed with a delay of only 2 days, providing global maps of anomalies as the event unfolded (image1.oc2). In addition, assimilation of these sea level data in the NWS/NCEP ocean model produced improved, long-term predictions of tropical Pacific sea surface temperatures. Based on this successful application, satellite altimeters will be included in the future NPOESS operational system. ***http://ibis.grdl.noaa.gov/SAT/elnino_97.html***

Marine Geophysics. A novel approach for chronicling the development of plate boundaries in selected ocean basins. This method entails reconstructing gravity fields from satellite altimetry gravity, using magnetic anomalies and tectonic features as constraints. Reconstructions of the Southwest Pacific Ocean and the Southeast Indian Ocean have revealed the existence and location of previously unconfirmed plate boundaries as well as details of spreading ridge evolution. Images show the present-day gravity field over the Southwest Pacific (image2.oc2) and its reconstruction at a time 61 million years ago (image3.oc2).

Geosat Follow-On (GFO). Launch of the Geosat Follow-On radar altimeter in 1998 renewed NODC's long-standing relationship with the U.S. Navy in this area. During the next 5-10 years, GFO will provide real-time sea level, wind, and wave data for both military and civilian users. The Laboratory for Satellite Altimetry staff serves on the validation team for this Navy satellite and is responsible for producing and distributing the final GFO data sets.

http://ibis.grdl.noaa.gov/SAT/gdrs/gfo.html

http://ibis.grdl.noaa.gov/SAT/

http://ibis.grdl.noaa.gov/SAT/marine.prods/products.html

http://ibis.grdl.noaa.gov/SAT/curr_res/res_list.html

Ocean Profile Database (OPD). The Ocean Profile on the Internet (OPI) system was activated on the NODC web site in February 1998. The system provides access to the NODC Ocean Profile Database of approximately 8.7 million profiles. The current version features station selection based on geographic area, date range, and parameter. In addition to retrieving data, users can display their selected parameters from several stations on a single composite plot or produce individual plots for several stations with a single plot command. There is horizontal and vertical slice plot capability. ***http://www.nodc.noaa.gov/NODC-opdb.html***

Interactive Data Access and Retrieval System (IDARS). NODC led the development of IDARS (image1.oc1) which provides users with the ability to preview data in the extensive OPD at NODC. IDARS permits the user to interactively select a region of the world's oceans using a "rubber band" on a global or smaller map region. The user selects desired variables and the time period of interest. Once

IDARS finds all of NODC's holdings in the user's request, it provides the capability to display the data in a variety of plots: profiles, scalar and vector time series, and scalar contours. Expansion of the display capabilities to three dimensions is planned. IDARS allows the user to download data or request that a custom CD be written for the data desired. ***http://www.nodc.noaa.gov/dsdt***

Bathymetry of Lake Erie and Lake Saint Clair. A full-color poster depicting the bathymetric contours of Lake Erie and Lake Saint Clair. Color diffracting glasses are included with the poster for viewing in 3-D. A CD containing data, images, and text describing the geomorphology of the lake floors is available. This new bathymetry was compiled at a 1 meter contour interval at scales ranging from 1:100,000 to 1:2,500 and registered to the NOAA nominal scale 1:80,000 digital vector shoreline. The resulting detail, exceeding that achieved in any previous bathymetry for the two lakes, defines more clearly the shape and location of previously known features and reveals other features for the first time. ***http://www.ngdc.noaa.gov/mgg/fliers/98mgg01.html***

Circumpolar Active Layer Permafrost System (CAPS). This first-of-its-kind CD contains a collection of 56 data sets and 7 information products pertaining to permafrost and frozen ground. Intended for a broad audience, including the scientific and engineering communities, educators, and policy makers, the CD contents represent 52 contributors and data collection sites in 22 countries and Antarctica. Available from NGDC's affiliated National Snow and Ice Data Center (NSIDC). ***http://www-nsidc.colorado.edu/ NSIDC/CATALOG/ENTRIES/G01175.html***

Geologic Hazards Photo Collection. NGDC has compiled its geologic hazards photo archive into a new, three-volume CD collection. The volumes are *Earthquakes, General Topics*; *Earthquake Events*; and *Landslides, Tsunamis, and Volcanoes*. These photos are copyright-free. Access to the images and descriptive text is through a web browser interface and GeoVu, NGDC's multi-platform access and display software. Lower-resolution images are available from NGDC's web site. ***http://www.ngdc.noaa.gov/seg/fliers/se-0801.shtml***

Global AVHRR-Derived Land Climatology. This set of two CDs features data based on the Advanced Very High Resolution Radiometer (AVHRR) of NOAA's Polar-orbiting Environmental Satellites. The CDs contain Monthly Mean Normalized Difference Vegetation Index, Precipitable Water Index, Calibrated Albedos from Channels 1 and 2, Calibrated Temperatures from Channels 4 and 5, Standard Deviations of the same parameters, and ancillary data. The monthly mean values were computed from the highest-quality values over the period 1985-94 and are designed for a variety of environmental studies. CDs are available from NGDC. ***http://www.ngdc.noaa.gov/seg/fliers/gutavhrr.shtml***

The Tropical Storms of 1996. The 1996 tropical storms were captured in numerous images recorded by the DMSP OLS. The highest-quality images nearest in time to each storm's maximum intensity were chosen for inclusion in three slide sets: *North Atlantic and Northeast Pacific Hurricanes, Northwest Pacific Typhoons*, and *Indian Ocean and South West Pacific Cyclones.* Images from the 14 most intense tropical storms are shown on a poster, *The Most Intense Tropical Storms of 1996.* Each image is accompanied by the vital statistics of the storm, including maximum wind speed, date and time of the image, latitude and longitude of the eye, and duration of the storm. Images are available from NGDC. ***http://www.ngdc.noaa.gov/dmsp/***

U.S.-Russian Arctic Atlases. In 1997, Vice President Gore announced a new Arctic atlas in a press conference at the National Geographic Society. This CD-ROM atlas contains fields of temperature and salinity compiled from data which include more than a million classified observations by the Russian and U.S. Navies. The atlas is the result of the work of the Joint Commission's Environmental Working Group (EWG) Subgroup on Arctic Climatology. NOAA's Under Secretary, Dr. D. James Baker, co-chairs EWG with a Russian counterpart. Since the release of the first, precedent-setting atlas, an additional atlas on summertime Arctic oceanography has been produced, and Arctic sea ice and meteorology atlases are being planned by Russian and U.S. scientists. NGDC's affiliated NSIDC is distributing the atlases. The first oceanography atlas can be viewed online at ***http://ns.noaa.gov/atlas/*** ***http://www-nsidc.colorado.edu/NSIDC/EWG/***.

Antarctic Multi-Channel Seismic Data. Nineteen CDs of Antarctic Multi-Channel Seismic (MCS) data are now available from the NGDC and World Data Center-A (WDC-A) for Marine Geology and Geophysics. These data were collected by international geoscientists as part of a Scientific Committee on Antarctic Research (SCAR) project to study Antarctic glacial history and its effects on global climate and sea levels. The data have been used to determine the geologic histories of Antarctica and adjacent ocean basins and to understand possible hydrocarbon occurrences in Antarctica. ***http://www.ngdc.noaa.gov/mgg/fliers/98mgg02.html***

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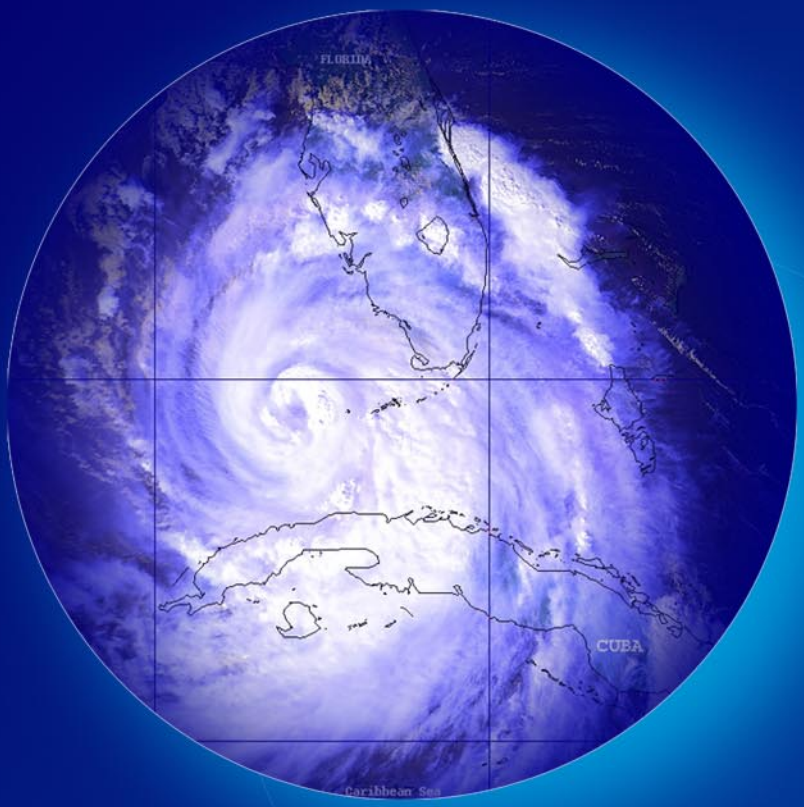
Acronyms

ABBA	Automated Biomass Burning Algorithm
ABI	Advanced Baseline Imager
ADEOS	Advanced Earth Observing System
AMSU-A	Advanced Microwave Sounding Unit-A
AMSU-B	Advanced Microwave Sounding Unit-B
AVHRR	Advanced Very High Resolution Radiometer
CAPS	Circumpolar Active Layer Permafrost System
CEOS	Committee on Earth Observation Satellites
CDA	Command and Data Acquisition
CLIVAR	Climate Variability and Prediction
COADS	Comprehensive Ocean Atmosphere Data Set
COL	Coastal Ocean Laboratory
COMPS	Customer Order Management Processing System
DMSP	Defense Meteorological Satellite Program
DOC	U.S. Department of Commerce
DOD	U.S. Department of Defense
EDRP	Environmental Data Rescue Program
EOS	Earth Observing System
EPA	Environmental Protection Agency
ESDIM	Environmental Services, Data, and Information Management
ESRI	Environmental Systems Research Institute
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
GEOSAR	Geostationary Earth Observing Search and Rescue
GFO	Geosat Follow-on
GIS	Geographical Information System
GOES	Geostationary Operational Environmental Satellite
GSFC	Goddard Space Flight Center
HIRS/3	High-resolution Infrared Sounder/3
HUSWO	Hourly United States Weather Observations
IDARS	Interactive Data Access and Retrieval System
IFFA	Interactive Flash Flood Analyzer
IGOS	Integrated Global Observing Strategy
INR	Image Navigation and Registration
INSAT	Indian National Satellite
IPCC	Intergovernmental Program on Climate Change
IPO	Integrated Program Office
LATEX	Louisiana-Texas Shelf Physical Oceanography Program
MCDW	Monthly Climate Data for the World
MCSST	Multichannel Sea Surface Temperature
MOBY	Marine Optical Buoy
MOCE	Marine Optical Characterization Experiments
MOU	Memorandum of Understanding
MSU	Microwave Sounding Unit
NASA	National Aeronautics and Space Administration
NCEP	National Centers for Environmental Prediction
NCDC	National Climatic Data Center
NDRI	Natural Disaster Reduction Initiative
NDVI	Normalized Density Vegetation Index

NESDIS	National Environmental Satellite, Data, and Information Service
NGDC	National Geophysical Data Center
NGS	National Geodetic Survey
NNDC	NOAA National Data Centers
NOAA	National Oceanic and Atmospheric Administration
NOAALINC	NOAA Library and Information Network
NOAAServer	NOAA Distributed Data and Information Server
NODC	National Oceanographic Data Center
NOS	National Ocean Service
NPOESS	National Polar-orbiting Operational Environmental Satellite System
NSIDC	National Snow and Ice Data Center
NVDS	NOAA Virtual Data System
OCL	Ocean Climate Laboratory
OLS	Operational Linescan System
OM	Office of Meteorology
OPD	Ocean Profile Database
OPI	Ocean Profile on the Internet
ORA	Office of Research and Applications
OSEI	Operational Significant Event Imagery
OSD	Office of Systems Development
OSO	Office of Satellite Operations
PMT	Photo Multiplier Tube
POES	Polar-orbiting Operational Environmental Satellite
SAA	Satellite Active Archive
SAB	Satellite Analysis Branch
SAMSON	Solar and Meteorological Surface Observation Network
SAR	Search and Rescue
SAR	Synthetic Aperture Radar
SARSAT	Search and Rescue Satellite-aided Tracking
SCAR	Scientific Committee on Antarctic Research
SCICEX	Scientific Ice Expeditions
SCP	Satellite Cloud Product
SDTS	Spatial Data Transfer Standard
SeaWiFS	Sea-viewing Wide Field-of-view Sensor
SEM	Space Environment Monitor
SOCC	Satellite Operations Control Center
SPIDR	Space Physics Interactive Data Resources
SSM/I	Special Sensor Microwave/Imager
SST	Sea Surface Temperature
TOMS	Total Ozone Mapping Spectrometer
USMCC	United States Mission Control Center
USGS	United States Geological Survey
VAAC	Volcanic Ash Advisory Center
WCRP	World Climate Research Program
WDC-A	World Data Center-A
WEFAX	Weather Facsimile
WOCE	World Ocean Circulation Experiment
WOD98	World Ocean Database 1998
YOTO	Year of the Ocean



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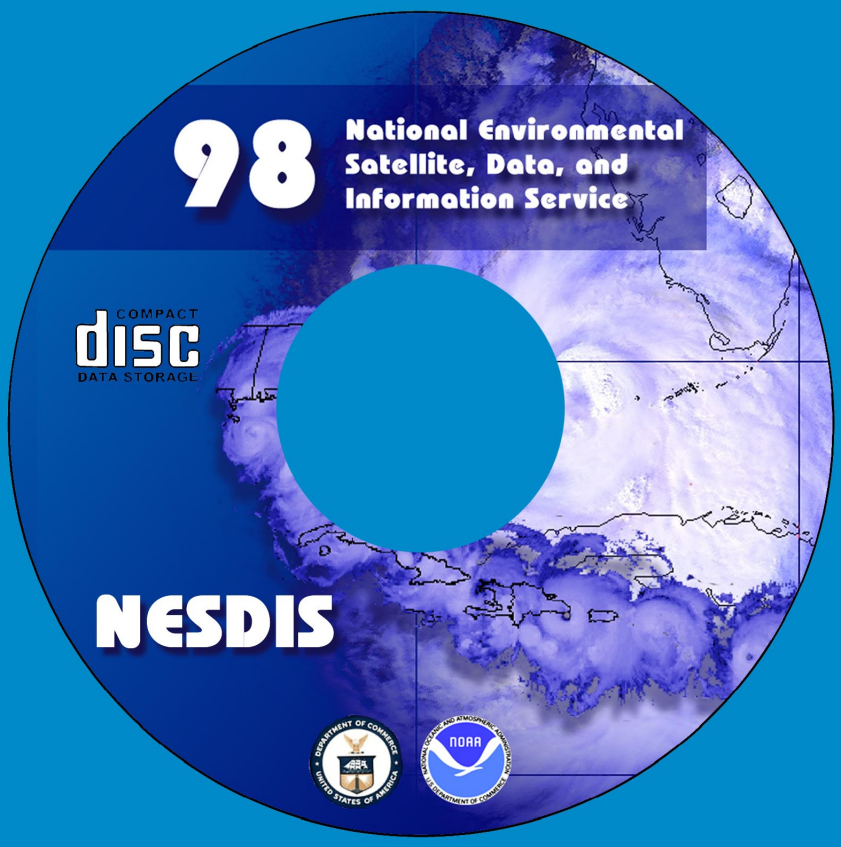
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