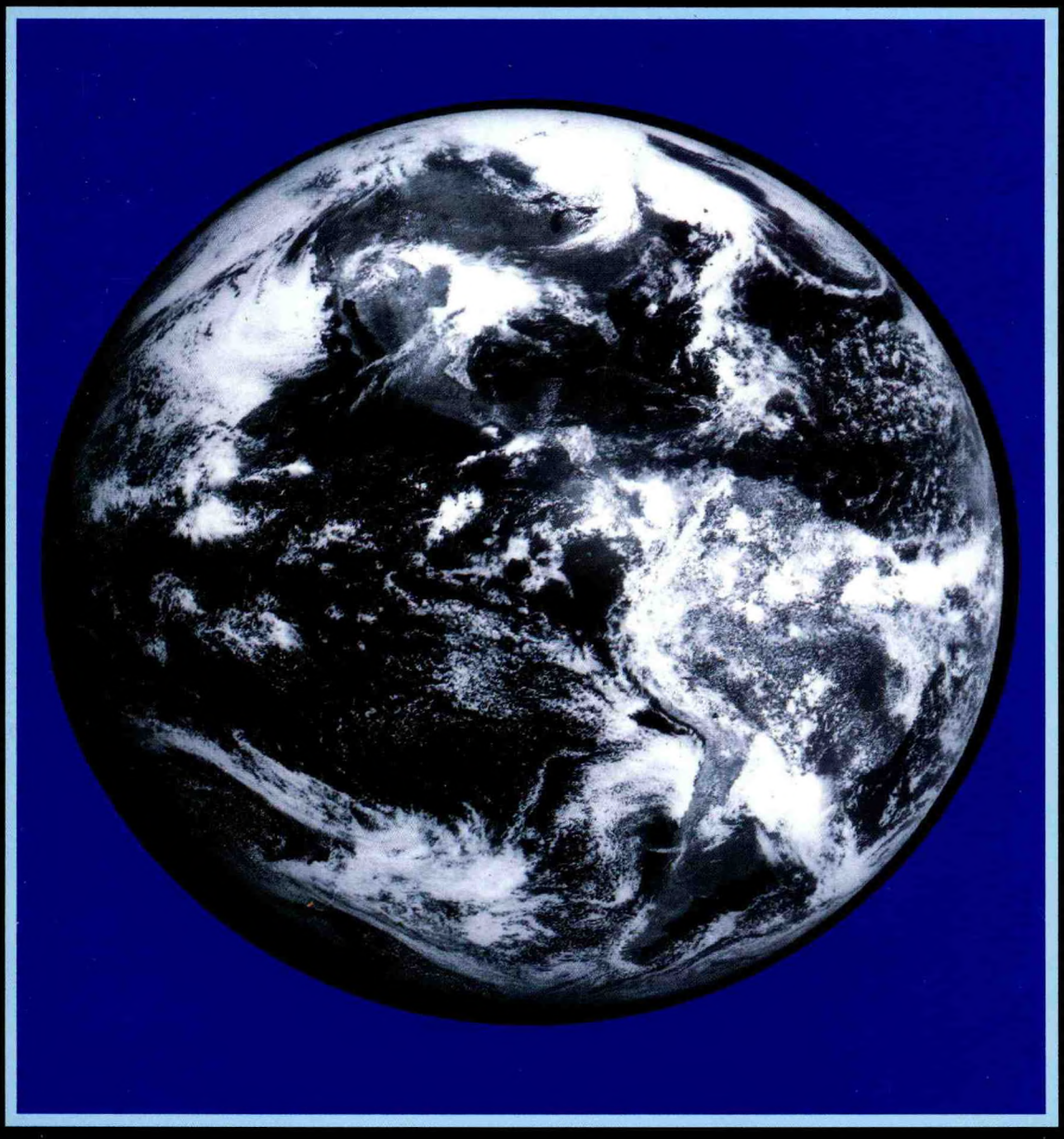
National Environmental Satellite, Data, and Information Service



1994

U.S. Department of Commerce

Fiscal Year 1994

April 15, 1995

U.S. DEPARTMENT OF COMMERCE
Ronald H. Brown, Secretary

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

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


VENTURA
LOS ANGELES
SAN DIEGO


NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NOAA
U.S. DEPARTMENT OF COMMERCE

Foreword

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND INFORMATION SERVICE
Washington, D.C. 20233

This report summarizes the accomplishments and highlights of the National Environmental Satellite, Data, and Information Service (NESDIS) of the National Oceanic and Atmospheric Administration (NOAA) in Fiscal Year 1994. It summarizes many significant activities undertaken during the past fiscal year, describes the NESDIS organization, outlines the many services provided by NESDIS, provides a brief history of our organization, and plans for the future. We welcome your comments.

Fiscal Year 1994 was highlighted by a variety of accomplishments indicative of the diverse nature of NESDIS and the commitment of our employees to serving the public. Examples of this very active year include the launch and operational demonstration of GOES-8, the first in a series of state-of-the-art geostationary weather satellites and a key element in the modernization of the National Weather Service; establishment of a new tri-agency program office in conjunction with the Air Force and the National Aeronautics and Space Administration to bring together the joint development and management of the Nation's polar orbiting environmental satellites in accordance with a Presidential Decision Directive; and continued expansion of data and information services with numerous new products and on-line services to better serve national and international users and decision makers to meet expanding needs for environmental data. These and other accomplishments amounted to an important year for NESDIS - a year in which all NESDIS employees can be proud.

I hope you will find this publication informative. We look forward to continuing to provide you with new and even better satellite and information services.

Robert S. Winokur
Assistant Administrator

OF THE EA

Generated Image of Color-Shaded Relief

World Data Center-A for Marine Geology and Geophysics
Report MGG-8 (1995)
Published by the National Geophysical Data Center

Data and Report MGG-8 available from:
National Geophysical Data Center
Code E/GC3
325 Broadway
Boulder, Colorado 80303-3328

NESDIS 1994

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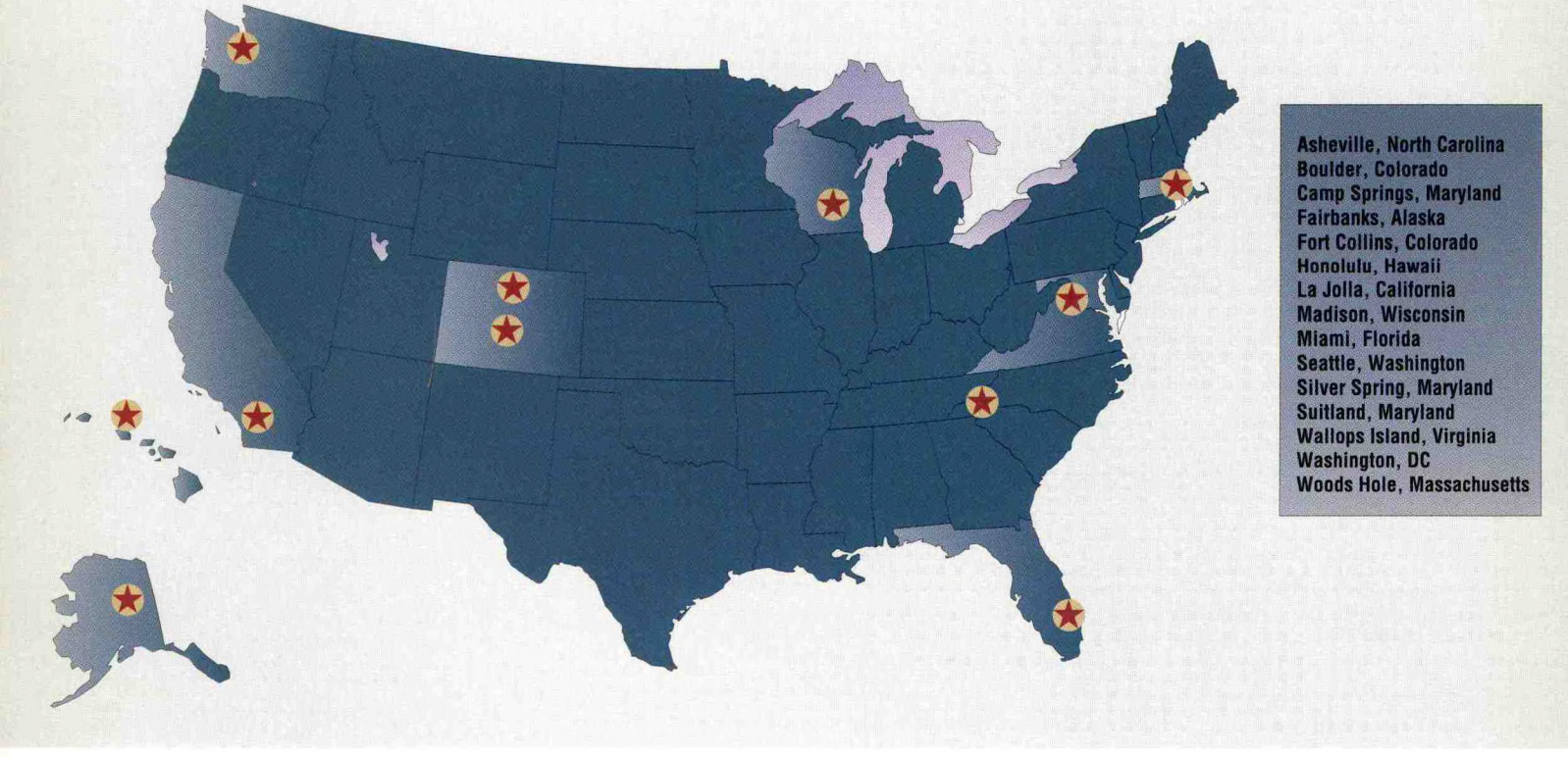


The National Environmental Satellite, Data, and Information Service (NESDIS) manages the U.S. civil operational Earth-observing satellite systems, and manages global data bases for meteorology, oceanography, solid-earth geophysics, and solar-terrestrial sciences. From these sources, it develops and provides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

I. Framework

The Evolution of NOAA and NESDIS

It was TIROS-1 (Television and InfraRed Observation Satellite) that literally "launched" the satellite age in 1960. This polar-orbiting satellite provided the earliest images of cloud patterns using a scanning InfraRed and VISible radiometer. The National Environmental Satellite Center, later called National Environmental Satellite Service, was created in 1965 to assume responsibility for the Nation's operational environmental satellite system. The first GOES (Geostationary Operational Environmental Satellite) was launched in 1974. Today, it is GOES satellites that provide the weather pattern images used by forecasters in their daily predictions. With the launch of the newest GOES series in 1994, the United States became the first nation to provide continuous viewing of weather patterns beyond its boundaries by using a tri-axis stabilized design for a geostationary satellite.

The Arcade Federal Building; home of the National Climatic Data Center in the late 1950's.

On a parallel course with weather observations, was the collection and archiving of these data. In 1908, the Weather Bureau's Climatological Division became the designated repository for all meteorological records. Today that office is the National Climatic Data Center, which maintains in its archives: approximately 320,000,000 pages of manuscript and autographic records; 2,500,000 microfiche; 195,000 reels of microfilm; 3,100,000 satellite film negatives; and 403,000 tapes/cartridges.

Two organizations created in the 1960s, the world's first National Oceanographic Data Center and the National Geophysical Data Center, came within the domain of NOAA in 1970. In 1982, NOAA's satellite and data management activities were merged to form the National Environmental Satellite, Data, and Information Service.

The NESDIS of Today

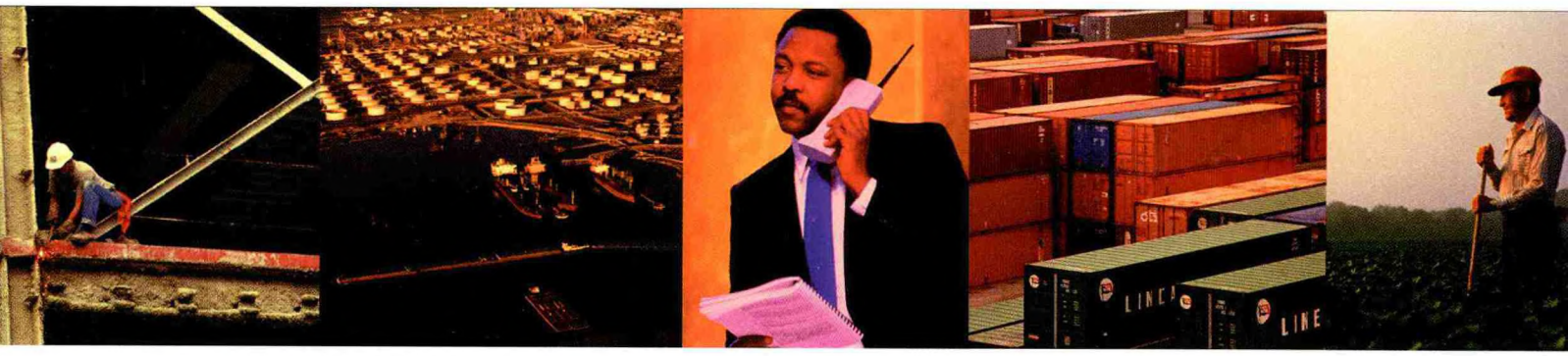
NESDIS is the world's largest civil operational, environmental space organization. We operate the nation's civil geostationary and polar orbiting meteorological satellites, and manage the largest collection of atmospheric, geophysical, and oceanographic data in the world.

Objectives of the operational satellite program include routine and reliable monitoring of the atmosphere and the ocean; sounding the atmosphere regularly and providing quantitative data for weather prediction services; providing continuous observations of severe weather conditions and environmental features in the western hemisphere; and collecting and relaying environmental data from remote platforms such as buoys, ships, automatic stations, gauges, and aircraft.

The Economic Impact of NESDIS

There is hardly a sector of society not affected in some way by NOAA environmental data. NESDIS operated satellites continuously survey the Earth, providing environmental information to protect life and property and to allow for informed economic decisions. Staring down at the United States through its automated telescopes from an altitude of 22,300 miles (35,800 kilometers), GOES satellites provide a constant vigil for hazardous weather. Tornadoes, flash floods, hailstorms, hurricanes, and winter snow and ice storms are detected and tracked by GOES visible and infrared eyes. Combining this information with other data, forecasters are

Below: NESDIS Satellite Operations Control Center employees send commands to GOES-8, the nation's newest geostationary operational environmental satellite.



able to issue more timely and accurate warnings and predictions, thereby reducing losses of life and property from severe storms. Polar-orbiting Operational Environmental Satellites (POES) provide daily atmospheric temperature observations of the entire Earth, enabling the National Weather Service to issue more accurate, longer range predictions. These forecasts are used by the general public, governmental agencies, and private industry to make more informed decisions, resulting in economic benefits to all weather-dependent sectors of the economy. POES observations of global ocean temperatures are making possible seasonal to interannual climate forecasts, with potentially profound economic implications to American agriculture, energy production, water resources, and fishing industries. Polar satellites monitor long-term global climate change, ozone depletion and land surface change, providing the nation with data needed for evaluating adaptation and mitigation strategies. Other nations, as well as schools, private sector companies, and military organizations, process satellite signals into value-added environmental data using commercially available ground stations.

The three national data centers housed within NESDIS conduct what might be called a "data recycling" operation. They increase the economic return on taxpayer dollars spent to collect environmental data by saving those data for future use and reuse. Typically, environmental data are collected to meet specific operational or research needs such as weather forecasting or studies of global ocean circulation. After the weather forecaster, research oceanographer, or other primary user has applied the data to the specific problem at hand, the data are then sent to the appropriate data center, where it is quality controlled and merged into large historical data bases. Once archived at the data centers, these data become permanently available to secondary users. The "recycled" data can serve many future uses and thereby strengthen the nation's economy. The data's value increases not only through reuse, but also because the time span of the environmental record grows through this steady accumulation of data. Is Earth's climate getting warmer? Is ozone being depleted from the upper atmosphere? To answer questions such as these about changes in the Earth's environment, data collected today must be compared to data taken over a sufficiently long time span in the past. The historical environmental record maintained by the national data centers provides this standard of comparison

and gives me aning and context for the environmental measurements being collected daily around the globe.

In the U.S., no airplane flies, no ship sails, no building is constructed, no roadbed is laid, no dam is built, no power plant is developed and no crop is planted without referring to information derived from NOAA data archived at these data centers. Global competitiveness, sustainable development, and climate change assessment require timely, high quality, and easily accessible data and information. In the marine industry, use of our data can create fuel savings by changing ship routing to account for ocean current patterns; identify areas favorable to fishing; preview hazardous storm conditions so that advisories can be issued; indicate a window for favorable winter operations before ice closes down shipping lanes; and help determine the safety of recreational boating. The agricultural industry uses our data to generate crop freeze warnings and recommendations for planting, and weed and pest control.

Above: GOES-8 launch over Melbourne, FL
Below: U.S. Department of Commerce, Washington, D.C.

In the construction trade, use of environmental data can assist in scheduling roofing and exterior work, pouring concrete, and assessing the need to stockpile supplies. For the utilities industry, the use of our data can project peak load usage. In hydroenergy, satellites can minimize flood damage by warning of major storms and allowing time to lower basin levels. Within the aviation industry, the use of satellite and in situ data can assist both large airline carriers and small aircraft owners in saving fuel by providing information to assess optimum routing, determining flight schedules and cancellations due to weather conditions.

In short, whether discussing data centers or satellites, taxpayers receive an excellent return on their dollar when investing in NESDIS.

NESDIS: An Integral Part of NOAA's Vision

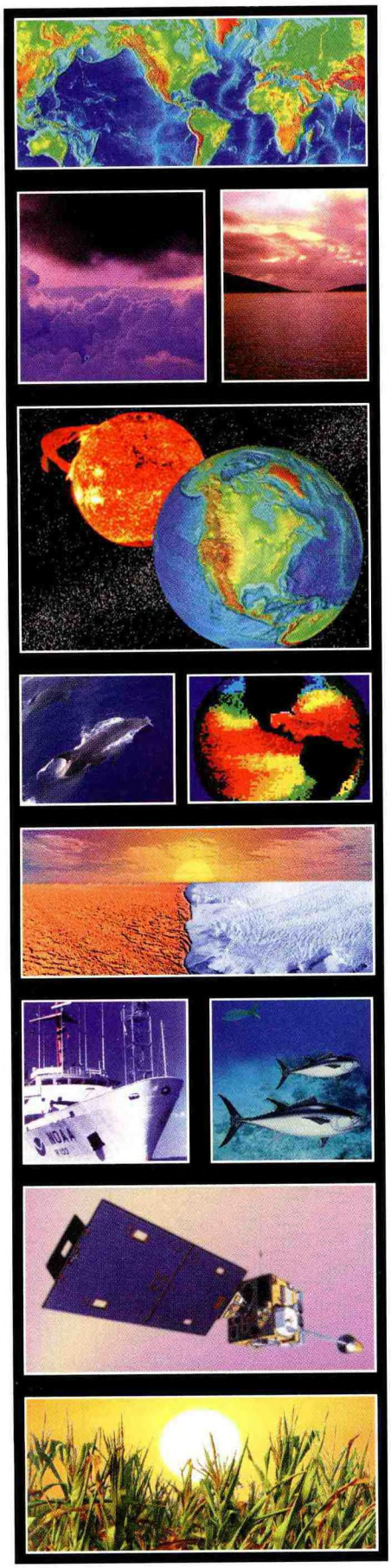
NOAA has set forth a vision for the year 2005 of a world in which societal and economic decisions are connected strongly to a comprehensive understanding of the environment. NOAA envisions a 21st century in which environmental stewardship, assessment, and prediction serve to enhance economic prosperity, overall quality of life, protection of life and property, and the balance of global trade.

NOAA's Strategic Plan defines the goals and objectives we have undertaken to fulfill this vision. The program strategy consists of seven interrelated program elements. While each element is a coherent unit, there are important crosscutting relationships that facilitate the implementation and advancement of Federal, U.S. Department of Commerce, and NOAA goals. The elements are grouped under two portfolios. Environmental Stewardship and Environmental Assessment and Prediction. NESDIS programs contribute to all elements.

NESDIS plays a particularly critical role in all elements of the Environmental Assessment and Prediction Portfolio, which is concerned with observing and predicting the future state of the natural environment. Our society makes daily choices based on the current and projected natural environment. Individuals make personal decisions, while local, state, and Federal government agencies make policy and program decisions that can have long-term and costly implications. The portfolio provides predictions of the natural environment on scales ranging from minutes to centuries. Based on these predictions, personal, policy, and programmatic decisions are debated and made.

Predictions are derived from computer models of the atmosphere, ocean, and space. These models rely heavily on accurate specification of initial environmental conditions. Initial conditions are currently specified by a mix of surface and space observations. To provide the necessary space observations, NESDIS manages an environmental satellite system, generates information from the observations, and distributes the data and data products.

Operational models that can link the ocean and atmosphere are becoming more sophisticated. The importance of specifying initial conditions with high spatial and temporal



resolution over sparsely observed ocean areas will increase. Since this can only be accomplished cost effectively using remote sensing techniques, the data input NESDIS provides to operational and research models of the environment will become increasingly significant with time.

Most importantly, satellite sensors are able to continuously monitor areas experiencing, or conducive to, hazardous weather conditions. Phenomena such as severe thunderstorms, hurricanes, tornadoes, and winter storms have unique "signatures" as observed from satellites, and can thus be identified and evaluated. Satellite remote sensing is particularly effective in monitoring large-scale synoptic events.

By managing the national climatic, oceanographic, and geophysical global data bases, NESDIS provides data for establishing the natural variability of the environment. Without this knowledge, accurate trends in atmospheric ozone, carbon dioxide, temperature, and water content are impossible to detect and model accurately. Millions of environmental observations worldwide have been collected, documented, and exposed to quality control procedures by national data centers. These data sets provide the natural background variability against which predictive model trends should be measured.

These same national data center data bases support the Environmental Stewardship Portfolio. Once again, uses have been found for data collected by other programs. For example, coastal weather observations taken decades ago to improve weather forecasting are now being "recycled," to define an earlier state of the local environment, and to allow analysis of the changes. Other NESDIS products such as the vegetation index – a measure of plant growth as determined from satellite data – are useful in supporting ecosystem analysis. NESDIS products expand the spatial and temporal horizons of coastal ecosystem analysis. By developing, using, and promoting these remote sensing, monitoring, and assessment techniques worldwide, NESDIS fosters better environmental stewardship. This in turn, enhances our ability to work cooperatively with the rest of the world in data collection and to define common scientific and environmental approaches to problems.

As curators of the Nation's data resources, NESDIS supports all elements of the NOAA Strategic Plan. NESDIS provides a crucial coordinating role to ensure that all NOAA programs are capable of accessing and exchanging data and information products. In addition, these products are made available to the entire nation in a fast and user-friendly way. Access to the information highway must be ensured to bring geographically dispersed environmental data and information together

for a wide range of users. Global economic competitiveness, sound environmental policies, and improved efficiency through intelligent use of the environment hinge on rapid exchange of reliable environmental data and information.

National Environmental Satellite, Data, and Information Service

NESDIS is comprised of the following units:

The Office of Satellite Operations directs NOAA's weather satellites and the acquistion of remotely sensed environmental data. It manages the Satellite Operations Control Center (SOCC), and Command and Data Acquisition (CDA) facilities that command, control, and track these satellites, and acquire their data.

The Office of Satellite Data Processing and Distribution (OSDPD) directs the operation of NESDIS central ground facilities. This office also processes and distributes current weather satellite data and related products to the National Weather Service, as well as other domestic and foreign users. Direct broadcast systems on NOAA's weather satellites enable users to receive images and weather charts directly from the satellites, with relatively low-cost equipment.

The Office of Research and Applications (ORA) conducts research and development in satellite remote sensing. It develops algorithms for generating atmospheric and oceanographic products from satellite observations, demonstrates new environmental applications of satellite data, plans future satellite instruments, and trains weather forecasters in the use of weather satellite data.

The Office of Systems Development (OSD) plans, acquires and integrates new or improved satellite ground systems to take advantage of technological advances and to meet current and future needs.

The National Climatic Data Center (NCDC) is the collection center and custodian of all U.S. weather records, including satellite data, and is the largest climatic center in the world. It acquires, processes, archives, analyzes, and disseminates global climatological data; develops analytical and descriptive products to meet user requirements; and operates World Data Center-A (Meteorology).

The National Oceanographic Data Center (NODC) houses the world's largest collection of oceanographic data. It acquires, processes, archives, analyzes, and disseminates global oceanographic data; develops analytical and descriptive products to meet user requirements; and operates World Data Center-A (Oceanography).

The National Geophysical Data Center (NGDC) acquires, processes, archives, analyzes and disseminates global solid Earth and marine geophysical data, as well as ionospheric, solar, and other space environment data. It also develops analytical, climatological, and descriptive products to meet user requirements; and operates World Data Center-A (Glaciology, Solar-Terrestrial Physics, Solid Earth Geophysics, Paleoclimatology, and Marine Geology and Geophysics).

Satellite Operations

Polar and geostationary satellite operations are conducted 24 hours a day, 7 days a week with a ground system availability greater than 99%. During normal operations, the Satellite Operations Control Center (SOCC) controls all command and data acquisition activities of the polar and geostationary systems by means of an autonomous daily schedule. The Command and Data Acquisition (CDA) stations at Wallops Island, Virginia and Fairbanks, Alaska are each capable of acquiring imagery and telemetry data, and of commanding two polar-orbiting satellites simultaneously. Only the Wallops Island CDA station supports the geostationary spacecraft, and can support three geostationary satellites simultaneously. Satellite control systems at SOCC support this spacecraft operations loading using advanced computer systems. All systems at SOCC and the CDA stations have at least one level of redundancy to ensure operations reliability. High-speed communication circuits connect SOCC to each CDA station for the flow of telemetry, command, and imagery data.

Geostationary Operational Environmental Satellites (GOES)

NOAA's operational weather satellite system is composed of two types of satellites: Geostationary Operational Environmental Satellites (GOES) for short-range warning and "now-casting;" and, polar-orbiting satellites for longer-term forecasting. Both types are necessary for providing a complete global weather monitoring system.

GOES provides continuous monitoring necessary for intensive data analysis. They circle the Earth in a geosynchronous orbit, meaning they orbit the Earth's equatorial plane at a speed matching its rotation. This allows them to hover continuously over one position on the Earth's surface. The geosynchronous orbit is about 35,800 kilometers (22,300 miles) above the Earth, high enough to allow the satellites a full-disc view. Because they stay above a fixed location, they maintain a constant vigil for atmospheric "triggers" of severe weather conditions such as tornadoes, flash floods, hail storms, and hurricanes. When these conditions develop, GOES monitors and tracks their movements.

Top: GOES satellite

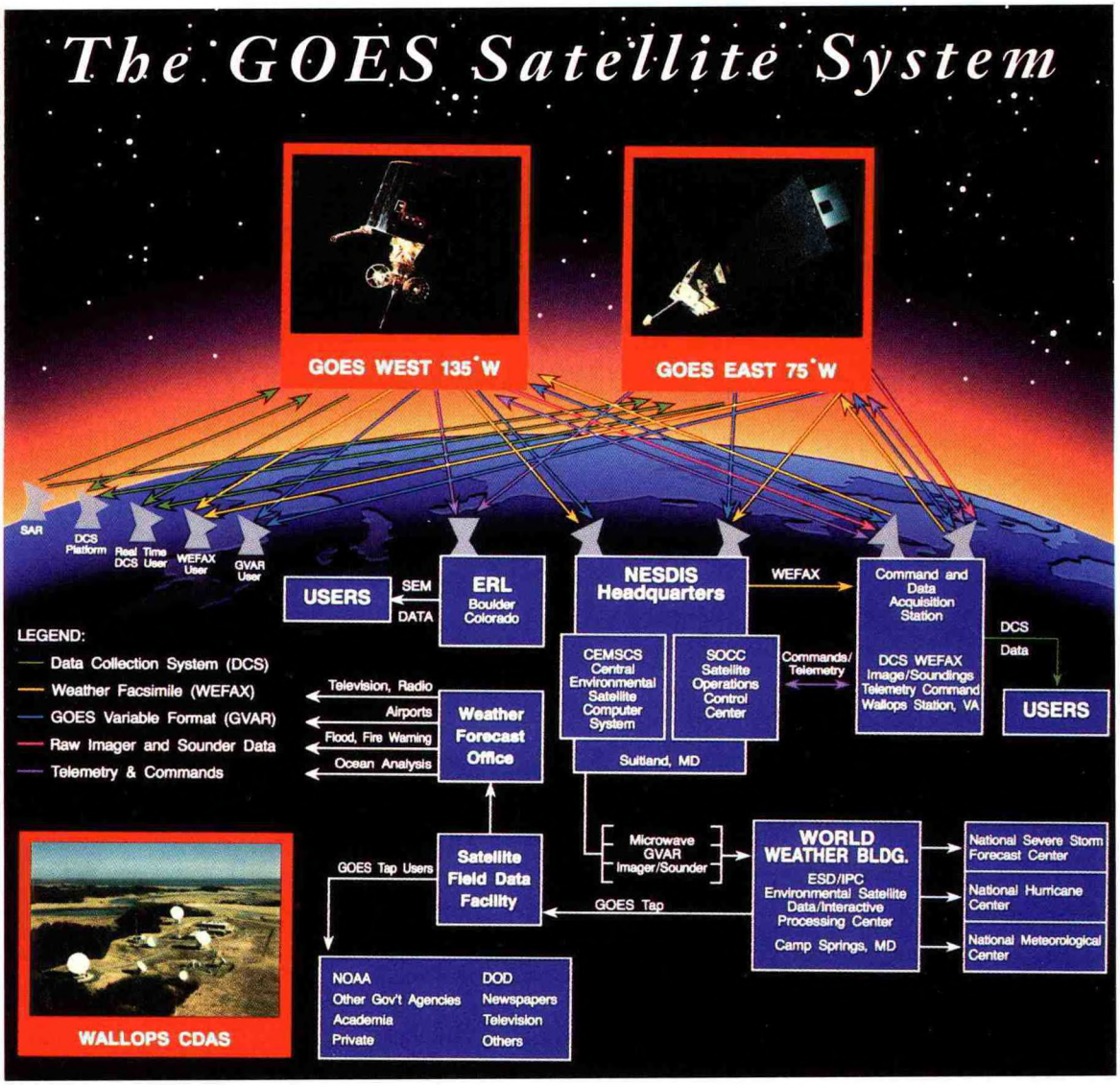
GOES imagery estimates rainfall during thunderstorms and hurricanes, as well as snowfall accumulations and overall extent of snow cover. Such data help meteorologists issue flash flood and winter storm warnings, and spring snow melt advisories. Satellite sensors also detect ice fields and map the movements of sea and lake ice.

The United States normally operates two meteorological satellites in geostationary orbit over the equator. Each satellite views almost one-third of the Earth's surface: one monitors North and South America and most of the Atlantic Ocean; the other monitors North America and the Pacific Ocean basin. The two operate together to send a full-face picture of the Earth, day and night. However, with the failure of GOES-6 in 1989, GOES-7 became this country's only operational geostationary satellite and it was repositioned midway over the United States.

In August 1991, METEOSAT 3 was moved from 5 to 50 degrees West above the equator to supplement NOAA's GOES system. In February 1993, it was moved to 75 degrees West. METEOSAT 3 was launched in 1988 and served as Europe's operational satellite until June 1989 when it was replaced by METEOSAT 4. It was developed for and operated by the European Space Agency on behalf of the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT).

GOES Ground System

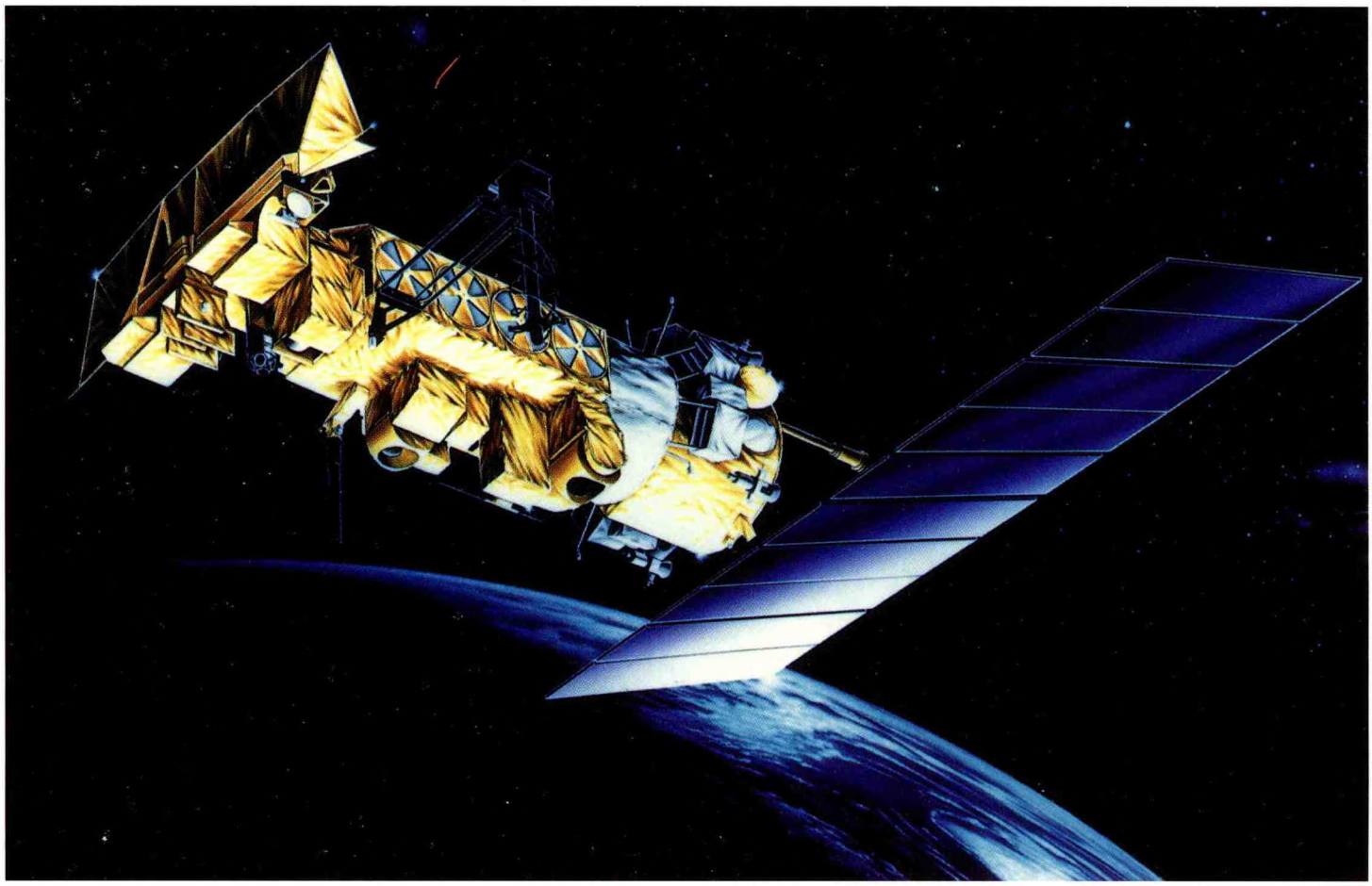
All control of the spacecraft is done from the Satellite Operations Control Center augmented by a backup satellite control system at



the NOAA Command and Data Acquisition Station in Wallops Island, Virginia. The ground systems that support the GOES spacecraft are divided into two parts: the GOES I-M Telemetry Command Systems (GIMTACS) handle all health and safety checks and commanding of the spacecraft, and the operational GOES equipment (OGE) performs instrument navigation and product assurance. GIMTACS also communicates with the OGE systems by gathering information in order to create daily operational schedules. The schedule is comprised of more than 5,000 commands to operate the GOES spacecraft and is executed from the GIMTACS system.

Polar-Orbiting Satellites

Complementing the geostationary satellites are two polar-orbiting satellites known as the advanced Television Infrared Observing System. Continuously circling the Earth in sun-synchronous orbit (450-mile altitude), these satellites support large-scale, long-range forecasts. They circle the Earth in an almost north-south orbit, passing close to

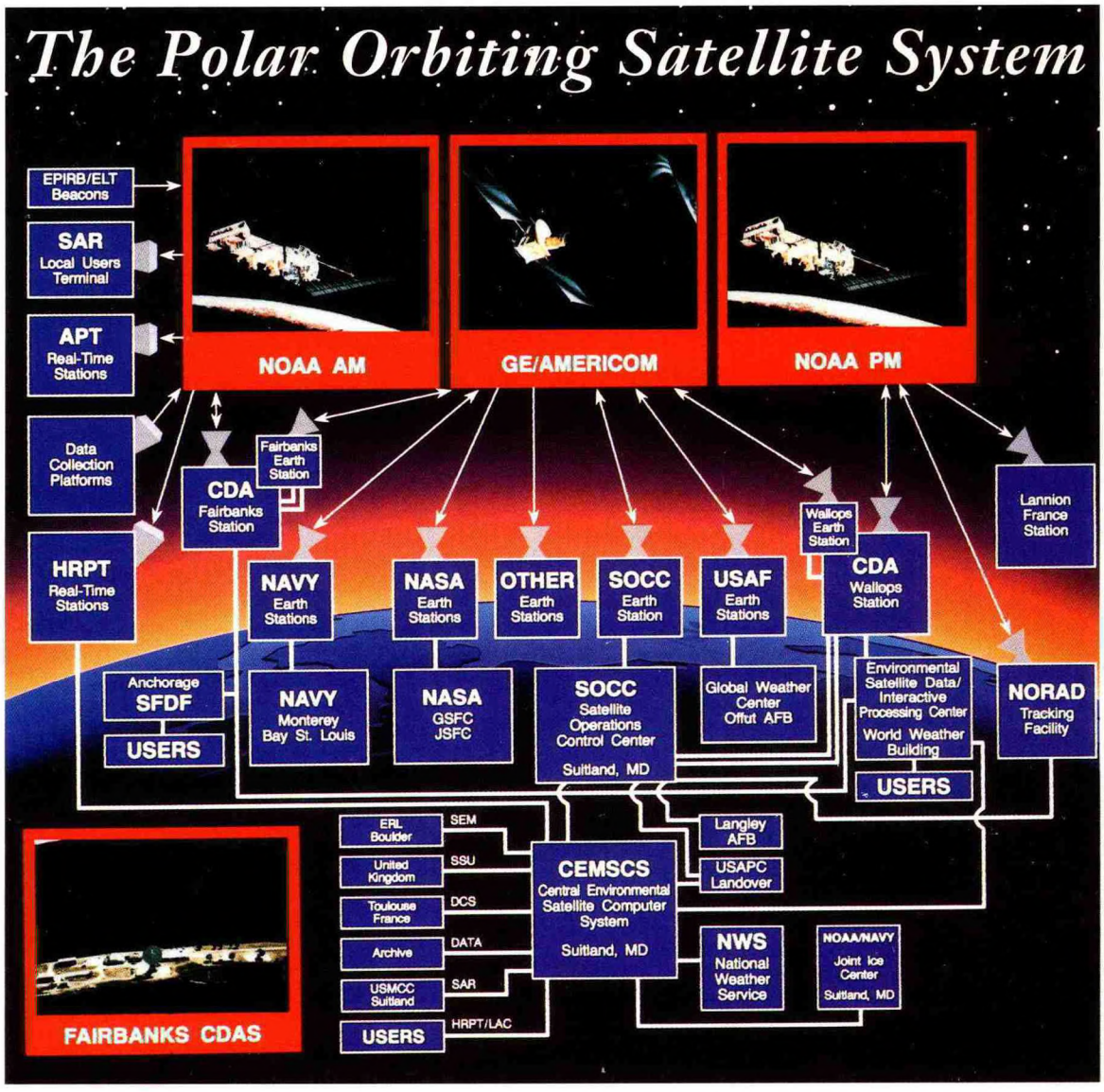


Top: Polar satellite

both poles. One crosses the equator near 7:30 a.m. and the other near 1:40 p.m., local time. Operating as a pair, these satellites ensure that non visible data for any region of the Earth are no more than 6 hours old.

The polar orbiters track atmospheric variables and patterns that affect the weather and climate of the United States and provide atmospheric data and cloud images. These satellites provide visible and infrared radiometer data used for imaging, radiation measurements, and temperature profiles. The polar orbiters' ultraviolet sensors provide information on ozone levels in the atmosphere and are able to detect the "ozone hole" over Antarctica. They send more than 16,000 global measurements daily to our Command and Data Acquisition (CDA) station computers. These add valuable information to forecasting models, especially for remote ocean areas where conventional data are lacking.

NESDIS currently operates two polar orbiters: NOAA-11, launched in September 1989, and NOAA-12, launched in May 1991. NOAA-14, launched December 30, 1994, will replace NOAA-11 when fully operational. Two satellites launched prior to GOES-8, NOAA-13, a polar orbiter, and Landsat 6, an Earth-resources satellite, both failed. Controllers lost contact with NOAA-13, 12 days after it was launched in August, and Landsat 6 never reached orbit.



Polar Ground Systems

At the Satellite Operations Control Center, the automated features of polar-orbiting system operation are supported by the Polar Acquisition and Control Subsystem (PACS), a computer-based, real-time control system.

The PACS processes and displays spacecraft health and safety telemetry for operator monitoring, and generates commands for controlling spacecraft subsystems.

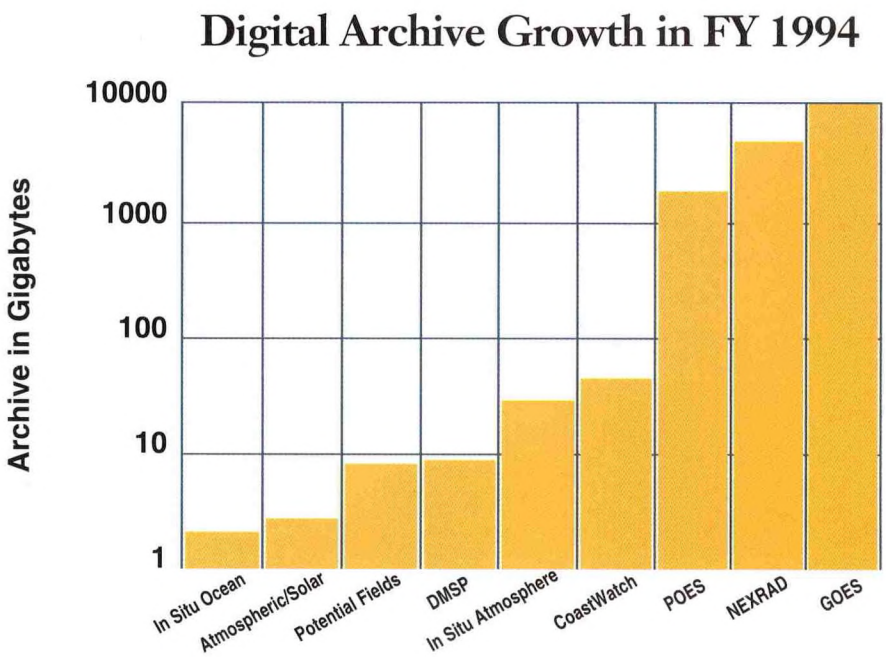
Radio Frequency

Within NESDIS, the Radio Frequency Management Division represents the interests of all bureaus and offices of the Department of Commerce in the broad field of telecommunications. This involves national and international allocation of radio frequencies, and the establishment of related operating procedures and technical standards. The Division is responsible for representing the Department on international, national and interdepartmental committees dealing with telecommunica-

tions policy and related technical matters. The Division is also responsible for the procurement, assignment and protection from harmful interference of all radio frequencies employed by the various DOC bureaus and offices and the maintenance of the master radio frequency records of the Department.

National Data Center Operations

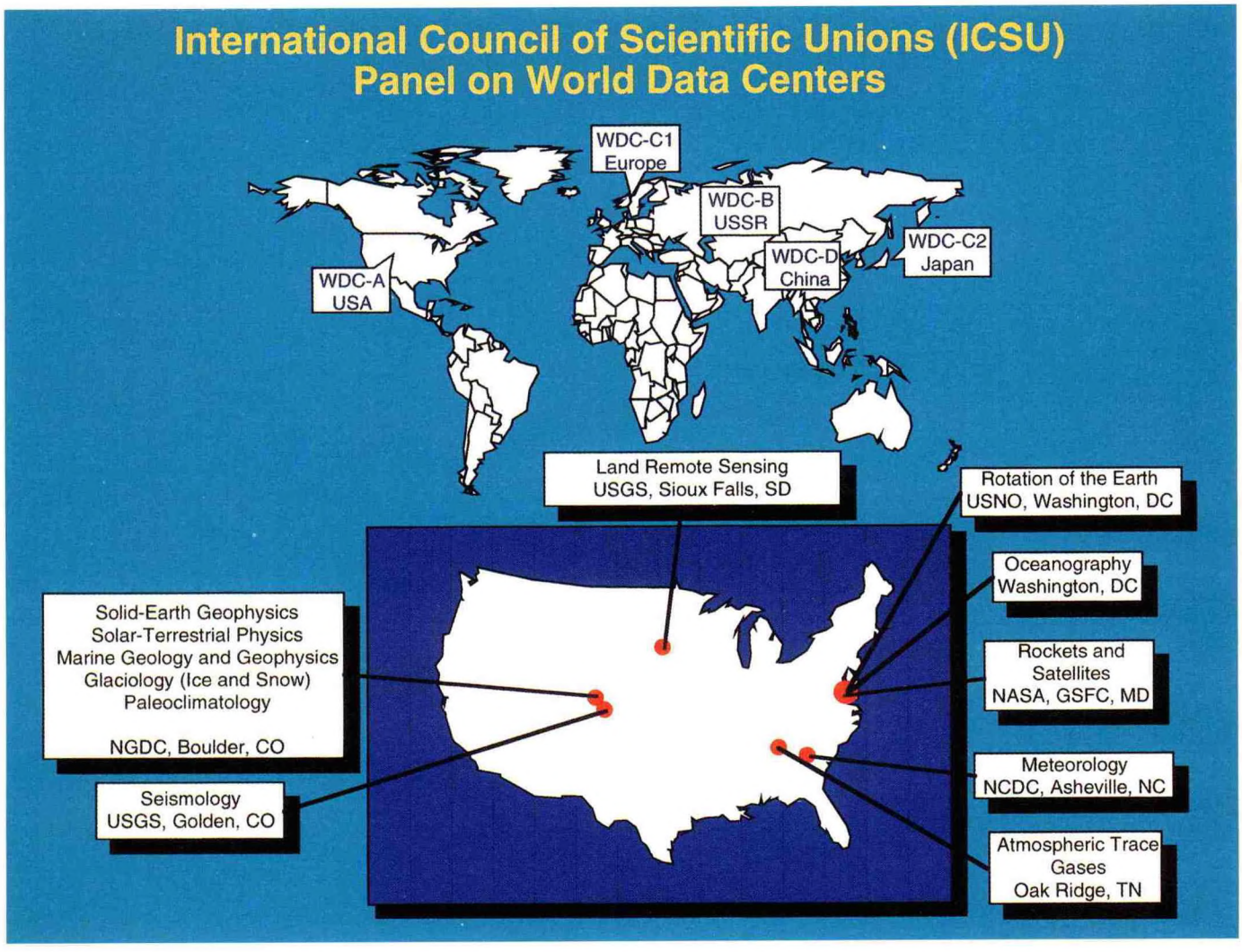
The three National Data Centers, NCDC, NODC, and NGDC, housed in NESDIS are responsible for the long-term archiving and distributing of the Nation's atmospheric, oceanographic, and geophysical data. Sources of these environmental data are global weather observing networks, operational environmental satellites, and field research programs; Federal, state and local agencies; international partners; private industry; and academia. These data arrive at the data centers on a variety of media as well as via telecommunications networks. The total archive of the three centers expands by approximately 60 gigabytes per day. The data centers distribute information in a variety of hard copy and digital forms. Increasingly, the distribution mediums are CD-ROM and electronic networks (Internet). Each year the data centers respond to more than 160,000 user requests for information. These requests are filled by telephone or facsimile; network transfer via World Wide Web, FTP, Gopher, Telnet and Wide Area Information Server; mailed digital media such as tapes or CD-ROMs; as well as mailed manuscripts or other hard copy.



World Data Centers

World Data Centers (WDC) first came into being in 1957 as part of the International Geophysical Year (IGY). The basic purpose for creating WDCs was to ensure that observational data from the IGY program would be readily available to scientific workers in all countries. The arrangement worked well and the WDC system was continued on a permanent basis to deal with relevant data collected after the IGY. The current World Data Center system includes about 44 individual centers funded by national institutions located in host countries around the world. NESDIS operates 7 of the 12 discipline centers in the U.S. The WDCs operate under guidelines established by the International Council of Scientific Unions (ICSU) Panel on World Data Centers, and its predecessor bodies.

Data available through the WDCs are used by scientists and engineers worldwide. Users usually pay a nominal cost to receive data



but providers of data to the WDC system normally receive data at no charge on an exchange basis. The WDCs depend upon the voluntary contribution of data and information from scientists and institutions worldwide.

The national data centers in NESDIS and their collocated WDCs frequently host international visitors who come to work on specific projects or to receive training in environmental data management. These visiting researchers and trainees often bring data from their home institutions and add them to the archives, where they become available to the public.

NOAA Library

In June 1993, the NOAA Central Library, also a part of the NESDIS organization, relocated to the second floor of the NOAA Silver Spring Metro Center #3, 1315 East-West Highway, Silver Spring, Maryland. This state-of-the-art facility provides access to automated records of the NOAA Library and Information Network, and to other scientific databases and files linked by a local area network.

The library maintains more than one million books, journals, technical reports, micro-

fiche, compact discs, and databases that support research in the atmospheric sciences, climatology, fisheries, hydrography, marine biology, meteorology, oceanography, and related topics. Much of the collection is available on open stacks, but some older documents dating back to 1482, are preserved in climate controlled conditions.

The library also provides extensive electronic interlibrary loan services, and electronic access to databases, files, and e-mail service.

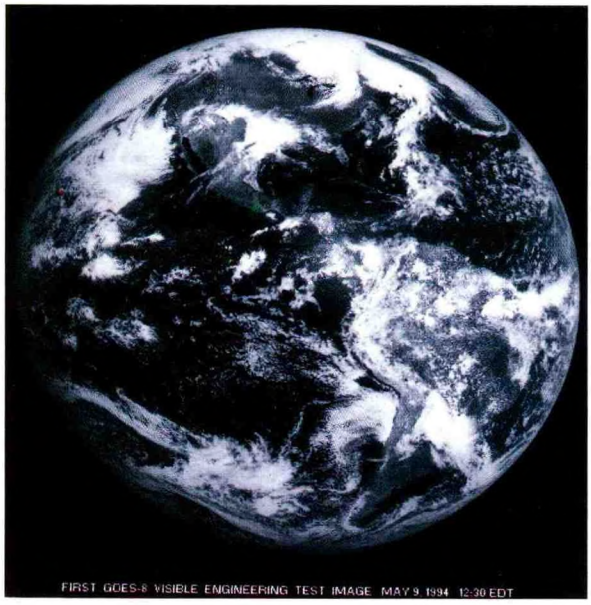
The library is an important resource for NOAA staff and the public. NOAA staffers have priority, but anyone is welcome to use the facility and may borrow materials through the library's interlibrary loan system. The library user community includes NOAA, academia, the general public, industry and other government agencies. In 1994, approximately 60 percent of information requests originated from outside NOAA.

For in-depth information retrieval, the library provides a computerized literature service including CD-ROM and on-line retrieval from more than 500 data bases. The centralized and automated NOAA Library and Information Network Catalog (NOAALINC) can also be accessed from a personal computer via modem. NOAALINC includes information on the availability of materials in NOAA libraries throughout the country.

The library collection also maintains materials generated by its predecessor agencies: Coast and Geodetic Survey, U.S. Weather Bureau, U.S. Fisheries Commission, and Environmental Data Service. These materials date from 1820. Recently, the NOAA Central Library was designated as a Government Printing Office (GPO) Depository and consequently, a considerable number of GPO publications can be found there.

The library maintains regional libraries in the Miami and Seattle areas that serve multiple components of NOAA. The specialized collections of the Miami and Seattle Regional Libraries can be used for all types of atmospheric research as well as ocean studies.

II. Highlights of Fiscal Year 1994



GOES-8

GOES-8, the first of a new series of advanced geostationary meteorological satellites, was successfully launched on April 13, 1994 and began a new era in meteorological observations. This satellite's ability to do simultaneous imaging and sounding provides more precise and timely weather observations and atmospheric data than have ever been possible. A new 3-axis, stabilized design allows the satellite sensors to view the Earth continuously, compared to the older generation, spin-stabilized satellites like GOES-7 that viewed the Earth only five percent of the time. GOES-8, to be positioned at 75 degrees West longitude, provides improved coverage of the central and eastern United States. GOES-7, the current geostationary meteorological satellite that was launched 7 years ago, is still operational, having outlasted its expected life span. It will be moved to 135 degrees West early in 1995* to provide coverage of the central and western United States, including Hawaii.

The United States will reap many benefits from the launch of GOES-8. This satellite will aid forecasters by providing better advanced warnings of thunderstorms, flash floods, hurricanes, and other severe weather. Improved forecasts will save lives, preserve property, and benefit agricultural and commercial interests.

Opposite: GOES-8 launch, Cape Canaveral, FL

Above: First GOES-8 full disk image, May 1, 1994

**This move was accomplished in January 1995*

GOES-8 will provide meteorologists and hydrologists with detailed weather measurements, more frequent imagery, and improved atmospheric soundings. The data it gathers, combined with those from new Doppler radars, will make possible a revolutionary flood and water management system devised by National Weather Service hydrologists. This will greatly assist water resource managers as they make critical decisions about the allocation of precious water resources, particularly in western states.

The second satellite in the latest GOES series, GOES-J, is planned for launch in May 1995. It will replace GOES-7, which will be used as a backup. The next three satellites in the GOES series will be launched to support NOAA's dual-satellite geostationary observing system.

Polar-orbiting Satellite Convergence

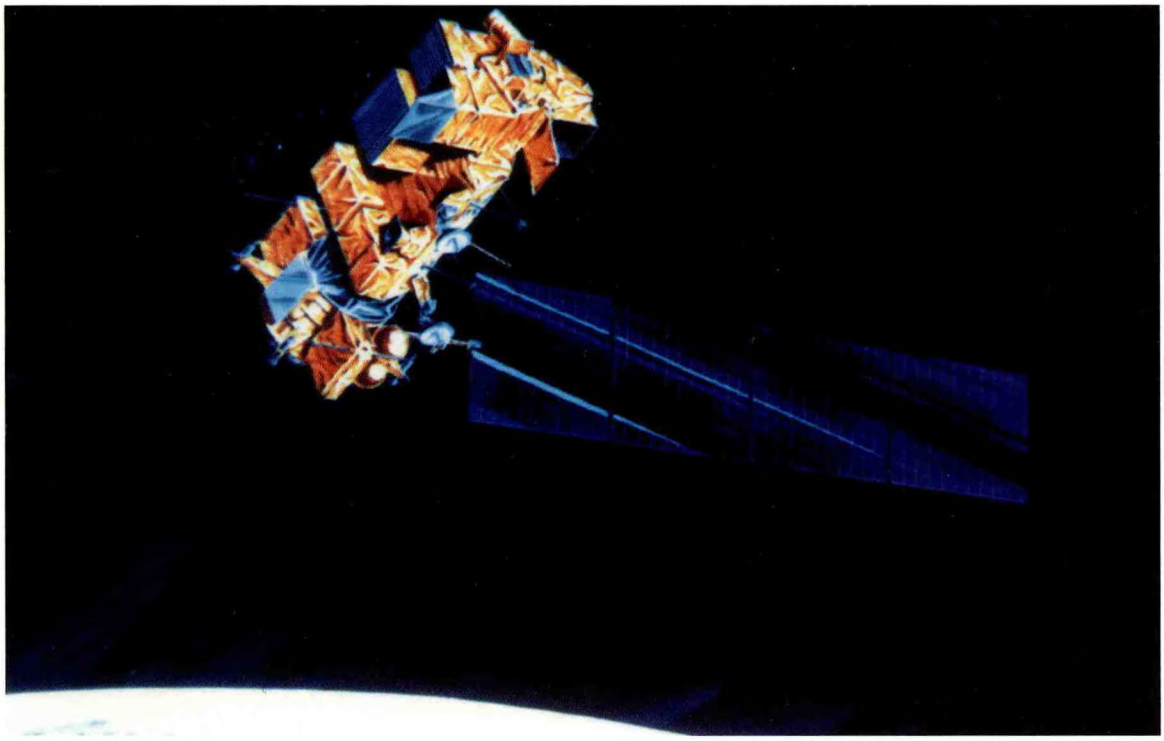
On May 5, 1994, President Clinton approved consolidation of the civil and military polar-orbiting, environmental satellite programs. This move was a key recommendation from the National Performance Review led by Vice President Gore. Presidential Decision Directive NSTC-2 calls for the Departments of Commerce and Defense to merge their polar-orbiting environmental satellite programs and for NASA, through its Earth Observing System, to provide new remote sensing and spacecraft technologies. The Department of Commerce, through the National Oceanic and Atmospheric Administration, has lead agency responsibility to the tri-agency Executive Committee for the converged system.

European Polar Satellite Participation

As a result of the President's decision, the United States will implement the converged system in a manner that encourages cooperation with foreign governments and international organizations. Key European partners – the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT), with appropriate involvement from the European Space Agency (ESA) – have been invited to consider a joint polar system, taking into account the consolidated U.S. system. This complements long-standing plans by NOAA and EUMETSAT to provide U.S. instrumentation for use on the European polar-orbiting environmental satellite series (METOP).

Landsat

Presidential Decision Directive NSTC-3, signed on May 5, 1994, provides for continuance of the Landsat program. This directive assures the availability of Landsat-type, quality data and reduces the risk of a data gap. A new Landsat strategy calls upon the Department of Commerce (through NOAA), the U.S. Geological Survey (USGS), and the



Above: Landsat satellite

National Aeronautics and Space Administration (NASA) to work together to implement a national strategy for Landsat remote sensing. Under this directive NOAA will continue the operation of Landsats 4 and 5 and the routine operation of future Landsat satellites. NOAA will seek better access to data collected at foreign ground stations for U.S. government and private sector users. Along with NASA, NOAA will manage the development of, and provide a share of the funding for, the Landsat 7 ground system.

Landsat 7 is the latest in a series of Earth remote-sensing satellites. This series has provided more than 20 years of calibrated, high spatial resolution data of the Earth's surface to a broad user community. These users include the agricultural community, global change researchers, state and local governments, commercial users, and the military. Landsat data have also been used worldwide by a network of international ground stations.

The Landsat 6 satellite, which failed to reach orbit in 1993, was intended to replace Landsats 4 and 5. These satellites are operating well beyond their intended 3-year lives and represent the only source of global, surface measurements comparable to previous long-term data records.

NASA will build the Landsat 7 spacecraft and ground system, and launch the satellite in late 1998. NOAA will co-manage development of the ground system with NASA and operate the space and ground segments after in-orbit checkout. The USGS will be responsible for archiving the data as part of the National Satellite Land Remote Sensing Data Archive.

Landsat 7 will provide a global archive of cloud-free, sun-lit land and coastal scenes. It will be updated on a seasonal basis to support regional and global change detection and

characterization. These data will be made available to the user community through the USGS EROS Data Center, located near Sioux Falls, South Dakota, at a cost expected to be significantly less than the current commercial cost of these data.

Commercial Remote Sensing

On March 10, 1994, Commerce Deputy Secretary Barram announced the Administration's new commercial, remote sensing capabilities policy contained in the Presidential Decision Directive entitled, "U.S. Policy on Foreign Access to Remote Sensing Space Capabilities." It addresses the licensing and operation of private remote sensing systems and the transfer of advanced remote sensing capabilities and sensitive technology. The policy allows for the commercial sale of remote sensing technology and covers foreign access to remote sensing space systems, technology, products and data. NESDIS coordinates commercial license requests by U.S. companies and reviews them on a case-by-case basis. The new policy is expected to increase global market access for American businesses.

Licenses have been issued to Lockheed Corporation, Ball Aerospace and Communication Group, and World View Imaging Corporation for a commercial remote sensing system and to Orbital Sciences Corporation for "Eyeglass" and "SeaStar."

Committee on Environment and Natural Resources-Research Task Force on Observations and Data Management

The Task Force on Observations and Data Management is a scientific committee under the larger Committee on Environment and Natural Resources-Research umbrella. It is one of nine research and development committees overseen by the President's National Science and Technology Committee. The task force is chaired by Charles Kennel, Associate Administrator for Mission to Planet Earth, NASA, and vice-chaired by Robert Winokur, Assistant Administrator for Satellite and Information Services, NOAA. The task force is a crosscutting entity comprising scientific organization subcommittee members, as well as other government agencies. The goal of the task force is to develop and oversee implementation strategies for U.S. components of an international global observing system. The system will provide global, regional, and local monitoring of the Earth's environment and its natural resources, and management of resulting and related data. To meet this goal the task force will coordinate development of an observations and data inventory; identify research observation and data systems requirements to eliminate gaps and overlaps; and promote development of a more comprehensive system of observations.

National Environmental Data Index

The National Performance Review and the National Information Infrastructure initiative recommended developing a National Environmental Data Index to improve access to government information. The Department of Commerce, through NOAA, was designated as the agency to lead this effort. NESDIS, along with the Committee on Environment and Natural Resources-Research (CENR-R) Task Force on Observations and Data Management will coordinate this activity with other government agencies to produce an implementation plan.

Climatic Data

The demand for basic climatic data and information services has been increasing annually. The National Climatic Data Center (NCDC) now services over 140,000 requests annually for data and information. Due to a particularly large increase in requests from the research community, NCDC has formed the Research Customer Service Group, specializing in providing data services support for domestic and foreign climate research institutions. NCDC has integrated information about its data and services into the NOAA Master Directory as well as the NCDC On-line Access and Service Information System (OASIS). The popularity of on-line data continues to grow and NCDC will expand its services accordingly. An increased number of in situ data sets will be made available via on-line access. State-of-the-art telecommunications and Internet will improve on-line browse and access for in situ and remotely sensed data. In FY 1995, NCDC and the Office of Satellite Data Processing and Distribution plan to implement the operational Satellite Active Archive, an expanded version of the prototype demonstrated in FY 1994, making near-real time satellite data available on-line for browsing images and/or accessing and ordering data. Data can be transferred via computers or ordered for off-line delivery.

Above: A sample graph using CLIMVIS – the Climate Visualization system, an interactive graphing tool designed to allow visual browsing of the data available on-line at the National Climatic Data Center.

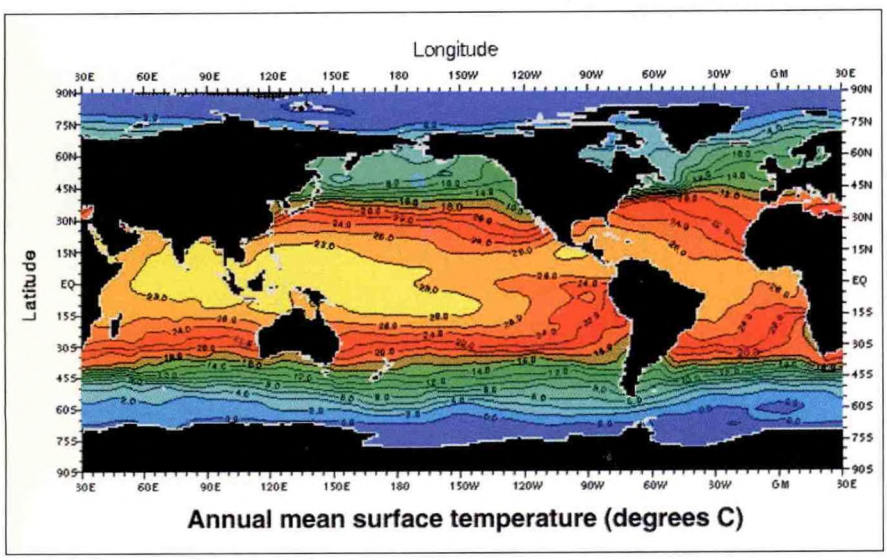
Oceanographic Data

In 1994, the National Oceanographic Data Center (NODC) published the *World Ocean Atlas 1994*. This global oceanographic climatology of physical and chemical parameters in atlas and digital form is a major accomplishment in the study of ocean natural variability.

NODC, on behalf of the Intergovernmental Oceanographic Commission (IOC), has also undertaken a project to locate and preserve historical oceanographic data. To support the Global Oceanographic Data Archaeology and Rescue (GODAR) project, NODC published *Results of the NODC and IOC Oceanographic Data Archaeology and Rescue Projects: Report 1* (1994). This publication is the first in a planned series that provide distribution plots and summaries of NODC's data holdings. This information will help the worldwide oceanographic community identify data not yet included in NODC's digital data archives. In March 1993, the GODAR project was endorsed by the IOC. The U.S. NODC World Data Center-A, Oceanography, was designated as the project leader. The success of initial GODAR activities has already resulted in submission to NODC of 1.5 million temperature-salinity profiles from nine countries.

During FY 1994, over 36,000 users accessed NODC data and resources and 741 gigabytes of digital data were distributed to customers. CD-ROM continues to be an increasingly important medium for disseminating large ocean data sets. In FY 1994, NODC released 17 individual disks holding several ocean data sets and other products, and established Gopher and World Wide Web servers on the Internet. These contain information about NODC, its products and services and will also enable basic data browse and electronic data ordering services.

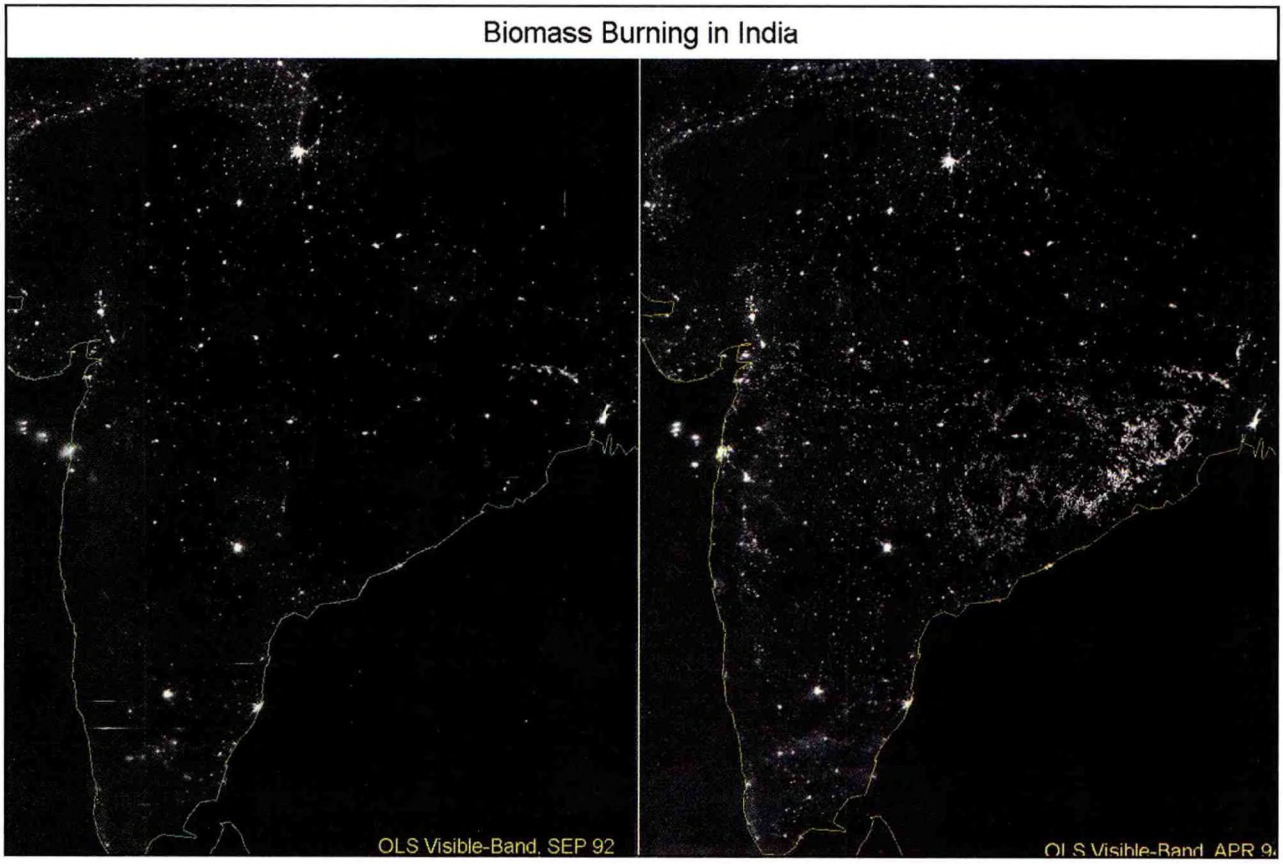
Below: This climatological global analysis of sea surface temperature was derived from millions of ocean temperature measurements in the NODC archives.



Geophysical Data

The National Geophysical Data Center (NGDC) processed more than 21,000 traditional requests for data and information in addition to electronically transferring more than 742,000 files via its Geophysical On-Line Data (GOLD) system that became operational in FY 94.

NGDC developed and implemented a nationally recognized data system to process all Defense Meteorological Satellite Program (DMSP) data received from Air Force Global Weather Command's (AFGWC) operational satellites. The center is also collaborating with AF Phillips Laboratory and Colorado State University to develop cloud algorithms using these data. DMSP data are also being used to monitor global biomass burning, and to identify and locate fires on a daily basis.



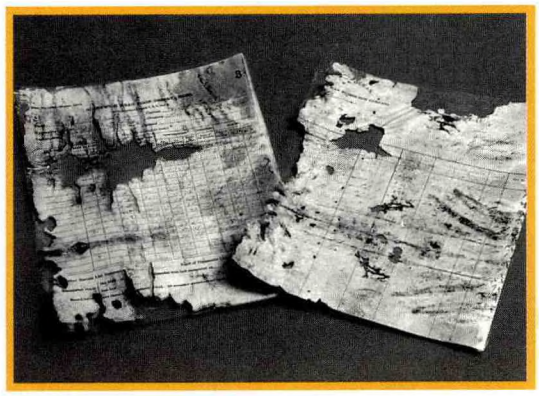
Above: Biomass Burning image of India

During 1994, NGDC focused on developing products such as the Global Change Data Base and the Global View Collection. These products link data disciplines and contribute to increasing awareness of the relationship between various environmental phenomena.

NGDC has acquired many paleoclimate databases derived from tree-rings, pollen and macrofossils, lake and bog sediments, ice core and other geological and biological sources. Digital data sets that have been enhanced with custom search and display capabilities along with other research tools, are currently being distributed to the paleoclimate community. The objectives of this effort are to cooperate with NOAA researchers, other agencies, and academia to describe global patterns of annual to millennial scale climate change; to identify and understand the causes of this climate change; to improve the ability to separate man-induced climate change from natural variability; and to validate models being used to predict future global climate change.

The National Snow and Ice Data Center received snow cover and meteorological data, as well as inventory data for more than 10,000 glaciers from the former Soviet Union. During 1994, the NGDC participated in the design and implementation of the data and information system at NOAA's new Center for Coastal Ecosystem Health in Charleston, South Carolina. NGDC is facilitating the acquisition and installation of computer hardware and software as well as network design and implementation.

Data Rescue

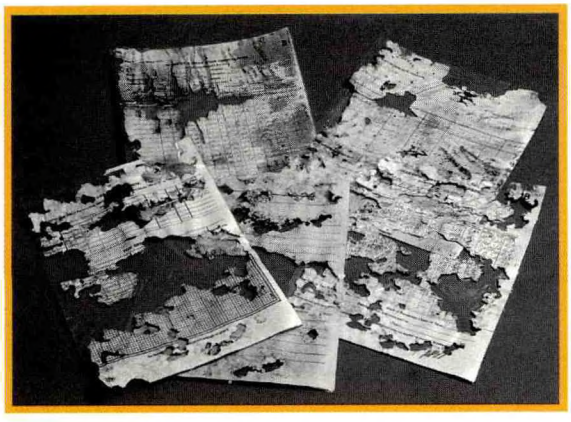


In addition to distributing data, NESDIS is responsible for acquiring them and making them accessible, understandable and useful to a broad spectrum of users including researchers, academia, lawmakers, and private industry. To do so, NESDIS has undertaken several data rescue projects.

Data rescue involves identifying critical data held by other organizations in danger of being lost either through neglect, lack of interest, or lack of resources. Ownership of these data is transferred to a NESDIS component for preservation. Rescue also includes transferring data in the data center archives from decaying to more stable media, or converting analog data to digital format to make them more accessible and useful to the user community. During the past 2 years, the data centers and libraries have converted paper data to digital format and made them widely accessible on-line.

This Page: The manuscript records show apparent damage possible from paper worms and silverfish.

Examples of data being rescued and transferred to NESDIS for archiving include oceanographic data obtained by Liaison Officers at five U.S. universities and NOAA laboratories; and glaciological, magnetic, and gravity data obtained through negotiations with officials of the former Soviet Union. International scientists visiting the data centers often bring data to contribute to NOAA's archive and assist in analysis and processing of the data prior to their public distribution.



With support from the IOC, NODC has acquired 1.5 million new oceanographic profile observations, representing a 25% increase in NOAA's archives of ocean temperature and salinity.

Several important climate data sets have been rescued from institutions and organizations in the former Soviet Union since data management has become less of a priority there. As a result, many long-term observational data sets are at risk of being lost. Rescued data include Russian snow cover, weather observations, glacier location and size and historical sea ice from the Russian Arctic Ocean areas. Data have been obtained from the Russian Academy of Sciences, Moscow University, and the Arctic and Antarctic Research Institute.

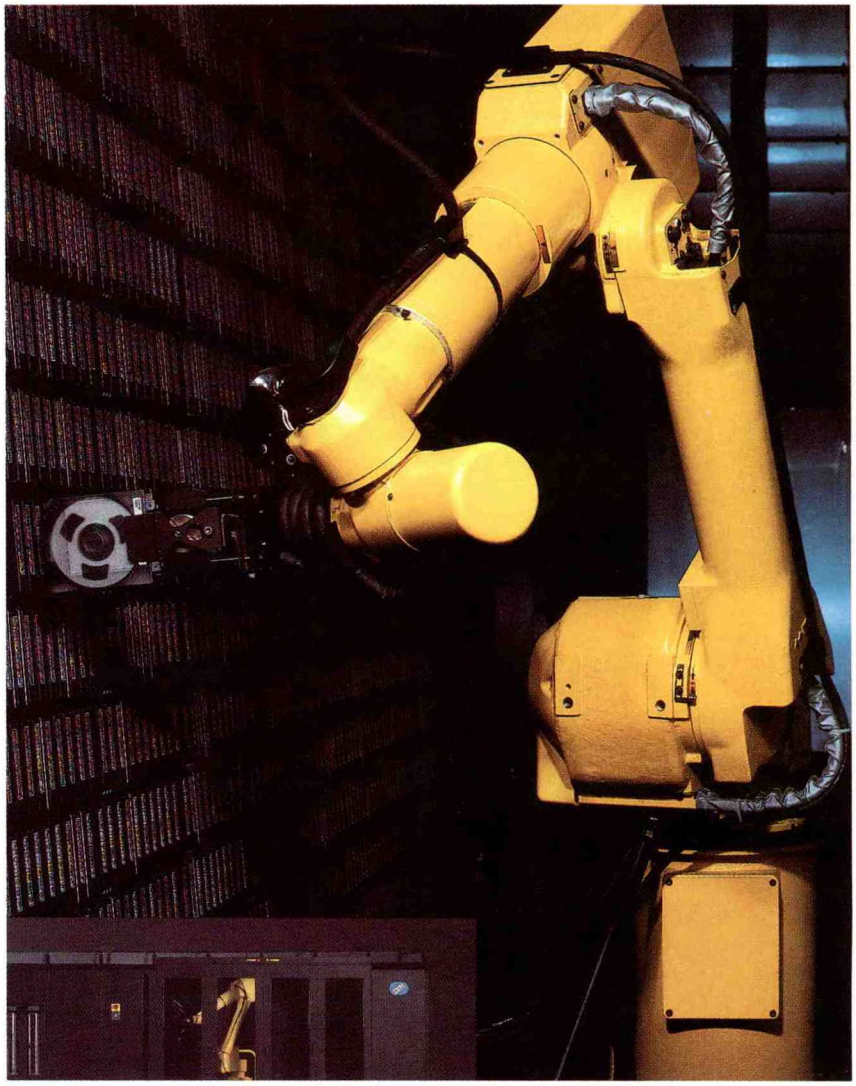
A Naval Oceanographic Office-supported program to rescue data from strategic coastal regions of the world was completed. Over 10 gigabytes of digital data, 500 reels of microfilm and an extensive bibliography were delivered to the Naval Oceanographic Office. In addition, a significant amount of new data was added to NGDC's coastal holdings.

A landmark data exchange agreement, made possible by the easing of restrictions on release of Russian data, was reached with the Russian National Marine Geological Data Center. As a direct result of this agreement, NGDC has received a large volume of marine sediment data.

New bathymetry for Lake Michigan at 5-meter contour intervals and 1:250,000 compilation scale has been completed as part of NGDC's data rescue program. This bathymetry utilizes the entire historical sounding data base and provides a view of the lake floor never before seen.

Satellite Active Archive (Polar)

During 1994, the prototype NOAA/NESDIS Satellite Active Archive (SAA) for polar orbiters became operational and now provides on-line access to NOAA satellite data. The SAA for polar orbiters system enables Internet users to quickly search, browse, order, and receive satellite data. Currently, only Advanced Very High Resolution Radiometer (AVHRR) data can be delivered over the network or mailed to users on a variety of media. Additional satellite and ground truth data will be made available through the SAA system. Future enhancements include a graphic user interface (GUI) being developed by NESDIS and a U.S. Geological Survey team at the EROS Data Center.



Above: An IBM 3495 tape library data server robot in action.

Automated Data Management

NESDIS built a satellite data processing and archive center with the goal of developing an environmental data access system that will make NOAA's massive volume of environmental satellite imagery and other products available to users across the Internet. The design utilizes an IBM 9000-class mainframe; 3495 Tape Library Dataserver; and 3490 Magnetic Tape Subsystem and Data Facility Storage Management Subsystem. The design is based on client-server architecture, mainframe and RISC-based, chosen to minimize cost by using existing resources

and implementing open scaleable systems.

The storage media are 3480 and 3490E cartridge tapes certified by NARA for long-term archival. The 3495 Dataserver has been designed to store from 5,660 to 18,910 tape cartridges and access 4 to 64 tape transports. The overall storage capacity is currently 6 terabytes, with an increase to 10 terabytes planned in FY 1995.

The distribution platform is a RISC-based technology using IBM RS/6000s. This allows user access and retrieval of the NOAA satellite images through the Internet and the World Wide Web.

On-line Products and Services

Less than 5 years ago, digital data were provided to NOAA users on magnetic tapes and diskettes. Today they have more sophisticated requirements. Users expect to access data catalogs on-line, order data and receive it within hours, if not minutes.

To keep pace with this growing and changing demand for environmental data, NESDIS uses the resources of the Internet as a means of acquiring and distributing information. By making use of publicly available resources such as bulletin boards, anonymous FTP, Gopher and World Wide Web, NOAA data centers and libraries are maximizing their limited resources and beginning to provide on-line catalogs and delivery. In just one year, user requests for NOAA data via the Internet increased by tens of thousands each month.

NOAA Data Set Catalog

NESDIS developed a NOAA Data Set Catalog containing descriptions of NOAA data sets and data products. The new catalog has flexible search capabilities and provides multiple output formats that are compatible with other systems such as the Government Information Locator System (GILS) and the Federal Geospatial Metadata Standard.

NESDIS Home Pages

Many NOAA facilities have developed World Wide Web home pages that provide environmental information and news of their activities. These home pages link with each other within NESDIS and NOAA and also with other outside organizations, providing ties to the NOAA Data Set Catalog and other NOAA holdings. NESDIS uses Wide Area Information Servers (WAIS), and other search engines to efficiently link information and data located throughout NOAA and the scientific community.

The NESDIS Home Page came on-line during the latter part of 1994 and provides access to all currently active home pages in our organization. An individual can click on any of the following and instantly link to that organization's home page:

Environmental Information Services

National Oceanographic Data Center

National Climatic Data Center

National Geophysical Data Center

Above: The NESDIS Home Page (center) surrounded by other NESDIS organization home pages.

Office of Satellite Data Processing and Distribution
CoastWatch Project
Satellite Active Archive
Pathfinder Program
Products Systems Branch
Office of Research and Applications
Oceanic Sciences Branch

Also available on the NESDIS Home Page are the latest press releases concerning NESDIS, and the current NESDIS Organization Chart. Many more features are planned for our home page in the coming year. The URL for the NESDIS Home Page is: http://ns.noaa.gov/NESDIS/NESDIS_Home.html. If you have an Internet connection and can run a World Wide Web client such as Mosaic or Netscape, please visit our home page and sample some of our on-line offerings.

NESDIS personnel have served on the NOAA Network Advisory and Review Board committees of the National Information Infrastructure, the High Performance Computing and Communications Networking Panel and the NOAA Network Information Center. Work is under way to improve network connections within NOAA's local and regional campuses.

Our personnel have provided advice and expertise to other NOAA components just beginning to develop their on-line capabilities,

including the new Center for Coastal Ecosystem Health in Charleston, South Carolina.

The system for processing, archiving and disseminating data from the Defense Meteorological Satellite Program (DMSP) is now fully operational at NGDC. Data from the program is processed within 48 hours of collection and browse images are available on the Internet.

Data Products

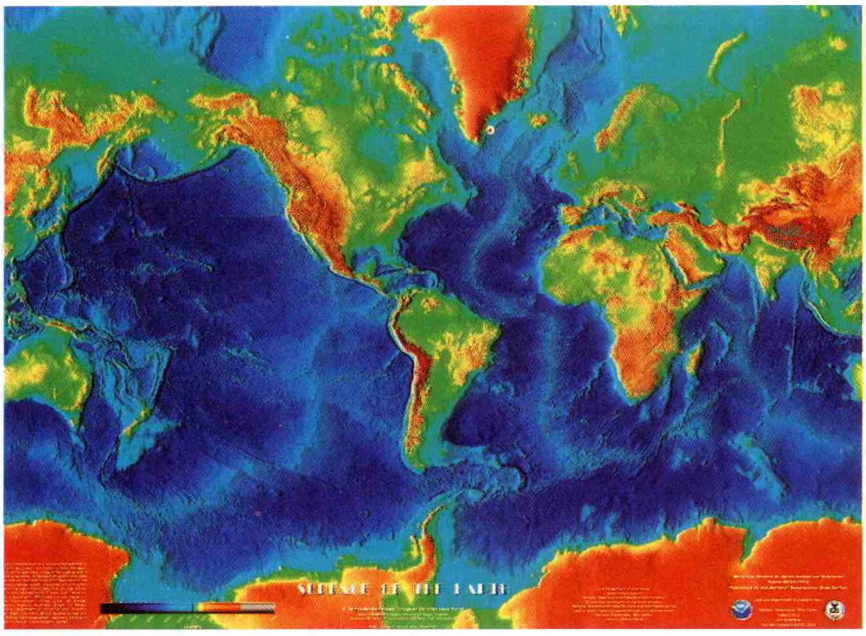
NODC published the *World Ocean Atlas 1994*, a multi-volume atlas and CD-ROM data set containing global oceanographic climatologies for temperature, salinity, oxygen, and nutrients, and two technical reports describing the procedures used in the quality control of the atlas data sets. All of these publications and CD-ROMs have been widely distributed in the U.S. and abroad.

NGDC issued an updated version of the poster, "Surface of the Earth." This image is derived from the digital, 5-minute, gridded data set that is one of NGDC's most popular products. NGDC has been working to improve reliability of the data set for commercial, educational and research applications.

NGDC created coherent data collections from diverse data sets. A major collection created during 1994 is called Global View. This CD-ROM set was distributed to all NOAA Pathfinder and Global Change Principal Investigators. It comprises 4 CD-ROMs: Global and Regional Elevation Grids, Global Vegetation Indices, Global Ecosystems Data, and Coastal Change Analysis Data. All of these data, as well as extensive metadata, are accessible using GeoVu, the multi-platform browse and display tool developed at NGDC.

In cooperation with the NOAA/National Ocean Service, Office of Ocean Resources, Conservation, and Assessment, NGDC has issued a beta version CD-ROM of the NOAA Medium Resolution Digital Vector Shoreline for the United States.

During 1994, NCDC distributed over 11 terabytes of data and information on 5 new CD-ROM products. The Solar and Meteorological Surface Observation Network CD-ROM is a 3-disk product containing hourly meteorological and solar data for 250 U.S. locations. The Global Daily summary CD-ROM provides daily temperature and



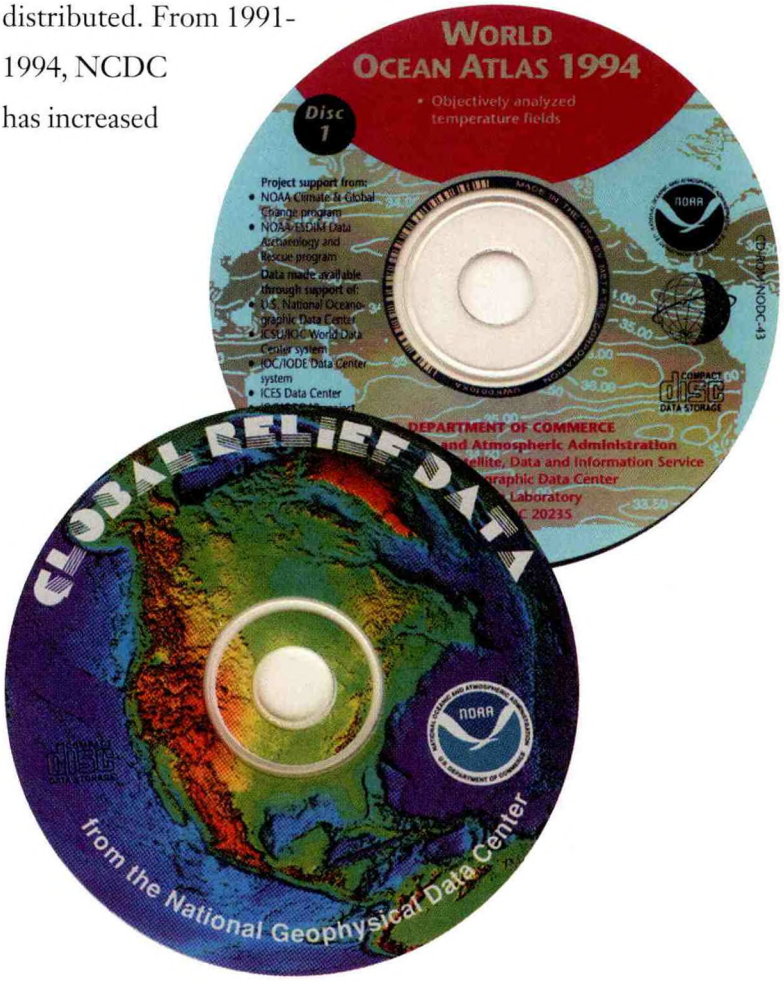
Right: Surface of the Earth poster.

precipitation data to over 10,000 global sites. NCDC also produced two atlas CD-ROMs providing access to, and visualization of, historical tropical and extratropical storm tracks and data. NCDC also issued a prototype disk entitled, "NOAA's National Environmental Watch." This disk contains summaries of NOAA research activities on global environmental problems and the societal impacts. NCDC published five monthly climate publications with an average distribution of 58,000 copies per month to subscribers and other customers.

With the initial implementation of modern observing systems under the national weather modernization program, NCDC was able to provide high-resolution data from operational sites of the Automated Surface Observing System (ASOS) and the Next Generation Radar Systems (NEXRAD). These data streams are now archived at NCDC and are used as inputs in meso- and micro-scale investigations as well as for applications in private industry.

NESDIS CD-ROM Trends

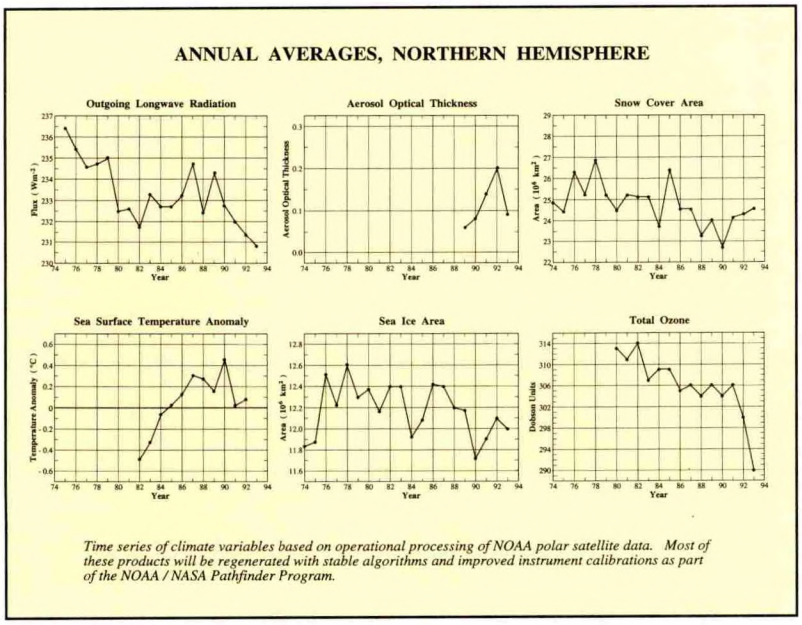
Over the past 4 years, each of the three National Data Centers has made an increasing percentage of their data holdings available via CD-ROM. In 1994, approximately 50 CD-ROM products were available from the three centers. Many of these products contain multiple volume data sets with local, regional, and in some cases, global coverage. The popularity of CD-ROM data is indicated by the significant increase in the number distributed. From 1991-1994, NCDC has increased CD-ROM distribution over 700 percent, and both NODC and NGDC distribution increased over 500 percent.



Above: Two of the many CD-ROMs available from NESDIS.

Pathfinder Program

NOAA's operational satellite data and derived products have provided a continuous, long-term data base for use in climate studies. However, because of periodic changes in algorithms and inadequacies in calibration, this data base does not have the continuity and stability needed for assessing long-term climate change. Recognizing these problems, NOAA and NASA initiated a joint program called Pathfinder. Pathfinder will generate "research/climate" quality data sets from the



Time series of climate variables based on operational processing of NOAA polar satellite data. Most of these products will be regenerated with stable algorithms and improved instrument calibrations as part of the NOAA / NASA Pathfinder Program.

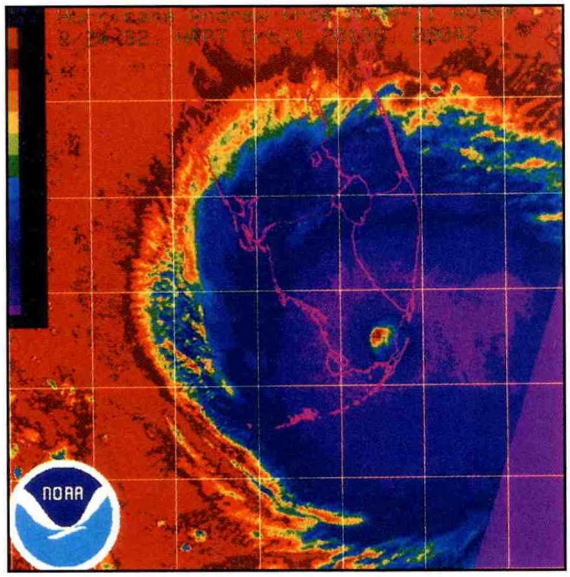
archived operational satellite observations and make them available to the global change research community.

Three NOAA and one Defense Meteorological Satellite Program instruments are included: the Advanced Very High Resolution Radiometer (AVHRR), since 1981; the Tiros Operational Vertical Sounder (TOVS), since 1979; the Geostationary Operational Environmental Satellite Visible and Infrared Spin-Scan Radiometer (VISSR) and its VISSR Atmospheric Sounder version, since 1978; and the Special Sensor Microwave/Imager, since 1987. Reprocessing is being done using the best available instrument calibration histories and community consensus algorithms. Science Working Groups (SWGs) consisting of NOAA, NASA, and academic scientists, representing both the remote sensing and user communities, are guiding the program.

The reprocessing effort is distributed among offices. NOAA is responsible for the AVHRR atmospheric products (clouds, aerosols, and radiation budget) and the TOVS Path C products (deep layer means of temperature and moisture). Office of Research and Applications scientists participate in all the SWGs and oversee the NOAA reprocessing efforts.

FY 1994 activities included implementation of a NOAA Pathfinder satellite reprocessing system, based on high-speed UNIX workstations; recalibration of the AVHRR visible and near infrared channels; production of the initial GOES Pathfinder Data Set for the period of April 1987 through November 1988; and production of the TOVS Path C Pathfinder Data Set for the same period. Initial AVHRR Atmospheric Data Sets are proceeding on schedule with the first products for the period due in January 1995.

As a prelude to FY 1995 activities, the GOES Data Set was provided to the research community via Internet. Additionally, an Internet server for TOVS and AVHRR products was installed and the initial NOAA Pathfinder World Wide Web Home Page was developed. Through this server, Internet access to Pathfinder Data Sets will be provided via World Wide Web, Gopher, and anonymous FTP services. Plans are being implemented to provide access to NOAA Pathfinder Data Sets through the Satellite Active Archive and through the Global Change Data and Information System, Gopher and World Wide Web services.



Left: CoastWatch image

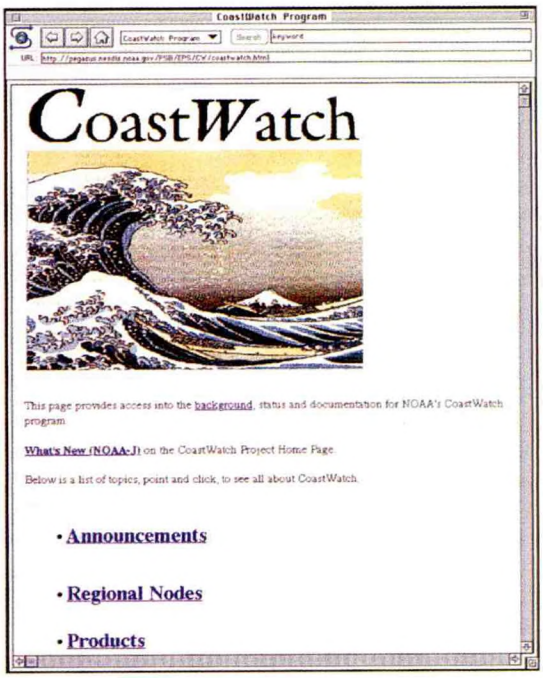
Below: CoastWatch Home Page

CoastWatch

CoastWatch provides timely and useful remotely sensed sea surface temperatures and visible AVHRR products to Federal, state, local, and tribal users. CoastWatch is intended to help make important resource management decisions in fisheries management, monitoring harmful algal blooms, marine waste disposal, research and education, and research vessel positioning. The CoastWatch Program was developed initially with support from the Coastal Ocean Program, and is presently operational in support of NOAA and other national mission requirements. Digital, high-resolution data products for the Great Lakes and eastern coastline of the United States are collected from NOAA polar orbiters, centrally processed, and made available to regional nodes serving the Great Lakes, the Atlantic Ocean, and the Gulf of Mexico. Pacific Ocean coverage relies on local acquisition, processing, and redistribution sites in Monterey, California, Honolulu, Hawaii, and Anchorage, Alaska.

Since its inception in 1987, CoastWatch has developed enhanced, low-cost workstations, display software, low-cost digital communications systems, near-line access to archives of CoastWatch products and environmental buoy data, a validation system, and a distributed national network of NOAA laboratories and offices to use and locally redistribute products.

Recent CoastWatch accomplishments include transition of the program from demonstration to operational status with national near real-time coverage, implementation of a full set of products from two NOAA polar orbiting satellites, and affordable software for end user image display. Work is underway on AVHRR cloud masks, improved communications, and inclusion of other sensors and platforms in the CoastWatch data stream.



Improved Geostationary Satellite Products

The NWS National Meterological Center's (NMC) Multi-Satellite Precipitation Estimation Program became fully operational in early 1994. This program relies on a newly enhanced NESDIS access package for the retrieval of GOES-7, METEOSAT 3 and

METEOSAT 4 imagery. Precipitation estimates are used in the NMC numerical model that brings the program closer to its long term goal of global coverage.

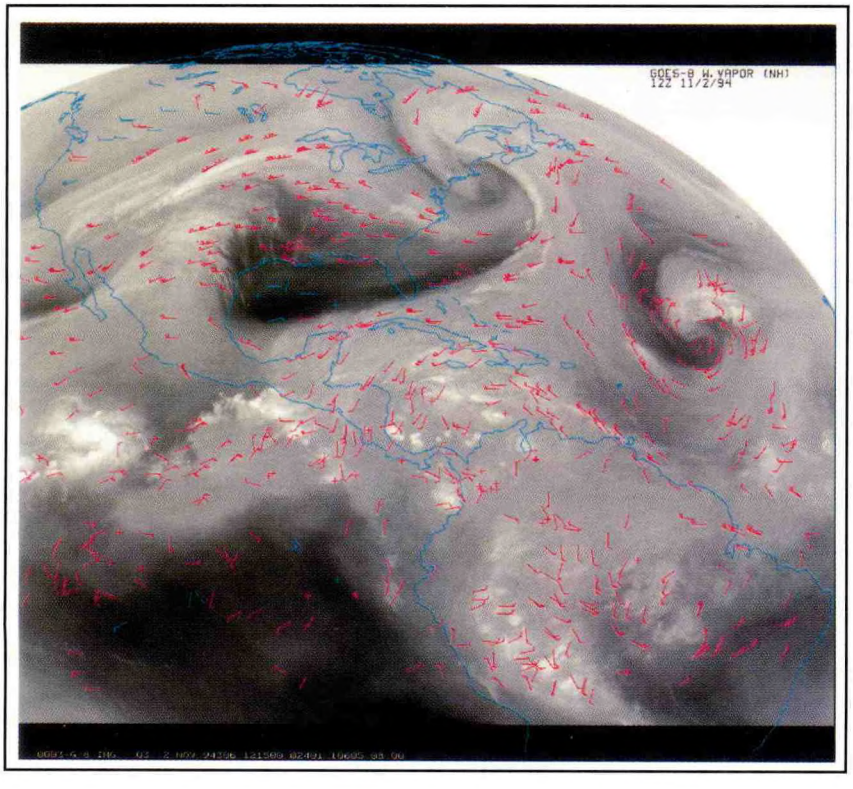
The NESDIS access package and the Picture Triplet Winds Program were modified for use with the GOES-8 GVAR "Routine Mode" imagery produced during an ingenious scanning scenario of the GOES-8 spacecraft and imager. "Routine Mode" imagery includes either a set of 3 sectors or a conventional full disk picture. In the sector option, a reduced-width 65N-to-57S scanning process is interrupted at 20S and then resumed. During the interruption, the imager scans the continental United States. This technique, which results in 3 sectors, allows routine coverage of the continental United States approximately once every 15 minutes, a significant advance to forecasters.

A User's Guide for the NESDIS package contains information to facilitate access to GOES-8 data by the research community. Data from the GOES-8 imager have been hailed by experts as superb, primarily because of their higher resolution and lower noise.

NESDIS processes cloud-drift, water vapor and picture triplet winds four times a day, for input into NMC's numerical weather forecast models. The three wind sets are complementary: cloud-drift winds are produced in partly cloudy areas, for middle and high altitudes; water vapor winds are produced in clear areas, mostly at high altitudes; and picture triplet winds are produced over ocean regions at low levels.

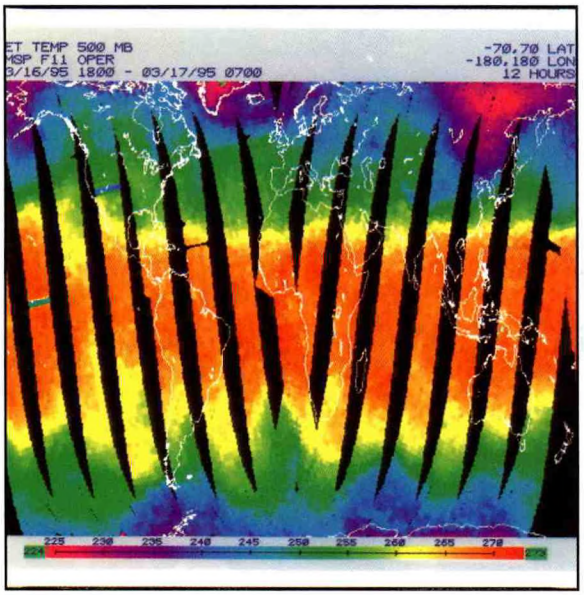
NESDIS is producing atmospheric temperature and moisture soundings from the new sounder instrument on board GOES-8. The winds and sounding products supplement traditional weather observations especially in data sparse regions, including ocean areas and the Southern Hemisphere. In addition, supplemental cloud information above 12,000 feet is generated in support of the NWS Automated Surface Observing System (ASOS).

Below: GOES-8 water vapor winds for 1200 GMT November 2, 1994. Winds are estimated by automated tracking of water vapor patterns. Wind "barbs" indicate direction and speed. Magenta barbs represent winds above 25,000 feet, and light blue barbs represent winds between 10,000 and 25,000 feet.



Soundings

TOVS soundings were modified to include HIRS moisture channels in the retrieval process. As a result, TOVS moisture retrievals now provide improved moisture information to help the NWS National Meteorological Center improve its weather forecasts. TOVS soundings were also improved concerning the use of radiosonde data which provide first guess and product evaluation information.



In August, the SSM/T processing was significantly improved by replacing a regression retrieval system with a physical retrieval system similar to TOVS. This significantly improved the quality of temperature retrievals produced from the SSM/T instrument. Many aspects of the processing system for the SSM/T physical retrieval system are those planned for Advanced TOVS (ATOVS), increasing the potential for using common software in future NESDIS sounding systems.

Global Ozone Trends

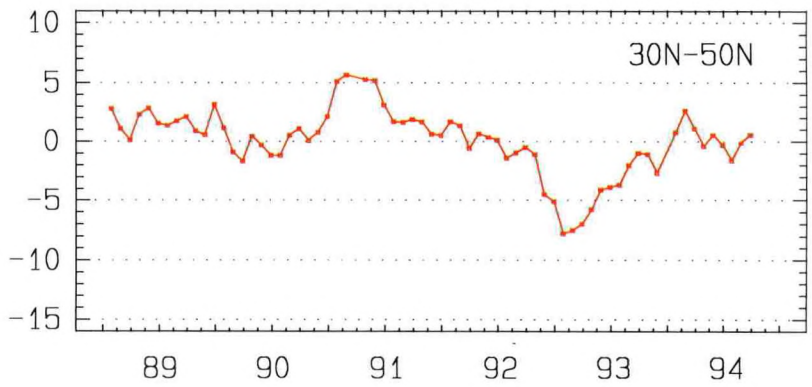
NOAA and NASA scientists have generated the longest, continuous, global satellite-based ozone data set. Ozone determinations from the Solar Backscattered Ultraviolet Instrument (SBUV/2) on the NOAA-11 spacecraft have been reprocessed using the latest algorithm and updated calibration parameters. Absolute calibration was adjusted by comparisons with a similar instrument carried on several shuttle missions, while in-flight calibration history was determined by an on-board calibration lamp. These reprocessed data were validated by comparisons with ground-based measurements. Based on these validations, the accuracy of SBUV/2-derived total ozone amounts is judged to be better than 2 percent over a 5-year period.

The NOAA SBUV/2 total ozone data (January 1989-June 1994) were merged with NASA SBUV data (November 1978-June 1990) to create a 15-year continuous total ozone data set. Merging was accomplished by adjusting SBUV/2 data during an overlap of the two instruments. After creating the extended data record, a standard linear multiple regression statistical model was used to estimate ozone trends as a function of latitude and season.

The results of combined NOAA/NASA research efforts have been used in the "WMO/UNEP Scientific Assessment of Ozone Depletion: 1994." Ozone amounts in the Northern Hemisphere (30N-50N) dropped sharply at the end of 1992, but recovered during 1993. Comparison with NASA data from 1979 indicates that the extent of the dip was unprecedented in satellite records. The cause of the decrease is not known but may have been related to the lingering effects of aerosols injected into the

Left: NESDIS operational SSM/T temperature retrievals at 18,000 feet from the DMSP F-11 satellite are depicted. The black areas indicate data gaps which occur normally between successive satellite orbits.

Below: Time series of anamalies of total ozone amount in the mid-Northern Hemisphere derived from the NOAA-11 Solar Backscatter Ultraviolet (SBUV/2) instrument. Anomalies are differences for each month from the overall monthly average.



stratosphere by the Mt. Pinatubo volcanic eruption in 1991.

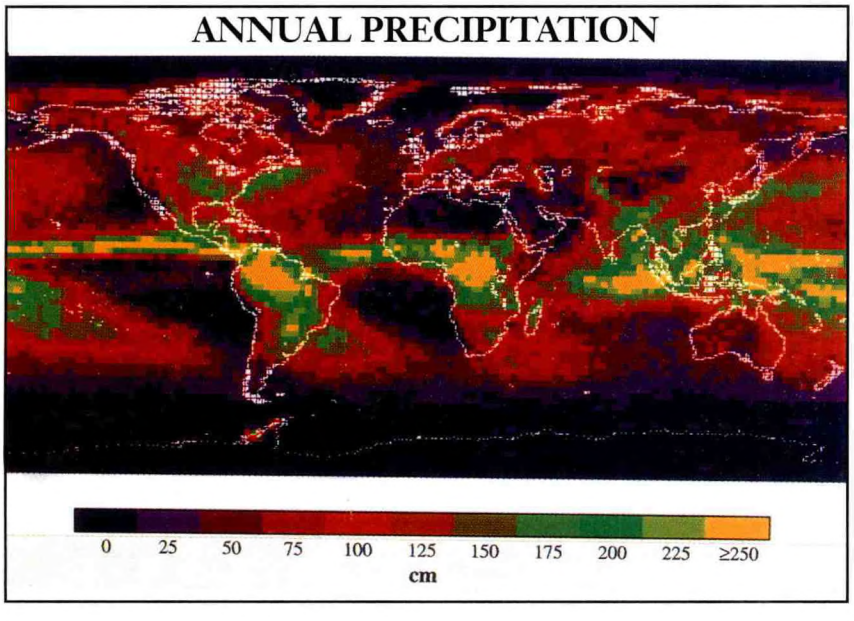
Global Rainfall

NESDIS has developed a satellite-based, global precipitation climatology using data for the years 1987-1992 from DMSP's Special Sensor Microwave/Imager (SSM/I).

Monitoring global rainfall is difficult because of the lack of ground-based measurements, especially over remote land regions and oceans. NESDIS scientists generate monthly mean rainfall from the SSM/I observations. The SSM/I data are particularly valuable for studying precipitation variations associated with El Niño/Southern Oscillation (ENSO) events. ENSOs, quasi-periodic (3-7 years) warmings of ocean temperatures in the eastern Equatorial Pacific Ocean, greatly impact the global distribution of precipitation, causing droughts in some regions and floods in others.

Right: An annual U.S. Greenhouse Climate Response Index (GCRI) based on greenhouse climate response indicators.

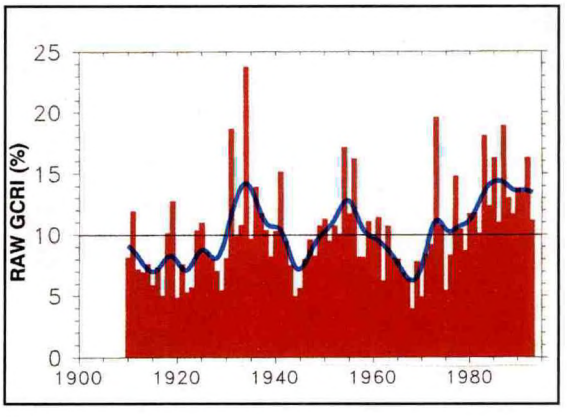
Below: The precipitation amounts are based on an application of a scattering based algorithm applied to SSM/I observations for the period August 1987 to June 1990. Individual determinations have a spatial resolution of 15 km and each point on the Earth is observed once every 2 days. The individual retrievals are averaged over 2 1/2 deg. boxes over the globe.



Global Warming

A NESDIS senior scientist reported at the American Meteorological Society's January 1994 annual meeting that global warming is on hold and that surface temperatures in 1993 remained unchanged from 1992 levels.

Global surface temperatures remain about 0.2 degrees Centigrade above the 30-year



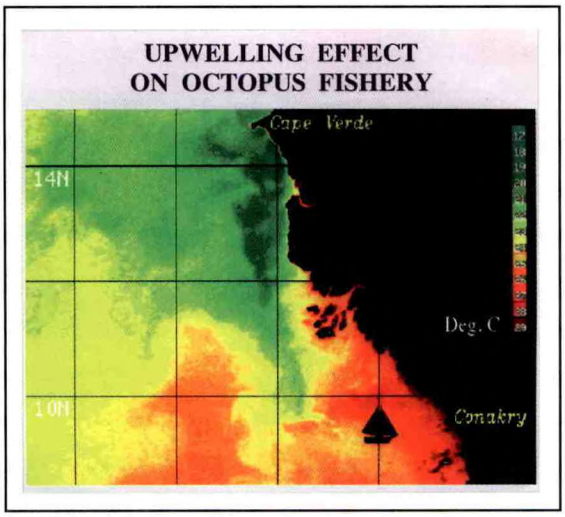
average ending in 1980. Now that the effects of Mt. Pinatubo have dissipated, the century-long 0.5 degree Centigrade warming trend could resume. Many scientists believe this warming trend is caused mainly by global increases of greenhouse gases.

Reports on temperatures in the troposphere (4,500 to 31,000 feet above the Earth's surface) and the stratosphere (50,000 to 80,000 feet above the surface), using data gathered by NOAA's Office of Oceanic and Atmospheric Research, were also presented. Tropospheric temperatures have cooled .05 degrees Centigrade per decade, and stratospheric temperatures have decreased dramatically, with the lower stratosphere experiencing record low levels in 1993.

In the contiguous 48 states, below normal temperatures persisted throughout 1993 and were due to reduced daytime temperatures.

Fisheries Studies

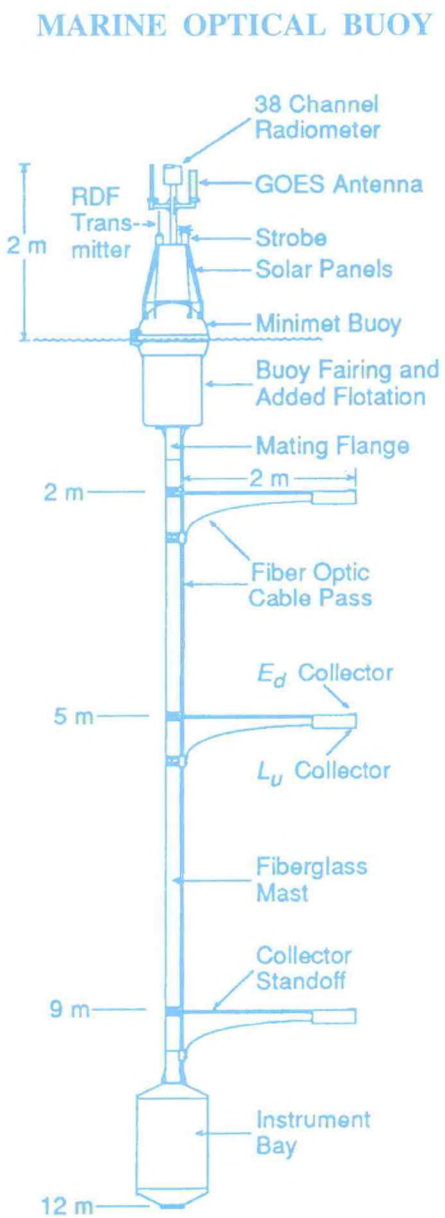
As part of a U.S.-Spain fisheries remote sensing cooperative project, American and Spanish scientists are studying the seasonal impact of upwelling off Cape Verde on the Guinea Conakry cephalopod Spanish fishery. Annual southward intrusion of upwelled



waters below 10 degrees North is associated with a winter/spring increase in the abundance of octopus in the region off Guinea Conakry. NESDIS scientists are using satellite sea surface temperature observations and catch data to determine the relationship between the ocean temperatures and octopus catch.

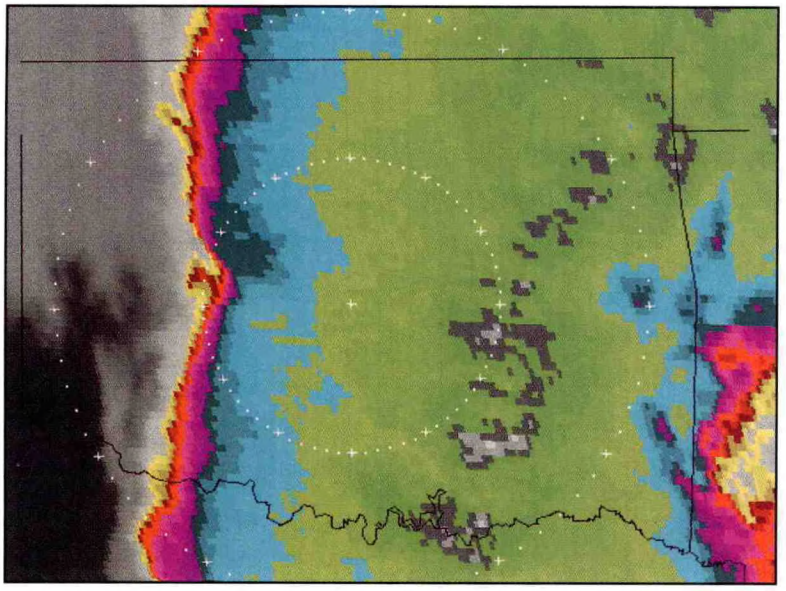
Ocean Color

The Marine Optical Buoy (MOBY) Program is the calibration and validation study for the U.S. Ocean Color Program. It was developed to support the SeaWiFS



instrument, scheduled to be launched in July 1995. MOBY is primarily funded by NASA and program implementation is under NESDIS. Ultimately, a goal of the ocean color program is to measure oceanic productivity worldwide by satellite. The MOBY program will also support the Advanced Earth Observing System (Japan) and the U.S. Earth Observing System/Moderate-resolution Imaging Spectrometer programs.

Far Left: An upwelling event off Cape Verde, Senegal brought cooler water up to the surface south of Cape Verde, as shown in this sea surface temperature image for February 26, 1987, based on AVHRR satellite observations. The octopus catch increased dramatically following the upwelling episode, an annual winter occurrence. The location of the largest octopus catch of Conakry, Guinea is indicated by the ship symbol.



Above: This is the RAMSDIS IR radar projection product. It is generated from the GOES-8 11 um channel. Yellow to red to cyan to green indicate decreasing cloud top temperature. The circles show the 60 nmi and 120 nmi range rings from the Norman radar.

RAMSDIS

The Office of Research and Application's Regional and Mesoscale Meteorology (RAMM) Branch and the Cooperative Institute for Research in the Atmosphere have developed a low cost PC workstation, the RAMM Advanced Meteorological Satellite Demonstration and Interpretation System (RAMSDIS) that allows for real-time ingest, display, and analysis of high-resolution digital satellite imagery. In 1994, RAMSDIS units were assembled and installed at more than 20 NWS forecast offices. The project is intended to familiarize forecasters with use of digital satellite data; test the operational utility of enhanced satellite products and blended data

International/Interagency

techniques (e.g., radar, profiler and satellite); provide better field training; and, prepare forecasters for the data that will be available on the AWIPS systems in the future.

Global Climate Observing System

In September 1994, the Assistant Administrator for Satellite and Information Services joined the Joint Scientific and Technical Committee (JSTC) of the Global Climate Observing System (GCOS), as third vice chair. The JSTC provides advice and direction in the development of GCOS. Management of GCOS data will be accomplished through an international system of distributed data bases. Built upon the existing and planned national and international data management infrastructure, GCOS will encourage participating centers to develop data servers that can interact with clients according to agreed upon guidelines.

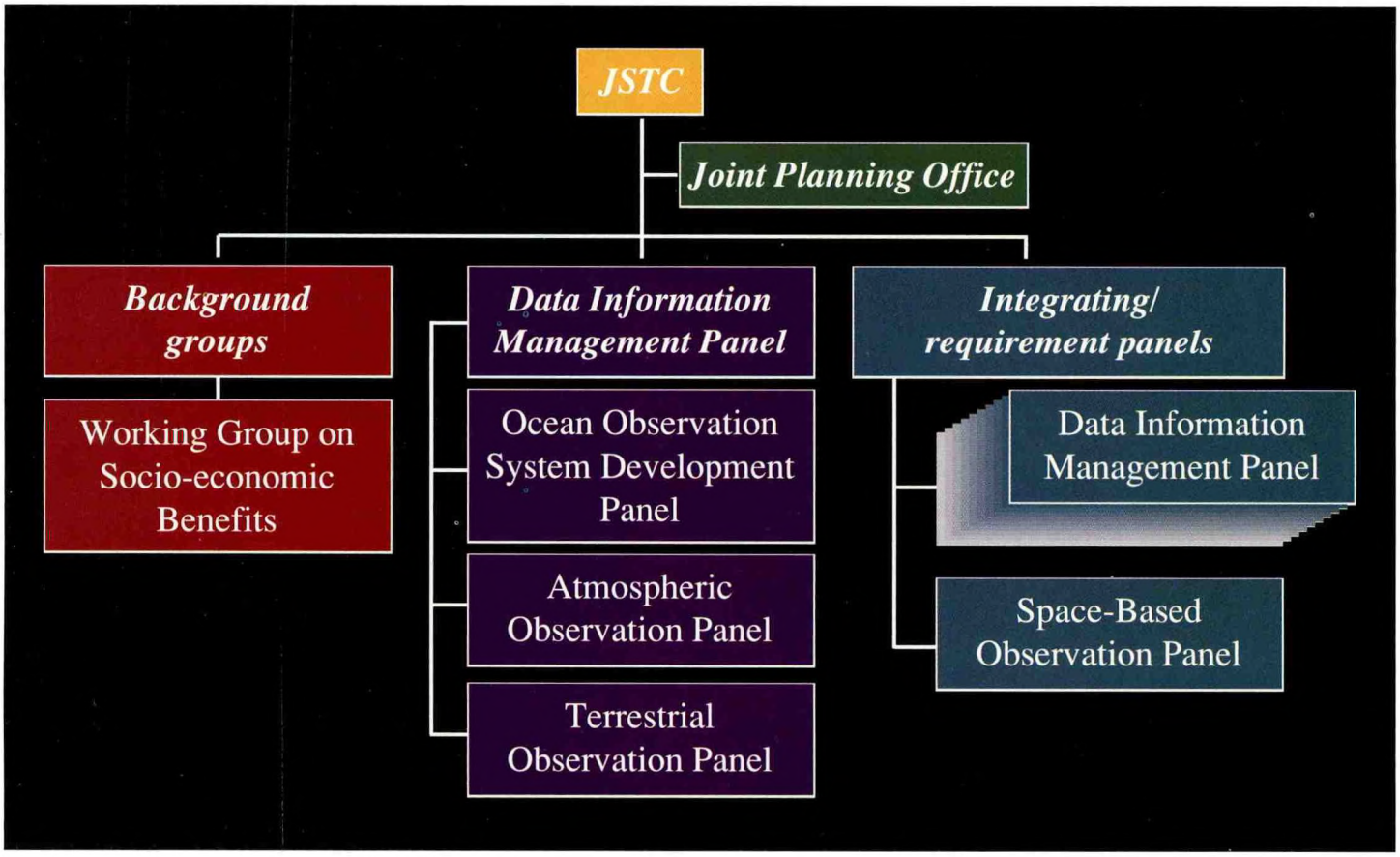
Data Policy

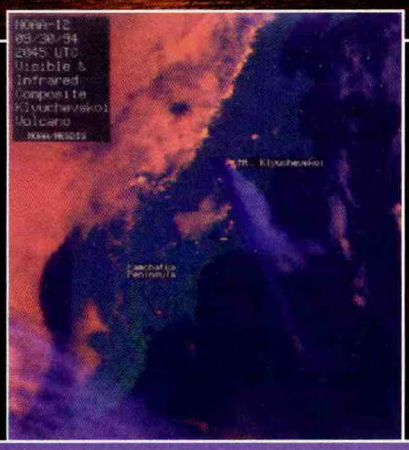
NOAA and NASA obtained approval by the Committee on Earth Observation Satellites (CEOS), for a Resolution on Principles of Satellite Data Provision in Support of Operational Environmental Use for the Public Benefit. Under the terms of this resolution, research satellite agencies (and operational satellite agencies) recognize the

NOAA helped draft a "Statement of General Principles for U.S.-Russia Exchange of Scientific and Technological Data and Information," which was signed in June 1994 by Vice President Gore and Russian Prime Minister Chernomyrdin.

Global Observation Information Network

The U.S.-Japan Global Observation Information Network (GOIN) initiative continued with comprehensive connectivity and interoperability between existing and planned networks for global satellite observations and in situ data. GOIN was initiated by NOAA Administrator James Baker and State Department Under Secretary for Global Affairs Timothy Wirth (as part of the U.S.-Japan Common Agenda), and endorsed by President Clinton and the Japanese Prime Minister. It serves as a model for global networking efforts being undertaken by space agencies through the Committee on Earth Observation Satellites.

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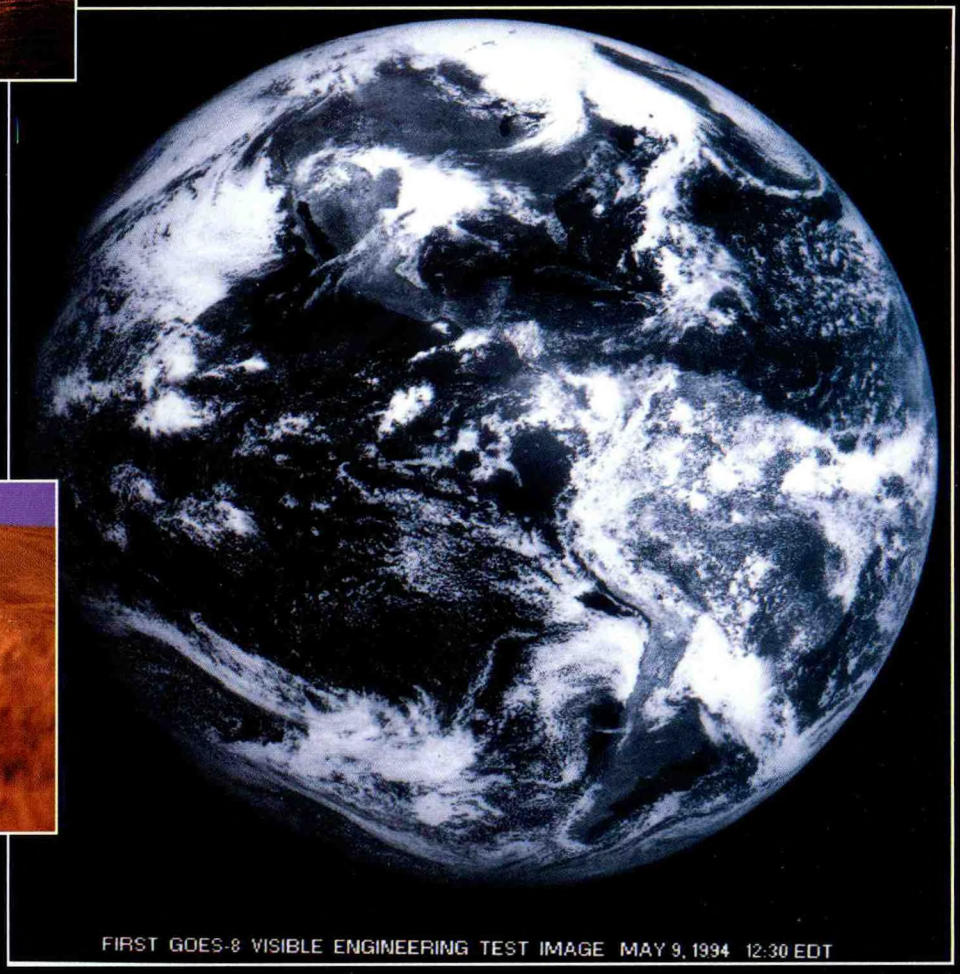
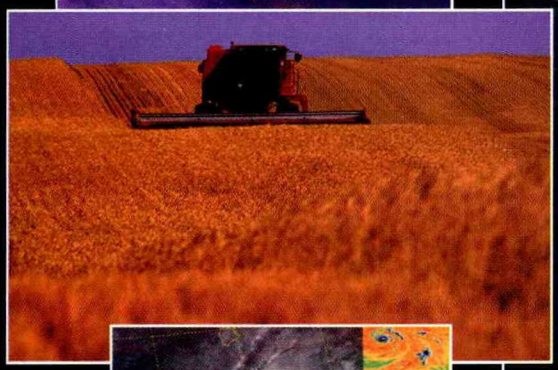
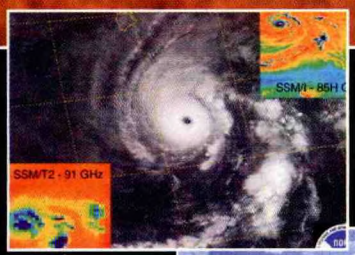
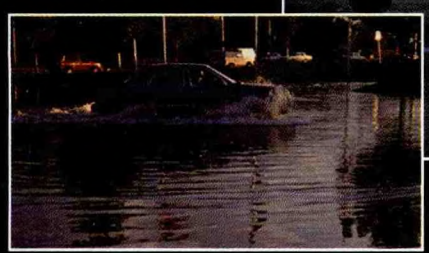

FIRST GOES-8 VISIBLE ENGINEERING TEST IMAGE MAY 9, 1994 12:30 EDT




SSM/T2 - 91 GHz



III. Partnerships

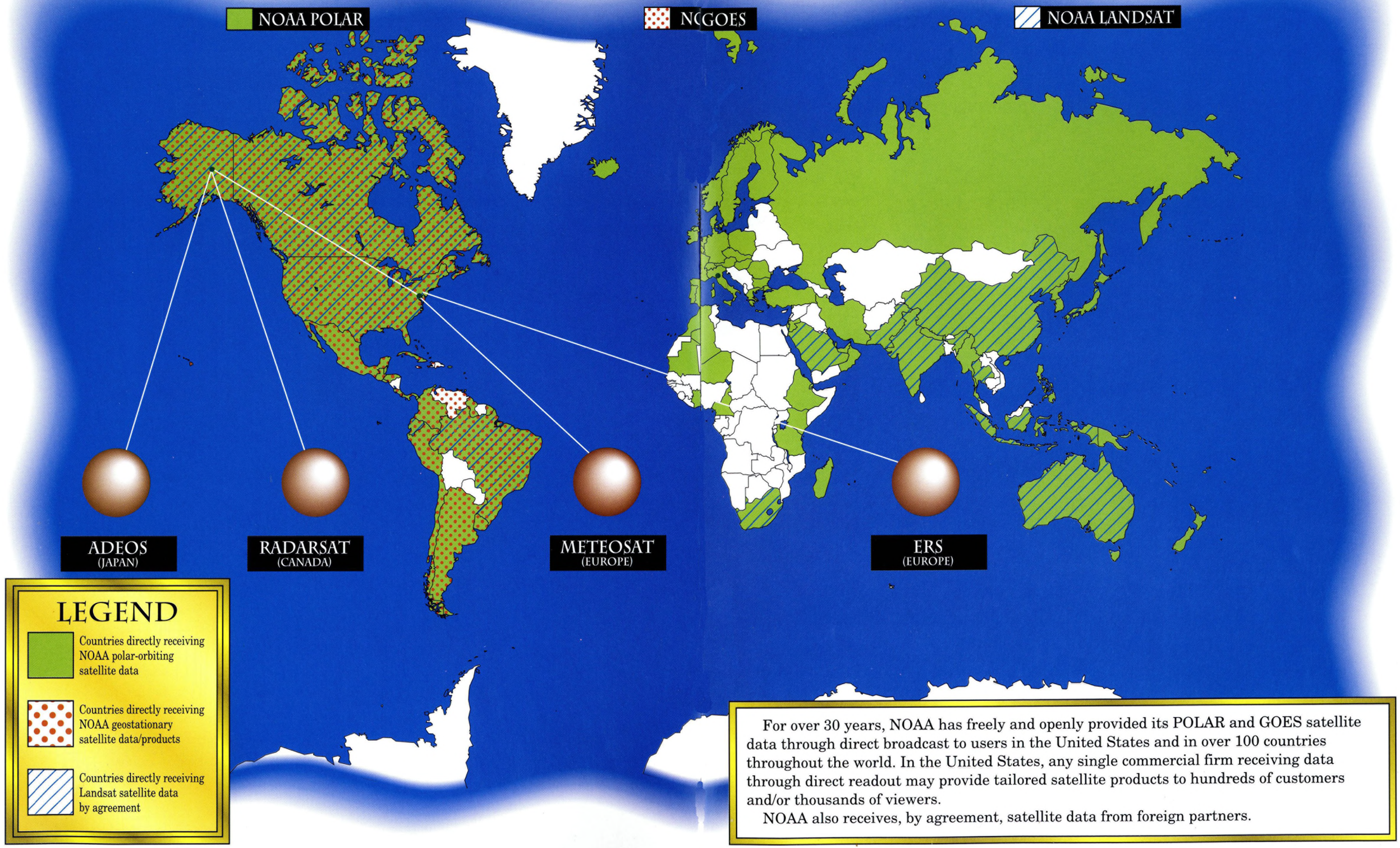
Two Examples of Academic Partnerships are:

The Cooperative Institute for Research in the Atmosphere (CIRA) at Colorado State University

The Cooperative Institute for Meteorological Satellite Studies (CIMSS) at the University of Wisconsin

NESDIS has developed productive partnerships with a number of universities over the years. The establishment of cooperative institutions and programs at these universities promotes collaborative research and development efforts that help improve all NESDIS products. NESDIS occasionally furnishes grants for scientific research supporting NOAA's mission. In other instances, government scientists reside at universities, and in still others, NESDIS contracts with a university for services. NESDIS has benefited greatly from these arrangements at a relatively low cost, receiving: 1) full access to faculty and graduate students; 2) use of leading-edge computing and laboratory facilities; 3) an environment where government scientists are challenged and inspired, and can continue to study and teach; and, 4) immediate benefit from results of research and development that is directly tied to NOAA's mission.

NESDIS Direct Broadcast of U.S. Satellite Data and Reception of Foreign Satellite Data



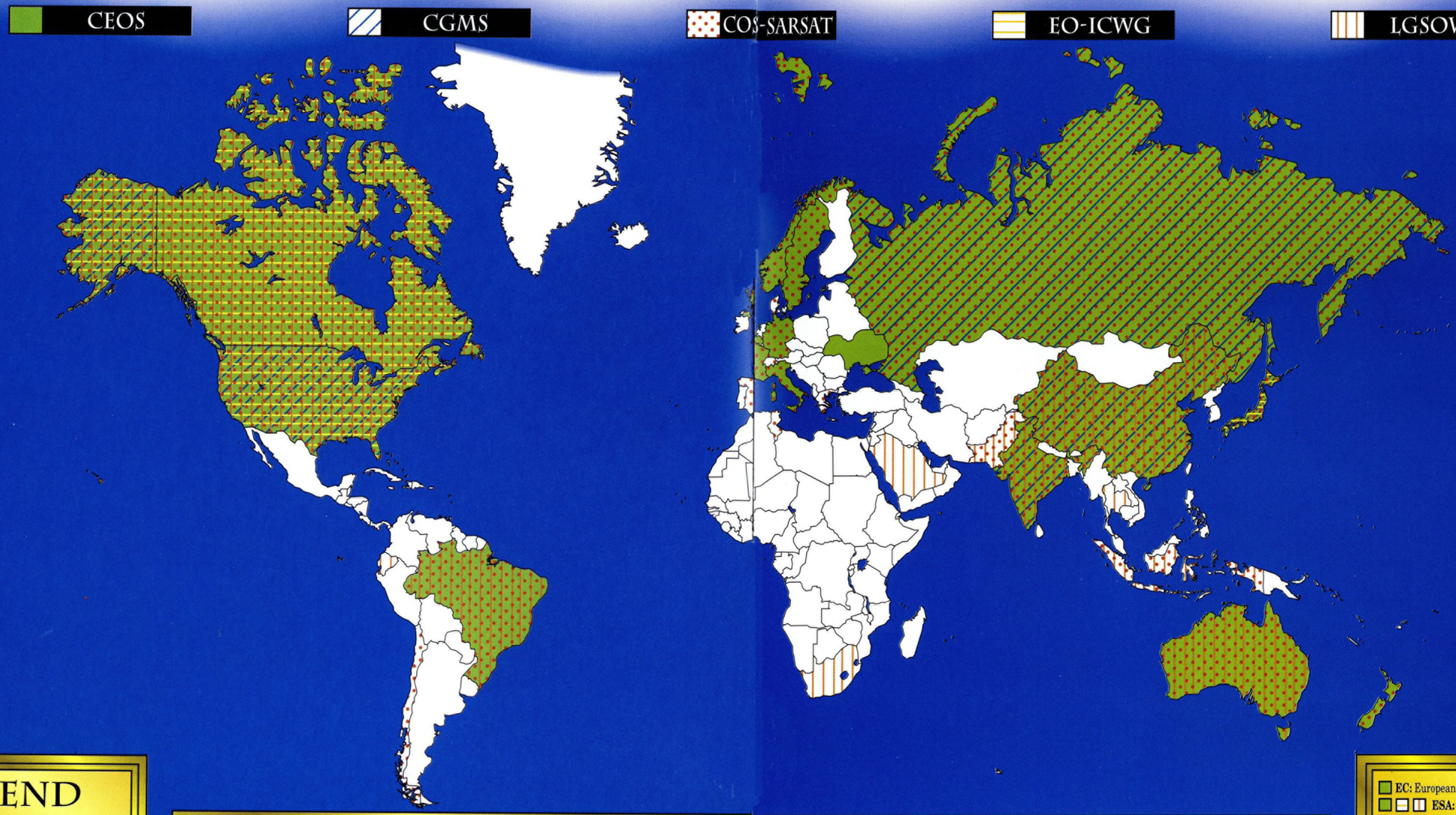
LEGEND

- Countries directly receiving NOAA polar-orbiting satellite data
- Countries directly receiving NOAA geostationary satellite data/products
- Countries directly receiving Landsat satellite data by agreement

For over 30 years, NOAA has freely and openly provided its POLAR and GOES satellite data through direct broadcast to users in the United States and in over 100 countries throughout the world. In the United States, any single commercial firm receiving data through direct readout may provide tailored satellite products to hundreds of customers and/or thousands of viewers.

NOAA also receives, by agreement, satellite data from foreign partners.

Partners in Satellite Earth Observation Coordination



LEGEND

- Committee on Earth Observation Satellites
- Coordination Group for Meteorological Satellites
- Search and Rescue Partners
- Earth Observation-International Coordination Working Group
- Landsat Ground Station Operations Working Group

Several international coordination mechanisms exist to address specific aspects of space-based Earth observation.
These include:

Partners in Overall Satellite Coordination: The Committee on Earth Observation Satellites (CEOS) is the chief organization for international coordination of space-related Earth observation activities. Policy and technical issues related to Earth observation satellite missions and the data received from them are addressed. Participants include government agencies with funding and program responsibilities for satellite programs that are currently operating or under development, and major international and intergovernmental user organizations. NOAA chairs the CEOS Working Group on Data.

Meteorological Satellite Partners: The Coordination Group for Meteorological Satellites (CGMS) focuses on the operation and related applications of the world's weather satellites. CGMS facilitates the exchange of technical information on geostationary and polar-orbiting meteorological satellite systems, harmonizes mission parameters, and encourages compatible data products and services. Participants are meteorological satellite operators and the World Meteorological Organization (which represents the user community).

Search and Rescue Partners: COSPAS-SARSAT is an international satellite system for search and rescue. It consists of a network of satellites and ground stations that provide distress alert and location information to appropriate rescue authorities anywhere in the world for maritime, aviation and land users. In its 12 years of existence, COSPAS-SARSAT has assisted in the rescues of more than 4,300 individuals.

International Earth Observing System (IEOS) Partners: The Earth Observation-International Coordination Working Group (EO-ICWG) examines the technical, operational and policy aspects of payload planning for IEOS missions. Members are the Space Station partners: U.S. (NASA), Europe (ESA), Japan and Canada. NOAA and EUMETSAT have participated with NASA and ESA to represent operational environmental interests.

Landsat Ground Station Partners: The Landsat Ground Station Operations Working Group (LGSOWG) serves as a forum for the exchange of ideas and information on land remote sensing activities. The group is co-chaired by NOAA and EOSAT. Communication between the United States and the foreign Landsat station operators encourages development of technical compatibility and promotes diffusion of innovations in Landsat data use.

- **EC:** European Commission
- **ESA:** European Space Agency
- **EUMETSAT:** European Organisation for the Exploitation of Meteorological Satellites
- **FAO:** Food and Agriculture Organization
- **GCOS:** Global Climate Observing System
- **GOOS:** Global Ocean Observing System
- **ICSU:** International Council of Scientific Unions
- **IGBP:** International Geosphere-Biosphere Program
- **IOC:** Intergovernmental Oceanographic Commission
- **ITDC:** International Telecommunications' Development Corporation (Taiwan)
- **UNEP:** United Nations Environment Program
- **UNOOSA:** United Nations Office of Outer Space Affairs
- **WCRP:** World Climate Research Program
- **WMO:** World Meteorological Organization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IV. Community Involvement

NESDIS people have long been involved in outreach to schools in an effort to improve and enhance the education of our young people. Most of these efforts originate from the individual initiative of NESDIS staff members, and focus on local schools in areas of NESDIS facilities. Nearly 45 percent of NESDIS employees work at locations outside the Washington DC area. These include NESDIS facilities located in Wallops Island (Virginia), Asheville (North Carolina), Boulder (Colorado), and branches in Madison (Wisconsin), Fort Collins (Colorado), Seattle (Washington), Miami (Florida), Woods Hole (Massachusetts), Honolulu (Hawaii), and La Jolla (California). Staff at all locations are active in educational outreach to the extent that their work schedules allow. Although many programs are not directed specifically at minority students, minorities typically represent a substantial portion of program participants.

In Asheville (North Carolina) and the Washington, DC area, outreach efforts have been coordinated through formal partnerships in education with local schools. However, there have been many NESDIS employees working on their own in support of educa-

tion who never formally report their accomplishments.

Science Fairs: Perhaps the most common educational outreach activity by NESDIS people is the judging of science projects. Science fairs cover all grades, from 1st through 12th. In addition, NGDC sponsored an award in 1994 recognizing a minority student for excellence on a science project, and NESDIS Headquarters sponsored an all-day field trip to the Maryland Science Center for science fair winners from its partner school.

Classroom Visits: Classroom presentations are a very popular activity for NESDIS employees. Most presentations are science-related but at some locations they are given on more general subjects.

Technical subjects generally relate to areas of staffers' expertise. More than 30 presentations by NGDC employees concentrated on subjects such as earthquakes, volcanoes and geomagnetism. A team of 20 NESDIS meteorologists in the Washington D.C. area conducted weather briefings at an elementary school using data collected from a weather station installed by a local TV station. The team also showed videos of concurrent satellite imagery.

Tutoring and Mentoring: NCDC has a total of 14 tutors working at two elementary schools on subjects such as science, language arts, reading, math, and social studies. NGDC has a program to mentor learning-disabled students at the University of Colorado, and staffers at Wallops Island have tutored as well.

Tours: Tours of operational facilities are always an attraction for schools. Of course, students get only a quick look and are probably overwhelmed but sometimes an interest can be sparked. The NOAA Science Center in the Washington, DC area welcomes visiting classes from all around the area, especially in the summertime. NCDC and Wallops Island also conduct tours of their facilities.

Computer Equipment: What better way to use old, but still functional computer equipment than to let schools borrow it? NESDIS offices in the Washington DC area, Asheville and Wallops Island have accomplished this.

Teacher Training: Helping teachers improve their skills can be very effective in improving Earth science education and encouraging the use of satellite imagery. Once teachers have become involved and informed, they can become very effective allies.

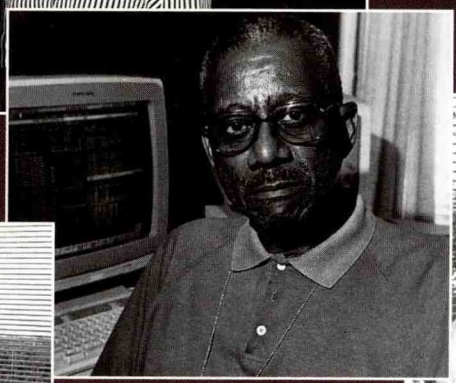
In the Washington DC area, NESDIS staff presented a one-day seminar for teachers in satellite imagery interpretation as it applies to meteorology, oceanography, and terrestrial ecology. NESDIS also sponsored the attendance of two minority science teachers at a Satellites and Education Conference in West Chester, Pennsylvania. In Boulder, several teacher groups attended seminars at NGDC where teaching aids for the Earth sciences were demonstrated and distributed.

Student Employment: All NESDIS facilities provide employment to students. Minorities are well-represented as student employees, and some programs are designed specifically for them. Those facilities near universities, as in Boulder, Fort Collins, Madison and Asheville, hire students in large numbers through cooperative programs. Other facilities hire college students individually, as they can.

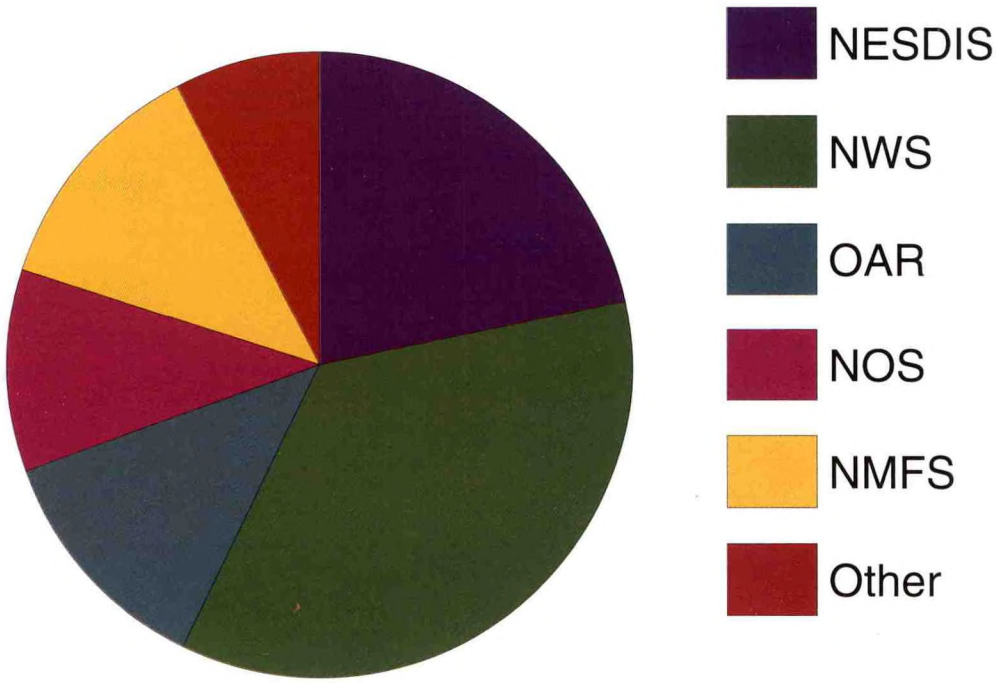
Most high school student employees are hired through formal programs. The NOAA Library works with a Washington area school to provide

work-study and library aide positions for three minority high school students. The NOAA Regional Library in Miami participates with a local high school in a program that allows students to intern at the library every summer. NESDIS participates in a summer engineering and science program for minority high school students that is operated by Howard University in Washington, DC. NESDIS staff supervised the science-related work of six students, with assignments focusing on the students' computer skills.

The Benefits: NESDIS employees contribute substantially to the improvement and enhancement of education. Schools are certainly appreciative of these efforts; the District of Columbia Public School System recognized NESDIS as one of six Partners of the Year in 1994. In addition to the improved community relations for NESDIS and the satisfaction of its staff, these efforts expand the pool of potential Earth and space scientists. We should be reaping the benefits for many years to come.



V. Fiscal Year 1994 Funding



Distribution of FY 1994 Funds Within NOAA

As the world's largest civil operational environmental space organization, the National Environmental Satellite, Data, and Information Service (NESDIS) has a mission for development and use of all operational, civilian, satellite-based, environmental, remote sensing systems. Therefore, a large percentage of the budget is spent on the procurement, launching, operation, and associated ground systems for geostationary and polar orbiting satellites. The satellites are the mainstay of the Nation's weather information system and provide environmental information valued by the research community.

The remaining percentage of funds is disbursed between the Environmental Observing Services and the Environmental Data Management Systems. The day-to-day operations and expenditures of NESDIS are included under these programs.

Barbara Abbott Everett Abbott Diana Abney Richard Abram Rao Achutuni Olubumi Adesuko Elaine Albert John Alishouse Andrew Allegra James Allen Joe Allen Paul Allen Victoria Alston Steve Ambrose David Anderson Donna Anderson Dorothy Anderson Gloria Anderson Gwen Anderson William Angel Frank Arbusto Steven Arnett Larry Arnold Betty Arrowood Joseph Askew Steve Atkins Robert Aune Lynne Axtell Garry Ayres TerryBabb Tom Babicki Jim Bailey Shyam Bajpai Bruce Baker Ronald Baldwin Thomas Baldwin Barbara Banks Lou Barbieri Celso Barrientos Dick Barth Gerald Barton Bruce Bauer Carla Bazemore John Beall Janice Beattie Edward Belote Patrick Belote Curtis Benner Delma Bennett James Berger Eugene Berry Paula Berry Anna May Bethea Rosetta Beuerlein Wilbur Biggs Roger Bissinger Alfreida Black Ann Blevins Brian Bloedel Matthew Bodosky Mark Boland Richard Bolton Arthur Booth John Booth Robert Boreman Richard Borneman Karen Bowie Dudley Bowman Barbara Boyd Tom Boyd Timothy Boyer Carolyn Bradford Veronica Bradford James Brady Betty Bramer George Brandon Larry Brasket Opal Brass Debi Braun Al Bressi Paige Bridges Mark Briele Dave Briggs Vicki Briggs Randal Brinker Robert Britter Barbara Brooks Frances Brooks Bob Brower William Brower Alonzo Brown Cynthia Brown David Brown Dorothy Brown Ellen Brown Linda Brown Pat Brown Stan Brown William Brown Joseph Brust Charles Bryant Loyce Bryant Jim Budd Ronald Buhmann Michael Burgin William Burkhart Ted Burlew Jeffrey Burney Donna Burns Mary Burris Thomas Burtt Bob Bush Andrea Butler Patrick Caldwell John Callaghan Geary Callan Bill Callicott Lou Cambardella Robert Cameron John Campagnoli Jennifer Campbell Joyce Campbell John Canter Jeff Capps Sharon Capps Robert Carey John Carlucci Howard Carney Charles Carpenter Jan Carpenter Larry Carr Lila Carr Donald Carroll Tom Carroll Barbara Carson Emily Carter Lisa Carter S. Jean Carter Steven Carter Tina Cashman Terrie Castelar Al Diaz Del Castillo Keith Catalan H. Austin Caviness Michael Chalfant Sabrina Chandler Paul Chang Michael Changery Laura Chapman Dimitri Chappas Douglas Charnock Albert Chen Homer Cherrix Michael Chinnery Bob Clark Craig Clark Dane Clark David Clark Debra Clark Dennis Clark Johnny Clark Pablo Clemente-Colon Wendell Clouse De'Wahn Coburn Helen Coffey Rosalind Cohen Janice Coil Morris Cole Ken Coleman Richard Coley Donald Collins Elaine Collins Kay Collins Ray Conkright Eugene Connelly Barbara Cook Brenda Cooke George Cooper Dennis Cope Kevin Copes Mel Craddock Richard Cram Michael Crane Van Douglas Crawford Harold Creasman Dennis Crockett Roy Crockett Lawrence Crone Eveline Cropper David Crosby Mike Crowe Ruby Cubano Jane D'Aguanno Ernest Daddio Harry Dahlberg Carol Dash David Dater Lynn Davenport Ken Davidson Gary Davis John Davis Paul Davis Richard Davis W. 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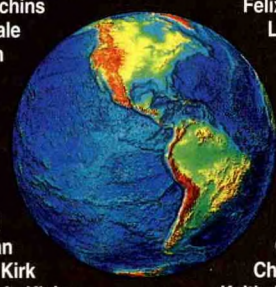
Ghafoori Helen Gibson Bobby Gill Brent Goddard Catherine Godfrey Hilda Gohrband Mitchell Goldberg David Goldsmith Grant Goodge Yolanda Goodge Geoffrey Goodrum Andy Goss Ann Grassia Axel Graumann Donald Gray James Green Shirley Greene Margarita Gregg Larry Griffin Mary Ann Griffin Victoria Grigsby Doria Grimes Peter Grimm Donald Grisinger Norman Grody Charles Gross Wendy Gross Steve Grove Arnold Gruber Carol Gunning Jose Gutierrez George Gutman Ned Guttman E. Ray Habermann Kenneth Hadeen Philip Hadsell Barbara Hall Devery Hall George Hall Mark Hall Norman Hall Anne Hambleton Douglas Hamilton Melanie Hamilton Greg Hammer Dong Han Jerry Hardy Billy Harless James Harley James Harmon Heidi Harris Emily Harrod Clifford Hartley Chantell Haskins David Hastings Jamie Hawkins Christopher Hayden Michael Hazel Larry Heacock Gail Heddinghaus Lisa Heilmeier Richard Heim George Heimerdinger Sean Helfrich John Henderson Gene Henry Claude Hensley Edward Herbrechtsmeier Ruthanne Heriot Leroy Herman Roger Heymann Michael Hill Donald Hillger Allen Hittelman Samuel Hocking Michael Hodges John Hoffman Amy Holbrooks Troy Holcombe Curtis Holland Jay Hollifield Mary Hollinger Frances Parmenter Holt Gary Holt Charles Hook Keith Lee Hooker Earl Hooper Vicki Horton Seyed Hosseini Colby Hostetler Phillip Hovey Jason Howard Hugh Howell James Hudson Paul Hudspeth Joan Hufton George Hughes John Hughes Kent Hughes Kimberly Hughes Mary Hughes Pam Hughes Brenda Humphries Linda Hurd John Hussey Joyce Hutchins Neil Huyck Glenn Hyatt Jean Hyatt Joy Ikelman Harry Iredale Antonio Irving Rachel Israel Cheryl Ivey Denise Jackson Nina Jackson Herbert Jacobowitz Cozette Jacobs John Jacobs Norma Jaxel John Jensen Junita Jiles Daphne Johnson Elizabeth Johnson Gregroy Johnson Larry Johnson Lee Johnson Mary Johnson Phillip Johnson George Jones Gwen Jones Wilbert Jones David Joyce Kenneth Justis Charles Kadin Faris Kahwajy Cynthia Karl Thomas Karl Otto Karst William Kayes Tomika Keels Amy Keely Kathy Kelly Everitt Kendall Kathy Kerr William Keull Alex Kidd Kathy Kidwell Serena Kierein Eric Kihn John Kineman Edward King Jeanette King John Kinsfather Jeff Kirk Patricia Kirk Laura Kirschner Rudy Kittel Harvey Klassen Thomas Kleespies Jody Klein



Thomas Knapik Richard Knight Darrel Knoll John Kobar Jack Koeppen Felix Kogan Joseph Kraft Jeff Krob Herbert Kroehl Richard Kuhn Lynda Kuntz Sheldon Kusselson Mark Lackey Sara Lackey Susan Ladenheim James Ladue Martha Lakenan Ann Lakowicz Dee Lallemont Larason Lambert Johanna Lang Leon Larry Levin Lauritson Phillip Lautenschlager Reginald Lawrence Anne Vironi Lazar Roz Ledford Kathleen LeFevre Donna Lefler Verna Leftwood Richard Legeckis Gene Legg Robert Levin Keith Levinson Sydney Levitus Arnold Levy Mary Lewis James Lienesch George Linvill Robert Lockerman Patricia Lockridge Neal Lott Michael Loughridge Ken St. Louis Elizabeth Love-Brotak Coe Lovell Phillip Lucich James Lynch Forrest MacDowell Charles MacFarland Dennis Mailhot Robert Mairs Joey Malone Greg Mandt Keith Mann Daniel Manns Grace Marano Bobby Martin James Martin Kathy Martin Anthony Mason Brooks Mason Elaine Mason James Mason Robert Masters Karon Mathews Michael Matson Eileen Maturi Billie Fay Maybin Gary McBrien Hume McClure Robert McCombie Sam McCown Bob McCoy Douglas McElreath William McElveen Christopher McFadden David McFarland Alvin McGahee David McGinnis Patrena McGruder Bob McIntosh Darin McKeever Keith McKenzie Tammy McLaughlin Susan McLean Pat McLeod Al McMath Lawrence McMillin Alan McNab Bobbie McQuilkin Albert Mears Ralph Meiggs Paul Menzel Nancy Merckle Eugene Merritt Kay Metcalf Theressa Metcalf Barbara Metz Dan Metzger Herbert Meyers Kathy Meyers Michael Mignogno Christopher Miller Dolores Miller Donald Miller Martha Miller Pedro Miller Phillip Miller Scott Miller Barry Mills Marina Minor Francis Mitchell Gary Mitchell Tsan Mo Ronald Moffatt Michael Mogil Gordon Moiles Robert Money Gregory La Montagne Linda Moodie Carla Moore John Moore Edward Moran John Moran Dave Moreno Joyce Morgan Leslie Morris Milt Mortman Roy Morton Kenneth Mugford Joseph Mulligan Pat Mulligan Ronald Mumma Greg Mundy William Murphy Chad Myers Kenneth Myles Robert Nagan Fred Nagle Doug Namian Paulos Natnael Cheryl Nave Phillip Neal Bruce Needham Ryan Nelson Teresa Nero Michael Nestlebush Arthur Neuendorffer Grant Newby Cathy Nichols Larry Nicodemus Debbie Nobbs William Nock Kathy Northrop Don Nortrup Kimberley Nye Anne O'Donnell Beverley O'Donnell Nancy O'Donnell Richard O'Neill W. Henry Odum David Ogden George Ohring Jon Olson John Otey Jonathan Overpeck Rhonda Paluba John Paquette Cecil Paris Bill Parker SeGun Parks Walter Parks Lori Paschal Jackie Passmore Sam Patterson Shirley Patterson Cathy Paxton Debbie Payne Ray Payne Karl Pechmann Jessica Pejsa Paul Pellegrino Ron Penn John Pereira Joe Perez Marlin Perkins Irving Perlroth Neil Perron Betty Petersen Lisa Peterson Tom Peterson Gary Petroski Charles Phillips Henry Phillips Roger Phillips Sharon Phillips Sheri Ann Phillips Anthony Picciolo William Pichel Linda Pikula Genevieve Piper Karol Pittman Walter Planet Marc Plantico Art Polansky Michael Forrest Porch Scott Poteat John Powers Martin Predoehl Jenny Pressley Linda Preston John Pritchard Ann Proctor William Propest James Purdom Peter Pytlowany Robert Quayle Steven Quillen Dennis Quinn Duncan Quinn Diedra Raboteau Ronald Rademacher Bruce Ramsay Myra Ramsey William Ramsey Lee Ranne Nagaraja Rao Potarazu Rao Nancy Rathburn Henry Ray Anthony Reale George Reedy Thomas Reek Letecia Reeves Nancy Regelin Donna Reisdorff Rene Cuzon du Rest Alan Revell Richard Reynolds Rashelle Richardson Debi Riddle Barry Riggin Anthony Rios Noel Risnychok George Ritchey Stan Ritter Jeannette Rivera Jeff Robel Thomas Roberts Robert Robertson Berto Robie Arlene Robinson Diane Robinson Jacob Robinson James Robinson Tilithia Robinson Lakyetta Rodgers Jesse Rodriguez Mike Rodriguez Carol Rogers John Rogers Doug Ross Thomas Ross Lee Row Nancy Rowan Louis Rubin Irwin Ruff Mark Ruminski Cherie Russell Robert Ryan Joseph Salazar Patricia Sanchez Richard Sanchez Richrad Sandridge John Sapper Richard Savage Jerry Sawyer George Saxton Charlotte Sazama William Sazama Jo Ann Sceizina Steve Schaffer Jean Schiro-Zavela Richard Schlapia David Schoolcraft Richard Schreitz Alan Schwartz Henry Schwartz Roderick Scofield Joan Seibert Mark Seiderman Glen Selby Shelly Selinske Ed Seman Cy Settles Michael Settles John Shadid Joyce Shaffer George Sharman Joseph Shaw Jim Sheridan John Sherman Lester Shipley Verna Shuler Gus Shumbera Raymond Silfa Jim Silva David Silverfarb John Simko Michael Simmons Cornie Simons Lloyd Simpson George Sinclair William Skinner James Slater Peter Sloss Alisa Smith D. Brent Smith David Smith Elizabeth Smith Johnny Smith Marshall Smyly Tom Snell Judith Snider Rex Snodgrass Roney Sorensen Sharon Souther Jesse Speidel William Speidel Robert Stancil Roberta Standa Linda Stathoplos Carl Staton Robert Stein Raymond Steiner Eric Stengel George Stephens Peter Steurer Dave Stewart Roger Stewart Sidney Stillwaugh Susan Stippich Dick Stone Robert Stone Lawrence Stowe Jesse Strand Alan Strong Timothy Stryker Jerry Sullivan Bob Summers Mike Suranno Grace Swanson Denise Sylvester George Talarski Roger Tanner Peter Ramsay Tantum Dan Tarpley Lisa Taylor Pamela Taylor Victor Taylor Roe Terry Peggy Tessier John Thomas Charles Thomason Howard Thompson Mike Tomlinson Peter Topoly Roger Torstenson Charles Towles E. Godfrey Trammell Jo Trevethan Leo Troup David Trush William Tseng Danette Tucker William Turnbull Kevin Turner Steven Turner Rob Tye Jack Urion Mark VanGorp Robert VanWie Tom Vilov Frederick Vizbulis Russ Vollmers John Voncent Gary Wade Robert Wagoner Leesalee Walker Alva Wallis Regis Walter Charles Walton Andrew Wardrett David Wark Robin Warnken Eunice Warrington Leroy Waters Benjamin Watkins Carmella Watkins Jesse Watkins Carol Watts Christopher Watts Marcia Weaks John Weaver Robin Webb Betty Weddle Michael Weinreb Roger Weldon Ingrid Wells Jim Welsh Paul Whealan Frederick White Greg White James White Joseph White Sandra White Steve White Lowell Whiteside Marie Whitt John Wilkerson Dan Wilkinson Claude Williams Donna Williams Howard Williams Linda Williams Lindsay Williams Robert Williams Monroe Wilson Marvel Wimbrow Roger Winchell Robert Winokur C. Michelle Winston Wayne Winston Gregory Withee Vernell Woldu Winifred Womack Natalie Wong Harold Wood Helen Wood Maureen Woods Charles Wooldridge Harold Woolf Vickie Wright James Wydick James Yoe Sharolyn Young Carl Yowell Marilyn Yuen James Zaitzeff Damon Zawkhin Raymond Zehr Cynthia Zeigler Stephanie Zeigler Jerome Ziemianski

Special Recognition

The following NESDIS employees were recognized by the U.S. Department of Commerce and the National Oceanic and Atmospheric Administration for the special contributions they made.

Gold Medal

Gary Davis, Satellite Operations Control Center, for his leadership in the geostationary operational environmental satellite program(GOES).

Silver Medal

W. John Hussey, Office of Satellite Development, for his major contributions to the GOES, NOAA Polar Satellite and Landsat Programs as Acting Deputy Assistant Administrator for Satellites.

Gregory W. Withee, Earl L. Heacock, Bruce H. Needham, Gregory A. Mandt, and Robert O. Masters for their outstanding teamwork in achieving cost savings through merging of the Nation's polar-orbiting meteorological satellites.

Susan J. McLean, Carla J. Moore, David M. Anderson, Eric A. Kihn, and Marcus O. Ertle, National Geophysical Data Center, for pioneering and spreading low-cost technology throughout NOAA for customer access to environmental data using the Internet.

Oscar Stone, Tom Vilov, Christopher Hayden, James Purdom, for the design, development, and implementation of the ground systems and science support for NOAA's newest geostationary weather satellites.

Bronze Medal

Mitchell Goldberg, Henry Fleming (posthumously), Office of Research and Applications, along with Wayman Baker and John Derber, National Weather Service, for implementing procedures using satellite data to improve forecast skills over the Northern Hemisphere by about 3 hours.

Reginald Lawrence, Eugene Legg, and Arlene Robinson, Office of Satellite Data Processing and Distribution, for outstanding work in increasing the accessibility of NOAA environmental data.

Richard DeAngelis, National Oceanographic Data Center, for his outstanding service as editor of Mariners Weather Log.

Mary Hughes, Office of Satellite Data Processing and Distribution, for outstanding contributions to NOAA educational programs, and developing and organizing a 2-week satellite course now being evaluated by Morgan State University as an accredited course.

Kathy Meyers, National Climatic Data Center, for her expertise and leadership in developing and implementing a computer system to process customer requests for environmental data.

Jonathan Overpeck, National Geophysical Data Center, for establishing a program in paleoclimatology that has achieved international prominence, and for creating the first agency-wide program in the study of past climates as a core project of NOAA's Climate and Global Change Program.

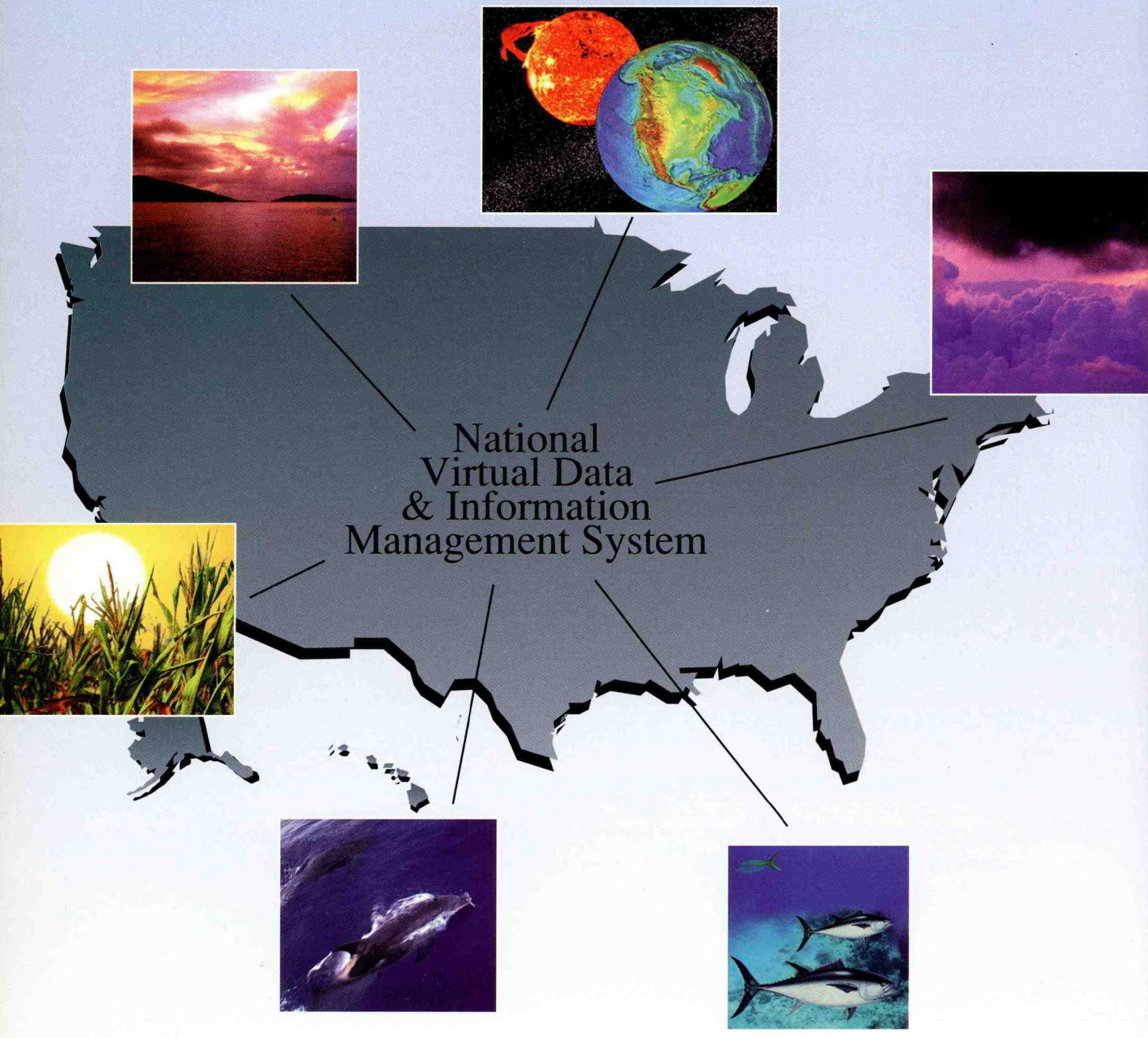
Walter G. Planet, Office of Research and Applications, for developing the capability to monitor global ozone levels from NOAA polar-orbiting environmental satellites.

Michael P. Weinreb, Office of Research and Applications, for playing a major role in the launch of the nation's newest series of geostationary weather satellites, GOES I-M.

NOAA Administrator's Award

Nina L. Jackson, Office of Satellite Data Processing and Distribution, for outstanding work in promoting opportunities and programs for minorities in NOAA.

Robert L. Mairs, Office of Satellite Data Processing and Distribution, for providing access to NOAA environmental satellite data to users around the world through development of the polar Satellite Active Archive.


National
Virtual Data
& Information
Management System

VI. Next Year and Beyond

As we approach the 21st century, NESDIS continues its dedication to its mission of serving the U.S. citizenry and the world community. To fulfill that mission, NESDIS has set goals we believe will serve the Nation's well being. Within that context we plan to:

- **Stimulate Sustained Economic Growth Through Advances in Technological Innovation**
- **Help Bring the Nation into the Information Age**
- **Implement the Nation's Converged Civilian and Military Polar-Orbiting Operational Environmental Satellite System**
- **Receive and Process Ocean-Related Data from non-NOAA Satellites**
- **Expand Our Observation Role**
- **Modernize Data Centers**
- **Strengthen Interagency and International Commitments**
- **Build Bridges to Academia and the Public**
- **Develop Improved Data Fusion/Visualization**

By 2005, NOAA will have established a fully coordinated, national, operational, environmental satellite system that will be the cornerstone of a global environmental observation and information management system. To accomplish this goal, NESDIS will build on existing interagency and international cooperation, as well as forge new partnerships. NESDIS will work with partner government agencies, and on an interagency basis through the Committee on Environment and Natural Resources Research Task Force on Observations and Data Management. NOAA will lead the National Polar-orbiting Operational Environmental Satellite System tri-agency effort, involving the Department of Defense and the National Aeronautics and Space Administration to merge civil and military polar systems. NOAA will work with EUMETSAT, the European Space Agency, the European

Union, and national space-based Earth observation agencies in Japan, France, Canada, Russia, China, and other countries. With its international partners, NESDIS will work toward overcoming observational deficiencies, correlating satellite and in situ data sets, and establishing common data formats and network interconnectivity through participation in the Committee on Earth Observation Satellites, the Global Climate Observing System, the Coordination Group for Meteorological Satellites, and other bilateral and international mechanisms. To fulfill the Nation's requirements for long-term climate monitoring, efforts must continue to enhance existing operational and research-oriented observing networks, procedures, and information management systems.

As it continues to broadcast its GOES and POES data worldwide on a free and open basis, NOAA will benefit greatly from access to foreign satellite data, including Japan's ADEOS, Canada's RADARSAT, and the European ERS series. Burden sharing will continue through provision of foreign instruments for NOAA satellites, instruments for use on the European METOP, and potentially, other foreign satellites. NOAA and its partners will continue to benefit from mutual backup satellite support as has been the case with METEOSAT and GOES. On the national scene, NESDIS and its partners will develop next-generation operational satellite programs, and will work toward establishment of a virtual data directory system.

New technology presents the national data centers with challenges and opportunities. We now have tools that allow an entire new way of doing business. We recognize that continuing along the old paths will lead to obsolescence.

With the opportunities before us, we plan to re-engineer our way of doing business so that our customers experience one integrated system. They will no longer need to discover, contact, learn the procedures of and establish payment methods for three separate data centers. Eventually we expect to provide this same level of integration throughout NOAA.

In the next decade, NASA and its foreign counterparts will continue their progress in development and launch of research satellites designed primarily for oceanographic observations. NOAA has documented operational requirements for oceanographic data that are not available from the operational POES and GOES spacecraft. Many of these requirements in ocean observations can be satisfied by NASA, ESA, and NASDA research satellites, and Canada's RADARSAT program.

A program under development within NESDIS will apply limited NOAA resources to exploit the very large financial investment in oceanographic satellites being made by the U.S., Europe and Japan. This effort is called the NOAA Satellite Ocean Remote Sensing Initiative and will provide an opportunity to access oceanographic data from the NOAA CoastWatch program and non-NOAA spacecraft; create products and services based on those data; and distribute data and data products to users. We expect to successfully accomplish these goals.

Milestones for FY 1995

In the coming year, the following milestones will continue our service to the nation and, we believe, these activities will also provide better products and services. More information on these are provided in other sections of this report.

- Launch of NOAA-J
- Launch of GOES-J
- Implement Ocean Remote Sensing Plan
- Develop Satellite Remote Sensing Plan
- Reconfigure GOES Constellation
- Implement NPOESS Integrated Program
- Continue Virtual Data Management Plan
- Begin Rookery Bay Demonstration Project
- Continue EOS Archive Options Study
- Develop a Data and Information System Capability for CCEH

Journal Articles

Borgman, L.E., C.D. Miller, S.R. Signorini, and R.C. Faucette, 1994: Stochastic interpolation as a means to estimate oceanic fields, *Atmosphere-Ocean*, 32 (2), 395-419.

Breaker, L.C., W.H. Gemmill, and D.S Crosby, 1994: Application of a technique for vector correlation to problems in meteorology and oceanography. *Journal of Applied Meteorology*, 33 (11), 1354-1365.

Carleton, A.M., D. Travis, D., R. Brinegar, D. Jelinski, and D.R. Easterling, 1994: Climaticscale vegetation cloud interactions during drought using satellite data. *International Journal of Climatology*, 14 (6), 593-623.

Chandra, S., R.D. McPeters, W. Planet, and R.M. Nagatani, 1994: The 27-day solar UV response of stratospheric ozone: Solar Cycle 21 vs. Solar Cycle 22. *Journal of Atmospheric and Terrestrial Physics*, 56 (9), 1057-1065.

Davies, J.M., C.A. Doswell, III, D.W. Burgess, and J.F. Weaver, 1994: Some noteworthy aspects of the Heston, Kansas tornado family of 13 March, 1990. *Bulletin of the American Meteorological Society*, 75 (6), 1007-1017.

Ellingson, R.G., D. Yanuk, A. Gruber, and A.J. Miller, 1994: Development and application of remote sensing of long wave cooling from the NOAA Polar Orbiting Satellites. *Photogrammetric Engineering and Remote Sensing*, 60 (3), 307-316.

Ellrod, G.P., and A. Schreiner, 1993: A comparison of ground and satellite observations of cloud cover. *Bulletin of American Meteorological Society*, 74 (10) 1851-1861.

Ferraro, R., N. Grody, and G. Marks, 1994: Effects of surface conditions on rain identification using the DMSP-SSMI. *Remote Sensing Reviews*, 11, 195-209.

Ferraro, R.R., N.C. Grody, D. Forsyth, R. Carey, A. Basist, J. Janowiak, F. Weng, G. Marks, and R. Yanamandra, 1994: Microwave measurements produce global climatic, hydrologic data. *EOS Transactions, American Geophysical Union*, 75, 337-343.

Gallo, K.P., A.L. McNab, T.R. Karl, J.F. Brown, J.J. Hood, and J.D. Tarpley, 1993: The use of NOAA AVHRR data for assessment of the urban heat island effect. *Journal of Remote Sensing*, 14 (11), 2223-2230.

Gonzalez, W.D., J. Joselyn, Y. Kamide, H.W. Kroehl, G. Rostoker, B.T. Tsurutani, and V.M. Vasyliunas, 1994: What is a geomagnetic storm? *Journal of Geophysical Research*, 99, (A4), 5771-5792.

Grant, W.B., E.V. Browell, J. Fishman, V.G. Brackett, R.E. Veiga, D. Nganga, A. Minga, B. Cross, C.F. Bugler, M.A. Fenn, C.S. Long, and L.L. Stowe, 1994: Aerosol associated changes in tropical stratospheric ozone following the eruption of Mt. Pinatubo. *Journal of Geophysical Research*, 99 (D4), 8197-8211.

Greatbatch, R., A.F. Fanning, A.D. Goulding, A. de Silva, and S. Levitus, 1994: Model-calculated seasonal transport variations through the Florida Straits: A comparison using different wind stress climatologies. *Journal of Physical Oceanography*, 24, (1) 30-45.

Groisman, P.Y., T.R. Karl, R.W. Knight, and G.L. Stenchikov, 1994: Changes of snow cover, temperature, and radiative heat balance over the Northern Hemisphere. *Journal of Climate*, 7 (11), 1633-1656.

Groisman, P.Y., and D.R. Easterling, 1994: Variability and trends of total precipitation and snowfall over the United States and Canada. *Journal of Climate*, 7 (1), 184-205.

Gutman, G., 1994: Normalization of multi-annual global AVHRR reflectance data over land surfaces to common sun-target-sensor geometry. *Advances in Space Research*, (1) 121-124.

Gutman, G., 1994: Multi-annual time series of AVHRR-derived land surface temperature. *Advances in Space Research*, (3) 27-30.

Gutman, G.G., 1994: Global data on land surface parameters from NOAA AVHRR for use in numerical climate models. *Journal of Climate*, 7 (5), 669-680.

Guttman, N.B., 1994: On the sensitivity of sample L moments to sample size. *Journal of Climate*, 7 (6), 1026-1029.

Guttman, N.B., J.R.M. Hosking and J.R. Wallis, 1993: Regional precipitation quantile values for the continental U.S. from L-moments. *Journal of Climate*, 6 (12), 2326-2340.

Guttman, N.B., 1993: The use of L-moments in the determination of regional precipitation climates. *Journal of Climate*, 6 (12), 2309-2325

Hastings, D.A., and L. Di, 1994: Modeling of global change phenomena with GIS using the Global Change Data Base; Part I: Modeling with GIS. *Remote Sensing of Environment*, 49 (1), 1-12.

Hastings, D.A., and L. Di, 1994: Modeling of global change phenomena with GIS using the Global Change Data Base. Part II: Prototype synthesis of the AVHRR-based Vegetation Index from terrestrial data. *Remote Sensing of Environment*, 49 (1), 13-24.

Johnson, G.L., J.M. Davis, T.R. Karl, A.L. McNab, K.P. Gallo, J.D. Tarpley, and P. Bloomfield, 1994: Estimating urban temperature bias using polar-orbiting satellite data. *Journal of Applied Meteorology*, 33 (3), 358-369.

Kamide, Y., and H.W. Kroehl, 1994: Auroral electrojet activity during isolated substorms at different local times: A statistical study. *Geophysical Research Letter*, 21 (5) 389.

Karl, T.R., 1994: "Smudging the Fingerprints." *Nature*, 371, 380-381.

Karl, T.R., R.W. Knight, and J. Christy, 1994: Global and hemispheric temperature trends: Uncertainties related to inadequate spatial sampling. *Journal of Climate*. 7 (7), 1144-1163.

Karl, T.R., R.W. Knight, G. Kukla, and J. Gavin, 1994: Evidence for radiative effects of anthropogenic sulfate aerosols in the observed climate record. Aerosol Forcing of Climate. *Dahlem Konferenzen*, John Wiley & Sons, New York, NY.

Kineman, J.J., and D.L. Phillips, 1994: Global environmental characterization: Lessons from the NOAA-EPA Global Ecosystems Database Project. *Environmental Information Management and Analysis*, Taylor and Francis, London, England.

Kogan, F., J. Sullivan, R. Carey, and D. Tarpley, 1994: Post-Pinatubo Vegetation Index in Central Africa. *Geocarto International*, 3.

Kogan, F., 1994: NOAA plays leadership role in developing satellite technology for drought watch. *Earth Observation Magazine*, September, 18-21.

Kondragunta, C.R., and A. Gruber, 1994: Diurnal variation of the ISCCP cloudiness. *Geophysical Research Letters*, 21 (18), 2015-2018.

Kroehl, H.W., W. Baumjohann, N. Crooker, W.D. Gonzalez, J. Joselyn, Y. Kamide, G. Rostocker, H. Singer, G. Siscoe, B.T. Tsururani, and V.M. Vasyliunas, 1994: Geomagnetic storms and magnetospheric substorms, EOS, *Transactions of the American Geophysical Union*.

Lander, J.F. and D. Cox, 1994: Revised source of the tsunami of August 23, 1872. *Science of Tsunami Hazards*, 12 (2), 117-126.

Levitus, S., M. Conkright, J.L. Reid, R. Najjar, and A. Mantyla 1994: Global distributions of silicate, nitrate, and phosphate in the world ocean. *Progress in Oceanography*, 13, 245-273.

Long, C.S., and L.L. Stowe, 1994: Using the NOAA/AVHRR to study stratospheric aerosol optical thicknesses following the Mt. Pinatubo eruption. *Geophysical Research Letters*, 21 (20), 2215-2218.

Lu, G., A.D. Richmond, B.A. Emery, P.H. Reiff, O. de la Beaujardiere, F.J. Rich, W.F. Denig, H.W. Kroehl, L.R. Lyons, J.M. Ruohoniemi, E. Friis-Christensen, H. Opgenoorth, M.A.L. Persson, R.P. Lepping, A.S. Rodger, T. Hughes, A. McEwin, S. Dennis, R. Morris, G. Burns, and L. Tomlinson, 1994: Interhemispheric asymmetry of the high altitude ionospheric convection pattern. *Journal of Geophysical Research*, 99 (A4), 6491-6510.

Matson, M., and G. Stephens, 1994: Unusual arson fires in the United States. *International Journal of Remote Sensing*, 15 (7), 1363-1364.

McMillin, L., 1994: An improved cloud retrieval algorithm using HIRS2-MSU radiance measurements. *Journal of Applied Meteorology*, 33 (2), 196-211.

Menzel, W.P., and J.F.W. Purdom, 1994: Introducing GOES-I: The first of a new generation of geostationary operational environmental satellites. *Bulletin of the American Meteorological Society*, 75 (5), 757-781.

Meyers, H., A. Hittelman, and S. McLean, 1994: Geophysical data bases managed by the U.S. National Geophysical Data Center and World Data Centers - A. *Revista Geofísica*, Pan American Institute of Geography and History.

Moore, C.J. 1994: Marine sediment data at the National Geophysical Data Center. *Marine Resources and Geotechnology*, 12, 25-32.

Ohring, G., 1994: The current status of operational satellite products for climate studies. *Advances Space Research*, 14 (1), 55-59.

Ohring, G., T. Aoki, D. Halpern, A. Henderson-Sellers, T. Charlock, J. Joseph, K. Labitzke, E. Raschke, and W. Smith, 1994: Joint IAMAS/IAHS symposium J1 on global monitoring and advanced observing techniques in the atmosphere and hydrosphere. *Bulletin of the American Meteorological Society*, 75 (4), 595-599.

Peterson, T.C., and D.R. Easterling, 1994: Creation of homogeneous composite climatological reference series. *International Journal of Climatology*, 14, 671-679.

Planet, W.G., J.H. Lienesch, A.J. Miller, R. Nagataini, R.D. McPeters, E. Hilsenrath, R.P. Cebula, M.T. DeLand, C.G. Wellemeyer, and K. Horvath, 1994: Northern Hemisphere total ozone values from 1989-1993 determined with the NOAA-11 Solar Backscatter Ultraviolet (SBUV/2) Instrument. *Geophysical Research Letters*, 21 (3), 205-208.

Prinz, E., and W.P. Menzel, 1994: Trends in South American biomass burning detected with the GOES Visible Infrared Spin Scan Radiometer Atmospheric Sounder from 1983-1991. *Journal Geophysical Research*, 99, (D8), 16719-16735.

Rao, C.R.N., M.P. Weinreb, and J. Chen, 1994: Recalibration of Advanced Very High Resolution Radiometer for climate. *Advances Space Research*, 14 (1), 117-120.

Raymond, W., R.M. Rabin, and G.S. Wade, 1994: Evidence of an agricultural heat island in the lower Mississippi River flood plain. *Bulletin of the American Meteorological Society*, 75, 1019-1025.

Rosenfeld, D., and G. Gutman, 1994: Retrieving micro physical properties near the tops of potential rain clouds by multispectral analysis of AVHRR data. *Atmospheric Research*, 34, 259-283.

Snodgrass, R.J., 1994: Comments on "Wind measurement and archival under the automated surface observing system (ASOS): User concerns and opportunity for improvement." *Bulletin of the American Meteorological Society*, 75 (2), 259-260.

Stathoplos, L., and N. Tuross, 1994: Proteins and DNA from modern planktonic foraminifera. *Journal of Foraminiferal Research*, 24, 40-59.

Stathoplos, L., and P.E. Hare, 1993: Bleaching removes amino acids from deep sea planktonic foraminiferal shells. *Journal of Foraminiferal Research* 23 (2), 102-107.

Stephens, G., 1994: Mount Pinatubo Eruption. *International Journal of Remote Sensing*, 15 (10), 1955.

Stowe, L.L., S.K. Vemury, and A.V. Rao, 1994: AVHRR clear-sky radiation data sets at NOAA/NESDIS. *Advances Space Research*, 14 (1), 113-116.

Stowe, L.L., R. Hucek, P. Ardanuy, and R. Joyce, 1994: Evaluating the design of the Earth Radiation Budget Instrument with system simulations. Part II: Minimization of instantaneous sampling errors for CERES-I. *Journal of Atmospheric and Oceanic Technology*, 11 (5), 1169-1183.

Strong, A.E., and L.L. Stowe, 1993: Comparing stratospheric aerosols from El Chicon and Mount Pinatubo using AVHRR data. *Geophysical Research Letters*, 20 (12), 1183-1186.

Tarpley, J.D., 1994: Monthly evapotranspiration from satellite and conventional meteorological observations. *Journal of Climate*, 7 (5), 704-713.

Uddstrom, M.J., and L.M. McMillin, 1994: System noise in the NESDIS TOVS forward model. Part I: Specification. *Journal of Applied Meteorology*, 33 (8), 919-938.

Uddstrom, M.J., and L.M. McMillin, 1994: System noise in the NESDIS TOVS forward model. Part II: Consequences. *Journal of Applied Meteorology*, 33 (8), 939-947.

Wang, W.C., Q.Y. Zang, D.R. Easterling, and T.R. Karl, 1993: Beijing cloudiness since 1875. *Journal of Climate*, 6 (10), 1921-1927.

Weaver, J.F., and J.F.W. Purdom, 1994: Some mesoscale aspects of the June 1990 Limon, Colorado, tornado case. *Weather and Forecasting*, 9 (1), 45-61.

Weng, F., R.R. Ferraro, and N.C. Grody, 1994: Global precipitation estimations using defense meteorological satellite program F10 and F11 Special Sensor Microwave Imager Data. *Journal of Geophysical Research*, 99 (D7), 14,493-14,502.

Wilkinson, DC, 1994: NOAA's spacecraft anomaly database and examples of solar activity affecting spacecraft. AIAA *Journal of Spacecraft and Rockets*, 31 (2), 160-165.

Yeh, K.C., S.Y. Ma, K.H. Lin, and R.O. Conkright, 1994: Global ionospheric effects of October 1989 geomagnetic storm. *Journal of Geophysical Research*, 99 (A4), 6201-6218.

Proceedings

Achutuni, R., J.G. LaDue, and R. Scofield, 1994: A soil wetness index for monitoring the great flood of 1993. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 580-583.

Aune, R.M., 1994: Improved precipitation predictions using total precipitable water from VAS. *Proceedings of the Sixth Conference on Mesoscale Processes and the 10th Conference on Numerical Weather Prediction, July 7-10, 1994, Portland, OR*, American Meteorological Society, Boston, MA, 3 pp.

Bailey, A., J. Daniels, P. Menzel, and D. Gray, 1994: Current status and future plans for the Operational Wind Extraction Program in NOAA/NESDIS. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 404-407.

Barry, R.G., R.L. Armstrong, and A.N. Krenkem, 1994: Assessing changes in snow cover. *Proceedings 50th Annual Eastern Snow Conference (Quebec City)*, Annual Eastern Snow Conference, 25-33.

Barry, R.G., J.M. Fallot, and R.L. Armstrong, 1994: Assessing changes in the crysophere: Eurasian snow cover. *Sixth Symposium on Global Change Studies*. American Meteorological Society, Boston, MA.

Bloom, J.J., A.L. Reale, and T. Gardner, 1994: The impact of the TOVS moisture channels on the retrieval of operational moisture soundings. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 116-117.

Booth, A., L.L. Stowe, and P. Topoly, 1994: AVHRR atmosphere Pathfinder data sets. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography and Ninth Conference on the Middle Atmosphere, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 251-253.

Casey, L., H.J. Bloom, and M. Chalfant, 1994: Satellite-derived products from TOVS radiations used as a database for climate and global change studies. *Proceedings of the Eighth Conference on the Atmospheric Radiation, January 23-28, 1994, Nashville, TN*, American Meteorological Society, Boston, MA, 16-18.

Chang, F-L., J.A. Coakley, Jr., and L.L. Stowe, 1994: Cloud properties retrieved from NOAA AVHRR data using spatial coherence, CLAVR, and ISCCP techniques. *Proceedings of the Eighth Conference on the Atmospheric Radiation, January 23-28, 1994, Nashville, TN*, American Meteorological Society, Boston, MA, 423-425.

Chen, J., and C.R.N. Rao, 1994: Sensitivity analysis of the post-launch calibration of the visible and near-infrared channels of the AVHRR using a desert target. *EOS-1994 Spring Meeting of the American Geophysical Union, Baltimore, MD*. American Geophysical Union, Washington, DC, 83.

Chinnery, M.A, 1994: ICSU activities in data and information. *Proceedings of the 14th International CODATA Conference, September, 18-22, 1994.*

Chinnery, M.A., A.M. Hittelman, G.F. Sharman, R.W. Buhmann, D. Metzger, and D. Dater, 1994: The National Geophysical Data Center's gravity program. *Proceedings, Symposium of the International Association of Geodesy: Gravity and Geoid, September 1994, Graz, Austria.*

Coakley, J.A., Jr., F.L. Chang, and L.L. Stowe, 1994: Differences in cloud properties retrieved using CLAVR and the spatial coherence method as candidate Pathfinder cloud algorithms. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA 285-288.

Coffey, H.C., M.E. Shea, and D.F. Smart, 1994: Problems updating solar comprehensive flare index (CFI). Proceedings of the *22nd General Assembly of the International Astronomical Union, The Hague, Netherlands, August 15-27, 1994.*

Crosby, D., 1994: Satellite inter calibration. *EOS-1994 Spring Meeting of the American Geophysical Union, Baltimore, MD*, American Geophysical Union, Washington, DC, 83.

Daddio, E., and W. Turnbull, 1994: NOAA on the Web. *Second World Wide Web Conference, Chicago, IL, September 17-20, 1994.*

Davis, P.A., G. Luo, E.P. McClain, and L.L. Stowe, 1994: Applications of multilayer cloud analysis procedures to nighttime satellite data over land. *Proceedings of the Eighth Conference on the Atmospheric Radiation, January 23-28, 1994, Nashville, TN*, American Meteorological Society, Boston, MA, 1-3.

Di, L., and D.A. Hastings, 1994: Quality assessment of global NDVIs reprocessed from NOAA GVI. *International Symposium on Global Change in Asia and the Pacific Regions, Beijing, August 1994.*

Dills, P.N., J. Jiang, J. Yang, J.F.W. Purdom, and D.A. Molenar, 1994: Applications of manual cloud tracking and height assignment to the diagnosis of mesoscale wind fields and convective systems. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 385-388.

Donahue, D.R., A.L. Reale, M. Goldberg, M. Petty, B. Whistler, and G. Kratz, 1994: Evaluation and implementation of a physical retrieval approach for DMSP operational soundings. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 548-549.

Dunbar, P., P.K. Park, and S. Dane, 1994: Natural hazards data and information in the United States. *Proceedings of the International Forum on Natural Hazards Mapping Conference*, Geological Survey of Japan.

Easterling, D.R., and T.C. Peterson, 1994: A new technique for detecting and adjusting for undocumented discontinuities in climatic time series. *Proceedings of the Sixth Conference on Climate Variations, January 23-28,1994, Nashville, TN*, American Meteorological Society, Boston, MA, 175-177.

Ellrod, G.P., 1994: Potential Use of GOES-I multispectral infrared imagery for nighttime detection of precipitation. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 164-167.

Elvidge, C.D., and W.T. Jansen, 1994: Use of AVHRR Global Vegetation Index data in the selection of multitemporal Landsat data sets covering the Atlantic coast of Brazil. *Proceedings of the International Society for Photogrammetry and Remote Sensing Symposium on Resource and Environmental Monitoring, Rio de Janeiro, Brazil, September 26-30, 1994.*

Elvidge, C.D., Z. Chen and W.T. Jansen, 1994: Rocksoil background effects on narrow band vegetation indices. *Proceedings of the International Symposium on Spectral Sensing Research, San Diego, CA*, July 10-15, 1994, 785-804.

Faas, W.M., and R.J. Snodgrass, 1994: Future on-line data access at NOAA's National Climatic Data Center. *Tenth International Conference on Interactive Information and Processing Systems for Meteorology, Oceanography and Hydrology, January 23-28, 1994, Nashville, TN*, American Meteorological Society, Boston, MA.

Ferraro, R.R., N.C. Grody, F. Weng, A. Bassist, and G. Marks, 1994: Hydrological cycle climate parameters derived from the Special Sensor Microwave/Imager. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 254-257.

Gallo, K., J.D. Tarpley, A. McNab, T. Karl, and J. Brown, 1994: A methodology for development of global baseline urban heat island adjustment for the Global Climate Perspectives System. *Proceedings of the Sixth Conference on Climate Variations, January 23-28, 1994, Nashville, TN*, American Meteorological Society, Boston, MA, 121-122.

Gallo, K.P., J.D. Tarpley, A.L. McNab, T.R. Karl, and J.F. Brown, 1994: Assessment of urban heat islands: A satellite perspective. *Proceedings of the 21st Conference on Agricultural and Forest Meteorology and 11th Conference on Biometeorology and Aerobiology, March 7-11, 1994, San Diego, CA*, American Meteorological Society, Boston, MA, 353-356.

Goldberg, M.D., 1994: Cross-satellite calibration of microwave temperature products. *EOS-1994 Spring Meeting of the American Geophysical Union, Baltimore, MD*, American Geophysical Union, Washington, DC, 78.

Goldberg, M.D., 1994: TOVS Pathfinder path-C deep layer mean temperatures. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 289-290.

Grody, N.C., R.R. Ferraro, and A.N. Basist, 1994: Identification of snow cover and precipitation using the Special Sensor Microwave/Imager (SSM/I). *Proceedings of the Special Sensor Microwave Radiometry and Remote Sensing Applications, February 1994, Rome, Italy.*

Groisman, P.Y., T.R. Karl, and R.W. Knight, 1994: Snow cover variations over the northern hemisphere and their relationship to temperature, heat balance and ENSO, *European Climate Variations Symposium, May 1994, Finland.*

Gutman, G., and L. Rukhovetz, 1994: Towards satellite-derived global estimation of monthly evapotranspiration over land surfaces. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 608-611.

Gutman, G., D. Tarpley, and A. Ignatov, 1994: Global Land AVHRR Products for Climate Studies. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 608-611.

Gutman, G., A.M. Ignatov and S. Olson, 1994: Reduction of cloud contamination in AVHRR composite images over land. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 315-318.

Habermann, R.E., and A.M. Hittelman, 1994: GeoVu data access software and data sampler. *Proceedings of the Third Annual SIGCAT National Conference and Educational Symposium on CD-ROM, April 25-28, 1994, Tysons Corner, VA.*

Habermann, R.E., and A.M. Hittelman, 1994: Providing and accessing diverse geophysical data. *Proceedings of the 3rd Annual SIGCAT National Conference and Educational Symposium on CD-ROM, April 25-28, 1994, Tysons Corner, VA.*

Hadeen, K.D. and N.B. Guttman, 1994: Homogeneity of data and the climate record. *Proceedings of the WMO Technical Conference TECO 94, Feb. 28-Mar. 3, 1994. Geneva, Switzerland.*

Hastings, D.A., and L. Di, 1993: Enhanced global change modeling with GIS: Improving data quality and GIS functionality. *Proceedings of the 25th International Symposium on Remote Sensing and Global Environmental Change, Ann Arbor, Michigan*, Environmental Research Institute of Michigan, 1, 693-704.

Hastings, D.A., 1994: Enhanced global change modeling with geographic information systems. *International Symposium on Global Change in Asia and the Pacific Regions, Beijing, Peoples Republic of China August 1994.*

Hastings, D.A., 1994: Attempting to model global environmental phenomena with the Global Change Data Base and GIS. Kuwait Institute of Scientific Research (April, 1994) at the *National University of Singapore (July, 1994) and at Chiba University, Japan (August, 1994).*

Hawkins, J. 1994: Operating GOES-I: schedule, Products, and services. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 463-367.

Hayden, C.M., and T.J. Schmit, 1994: GOES-I temperature moisture retrievals and associated gradient wind estimates. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 477-480.

Hayden, C.M., 1994: GOES-I sounder, pre-launch investigations in simulation. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 484-488.

Hayden, C.M., and X. Wu, 1994: Upper tropospheric relative humidity estimates from GOES. *Proceedings of the Eighth Conference on Atmospheric Radiation, January 23-28, 1994, Nashville, TN*, American Meteorological Society, Boston, MA, 58-60.

Herman, L.D., and F.W. Nagle, 1994: A comparison of POES satellite-derived winds techniques in the Arctic at CIMSS. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 444-447.

Hillger, D.W., and J.F. Weaver, 1993: Analysis of the convective environment utilizing clustered VAS retrievals. *Proceedings of the 17th Conference on Severe Local Storms, October 4-8, 1993, St. Louis, MO*, American Meteorological Society, Boston, MA, 84-87.

Hillger, D.W., and J.F. Weaver, 1994: Analysis of mesoscale satellite soundings with and without clustering. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 501-504.

Hillger, D.W., 1994: Use of truncated principal component analysis to improve images from satellite sounding channels. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 540-541.

Hittelman, A.M., 1994: The National Geophysical Data Center's Gravity CD-ROM project. *Bulletin D'Information*, Association Internationale de Geodesie, Bureau Gravimetique International, Issue No. 75, (June 1994).

Hittelman, A.M., and H. Iredale, 1994: A new view for Coastwatch change analysis data. *Proceedings of the Second Thematic Conference on Remote Sensing for Marine and Coastal Environments, January 31- February 2, 1994, New Orleans, LA.*

Holcombe, T.L., J.S. Warren, L.A. Taylor, and D.F. Reid, 1994: Digital data sets and graphics from New Bathymetry, Western Lake Erie. *Program Abstracts, 37th Conference of the International Association for Great Lakes Research, International Association for Great Lakes Research, Ann Arbor, MI*, p. 160.

Hollandsworth, S.M., R.D. McPeters, L.E. Flynn, and W. Planet, 1994: Comparison of trends from TOMS and combined SBUV - SBUV/2 total ozone time series. *EOS-1994 Spring Meeting of the American Geophysical Union, Baltimore, MD*, American Geophysical Union, Washington, DC, 95.

Ignatov, A.M., L.L. Stowe, and S.M. Sakerin, 1994: Estimation of oceanic aerosol properties by simultaneous shipboard sun-photometer and satellite measurements. *Proceedings of the Eighth Conference on the Atmospheric Radiation, January 23-28, 1994, Nashville, TN*, American Meteorological Society, Boston, MA, 389-391.

Jacobowitz, H., and R. Hucek, 1994: Impact of scene-dependence on AVHRR Albedo models. *Proceedings of the Eighth Conference on the Atmospheric Radiation, January 23-28, 1994, Nashville, TN*, American Meteorological Society, Boston, MA, 177-179.

Kaiser, D.P., R.S. Vose, T.R. Karl, and V. Razuvayev 1994: The distribution of cloud cover over the former USSR as derived from the RIHMI 223 3hourly meteorological database. *75th Annual Meeting of the American Meteorological Society, Applied Climatology Conference, January 23-28, 1994, Nashville, TN*, American Meteorological Society, Boston, MA.

Karl, T.R., D.R. Easterling and V. Derr, 1994: Report on second NOAA data quality and continuity workshop, Rockville, MD.

Karl, T.R., 1994: Observed climate variations and changes. *Global Climate Change Conference, April 5-8, 1994, Phoenix. AZ.*, Air & Waste Management Association.

Karl, T.R., D.R. Easterling, T.C. Peterson, C.B. Baker, P.D. Jones, G. Kukla, N. Plummer, V.N. Razuvaev, and B. Horton, 1994: An update on the asymmetric day/night land surface warming. *74th Annual American Meteorological Society Meeting, 6th Conference on Climate Variations, January 23-28, 1994, Nashville. TN*, American Meteorological Society, Boston, MA.

Kogan, F., and Pu Bu Ciren, 1994: Improvement in 1985-1993 NDVI time-series for world desert targets using post-launch calibration. *Proceedings of the International Geoscience and Remote Sensing Symposium (IGARSS'94), Vol. IV, August 8-12, 1994, Pasadena, CA*, 2308-2310.

Kroehl, H.W., G.R. Scharfen, E.S. Arrance, and S.J. Goodman, 1994: An archive of digital data from the Defense Meteorological Satellite Program. *Proceedings of the 10th International Conference on Interactive Information and Processing Systems for Meteorology, Oceanography and Hydrology, January 23-28, 1994, Nashville, TN*, American Meteorological Society, Boston, MA, 148-153.

Kukla, G., R.G. Quayle, and T.R. Karl, 1994: Is global warming mostly at night? *Global Climate Change Conference, April 5-8, 1994, Phoenix. AZ*, Air & Waste Management Association.

LaDue, J.G., 1994: The integration of satellite, radar and lightning data for the study of tornadic storms. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 341-344.

Lander, J.F., 1994: Tsunamis: We know less than we think we do and we underutilize what we do know. *The 19th Hazards Research and Applications Workshop, July 19, 1994, Boulder, CO.*

Lander, J.F., 1994: Tsunamis affecting Alaska and Hawaii. *The 19th Hazards Research and Applications Workshop, July 19, 1994, Boulder, CO.*

Lander, J.F., 1994: The past is prologue: To understand the wave of the future. *Fourth Annual Pacific Insular Earthquake and Hurricane Conference, September 15, 1994, Tumon, Guam.*

Lander, J.F., 1994: Tsunami source mechanism related to tectonic regimes. *Seismological Society of America Journal. Abstracts, Seismological Society of America, April 4-6, 1994, Anaheim, CA.*

Legeckis, R., 1994: Satellite sea surface temperature time series. *Proceedings of the Oceans - 94 Conference, Vol. 1, September 13-16, 1994, Brest, France*, IEEE, 510-514.

Maturi, E.M., and W.G. Pichel, 1993: Cloud masking for CoastWatch satellite imagery. *Proceedings of the Oceans '93 Conference: Engineering in Harmony with the Ocean*, October 18-21, 1993, Victoria, Canada, II-369-374.

Maturi, E.M., and W.G. Pichel, 1994: Cloud masking for coast watch satellite imagery. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 569-570.

McMillin, L.M., D.S Crosby, and M.D. Goldberg, 1994: A relative water vapor index. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 90-93.

McNab, A., and T.R. Karl , 1994: Metadata models used at the National Climatic Data Center. *IEEE Specialty Conference on Metadata models.*

Menzel, W.P., J.F.W. Purdom, and D.B. Miller, 1994: Early examples of GOES-I data and products. *Proceedings of the METEOSAT Users' Conference, September 1994*, 6 pp.

Meyers, H., A. Hittelman, and S. McLean, 1993: Geophysical data bases managed by the U.S. National Geophysical Data Center and World Data Center-A. *Abstracts, Instituto Panamericano de Geografia e Historia, November 8-12, 1993, San Jose, Costa Rica.*

Mo, T., 1994: A study of the microwave sounding unit on the NOAA-12 satellite. *International Geoscience and Remote Sensing Symposium, IGARSS '94, August 8-12, 1994, Pasadena, CA*, 1535-1537.

Mogil, H.M., and F.J. Smigielski, 1994: A systematic satellite approach for estimating central pressures of mid-latitude oceanic cyclones. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 379-384 and the *Proceedings of an International Symposium Geophysical Institute, University of Bergen, June 27-July 1, 1994, Bergen, Norway*, Vol. III 344-348.

Peterson, T.C., D.R. Easterling, C.B. Baker, R.S. Vose, and J.K. Eischeid, 1994: Homogeneous global mean temperature time series. *Proceedings of the Sixth Conference on Climate Variations, January 23-28 1994, Nashville, TN*, American Meteorological Society, Boston MA, 173-174.

Pichel, W.P., J. Sapper, C. Duda, E. Maturi, K. Jarva, and J. Stroup, 1994: CoastWatch operational mapped AVHRR imagery. *International Geoscience and Remote Sensing Symposium, IGARSS'94, August 8-12, 1994, Pasadena, CA*, IEEE, 1219-1221.

Planet, W.G., A.J. Miller, J. DeLuisi, D. Hofmann, I.S. McDermid, and R.D. McPeters, 1994: Comparison of NOAA-11 SBUV/2 ozone profiles with correlative measurements. *Proceedings of the Ninth Conference on the Middle Atmosphere, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 6 pp.

Planet, W.G., and K. Horvath, 1994: Northern mid-latitude total ozone; 1992-1994. *EOS-1994 Spring Meeting of the American Geophysical Union, Baltimore, MD*, American Geophysical Union, Washington, DC, 94.

Purdom, J.F.W., and P.N. Dills, 1993: Cloud motion and height measurements from multiple satellites including cloud heights and motions in polar regions. *Proceedings of the 2nd International Winds Conference, December 13-15, 1993, Tokyo, Japan.*

Purdom, J.F.W., and P.N. Dills, 1994: Cloud motion and height measurements from multiple satellites including cloud heights and motions in polar regions. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 408-411.

Purdom, J.F.W., 1994: GOES-I Imagery. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography and Ninth Conference on the Middle Atmosphere, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 3 pp.

Ramsay, B.H., 1994: A knowledge-based/geographic information system implementation of the Holdridge Life Zone Classification Method. *Artificial Intelligence Research In Environmental Science Workshop (AIRIES '94), November 15-17, 1994, Biloxi, MS.*

Rao, A.P., H.E. Fuelberg and D.W. Hillger, 1993: Cluster-derived satellite soundings during a period of intense low-level humidity gradients. *Proceedings of the 17th Conference on Severe Local Storms, October 4-8, 1993, St. Louis, MO*, American Meteorological Society, Boston, MA, 88-92.

Rao, C.R.N., 1994: An overview of meteorological satellite sensor calibration. *EOS-1994 Spring Meeting of the American Geophysical Union, Baltimore, MD*, American Geophysical Union, Washington, DC, 82.

Rao, C.R.N., J. Chen, C.C. Walton, J.T. Sullivan, and M.P. Weinreb, 1994: The NOAA/NASA Advanced Very High Resolution Radiometer (AVHRR) Pathfinder calibration activity: A progress report. *Proceedings of the Eighth Conference on Atmospheric Radiation, January 23-28, 1994, Nashville, TN*, American Meteorological Society, Boston, MA, 55-57.

Raymond, W.H., and R.M. Aune, 1994: Improved precipitation forecasts using parameterized feedbacks in a hydrostatic forecast model. *Proceedings of the 10th Conference on Numerical Weather Prediction, July 7-10, 1994, Portland, OR*, American Meteorological Society, Boston, MA, 306-308.

Reale, A.L., H.J. Bloom and D.R. Donahue, 1994: Operational applications at NESDIS using the Environmental Data Graphics and Evaluation (EDGE) System. *Proceedings of the 10th Conference on Interactive Information and Processing Systems for Meteorology, Oceanography, and Hydrology, January 23-28, 1994, Nashville, TN*, American Meteorological Society, Boston, MA, 143-148.

Reale, A.L., and M. Ferguson, 1994: Departures between satellite-derived soundings radiosondes and NMC forecast models. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 368-370.

Robinson, J.M., and R.A. Scofield, 1994: Using satellite imagery to analyze the devastating flash floods in the western region between December 1992 and February 1993. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 417-420.

Scharfen, G.R., H.W. Kroehl, E.S. Arrance, and K.N. Knowles, 1994: A user services capability for the Defense Meteorological Satellite Program (DMSP) digital data archive. *Proceedings of the 10th International Conference on Interactive Information and Processing Systems for Meteorology, Oceanography and Hydrology, January 23-28, 1994, Nashville, TN*, American Meteorological Society, Boston, MA, 154-159.

Schrab, K.J., D. A. Molenar, J.F.W. Purdom, L. Dunn, and B. Colman, 1994: The use of digital satellite data via a menu system in NWS offices. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 448-451.

Scofield, R.A., and L. Naimeng, 1994: The use of satellite imagery during the great floods of 1993. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 345-350.

Snodgrass, R.J., R.S. Cram, 1994: ASOS Data Continuity. *Proceedings of the Tenth International Conference on Interactive Information and Processing Systems for Meteorology, Oceanography, and Hydrology, January 23-28, 1994, Nashville, TN*, American Meteorological Society, Boston, MA.

Sobolev, G., Yu. Tyupkin, I. Frolov, N. Sergeeva, S. Arefev, A. Govorov, E. Rogozhin, R. Tatevasyan, M. Zhizhin, Yu. Schukin, H. Meyers, and R.E. Haberman, 1994: The Spitak database: A comprehensive description of a catastrophic earthquake. *Abstracts, International Association of Seismology and Physics of the Earth's Interior, 27th General Assembly, January 10-21, 1994, Wellington, New Zealand.*

Stephens, G., 1994: Volcano detection and monitoring using satellite data. *Proceedings of the Japan-United States Technology Workshop on the Application of Remote Sensing To Natural Disaster Reduction, November 17-20, 1993, Tsukuba, Japan*, p. 67.

Taranik, J.V., C.D. Elvidge, and J.P. Grimes, 1994: Comparison of JERS-1 with SPOT and Landsat image data for detection and mapping of hydrothermal alteration at Goldfield-Cuprite, Nevada, USA. *Proceedings of the International Society for Photogrammetry and Remote Sensing Symposium on Resource and Environmental Monitoring, September 26-30, 1994, Rio de Janeiro, Brazil.*

Tseng, W.Y., and L.S. Chiu, 1994: AVHRR observations of Persian Gulf oil spills, *International Geoscience and Remote Sensing Symposium (IGARSS) '94, August 8-12, 1994, Pasadena, CA*, 779-782.

Vampola, A., and DC Wilkinson, 1994: Single event upsets correlated with environment. *Proceedings of the Nuclear and Space Radiation Effects Conference, July 10, 1994, Tuscon, AZ.*

Weinreb, M.P., 1994: Calibration of GOES-I Imager and Sounder. *EOS-1994 Spring Meeting of the American Geophysical Union*, 83.

Weinreb, M.P., W.C. Bryant, Jr., M.S. Maxwell, and J.C. Bremer, 1994: Operational in-orbit calibration of GOES-I imager and sounder. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 473-476.

Weng, F., R.R. Ferraro, and N.C. Grody, 1994: Diurnal variations of cloud water and precipitation revealed from DMSP F-10 and F-11 SSM/I Data. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 152-155.

Winokur, R.S., and G.W. Withee, 1994: NOAA's Environmental Data System: Building a national environmental information capability. *Proceedings of MTS 94, September 7-9, 1994, Washington, DC*, Marine Technology Society, Washington, DC, 627-634.

Withee, G.W., and W.T. Turnbull, 1994: NOAA's Environmental Data System requirements: In search of a distributed petabyte data management concept. *Proceedings of the 13th IEEE Symposium on Mass Storage Systems, June 12-16, 1994, Annecy, France.*

Wu, X., G.R. Diak, C.M. Hayden, and J.A. Young, 1994: Short-range precipitation forecasts using assimilation of simulated satellite water vapor profiles and column cloud liquid water amounts. *Proceedings of the 10th Conference on Numerical Weather Prediction July 7-10, 1994, Portland, OR*, American Meteorological Society, Boston, MA, 124-127.

Yuan, C., C.D. Elvidge, J.G. Lyon, and R.S. Lunetta, 1994: North America land cover change detection using historical MSS data: three pilot studies. *Proceedings of the International Society for Photogrammetry and Remote Sensing Symposium on Resource and Environmental Monitoring, Rio de Janeiro, Brazil, September 26-30, 1994.*

Zehr, R.M., and R. S. Phillips, 1994: Expert system for tropical cyclone intensity forecasts. *Proceedings of the Seventh Conference on Satellite Meteorology and Oceanography, June 6-10, 1994, Monterey, CA*, American Meteorological Society, Boston, MA, 345-350.

Zhang, N., and C.R.N. Rao, 1994: The radiative effects of atmospheric aerosols on the retrieval of Sea Surface Temperature (SST) using the NOAA/NESDIS Operational SST Retrieval Algorithms. *Proceedings of the Eighth Conference on Atmospheric Radiation, January 23-28, 1994, Nashville, TN*, American Meteorological Society, Boston, MA, 68-70.

Technical Reports

Banks, B.A., and F. Holt, 1994,: NESDIS guide to satellite products and services implementation. *NOAA Technical Memorandum NESDIS 38*, U.S. Department of Commerce, Washington, DC, 109 pp.

Borneman, R., and C. Kadin, 1994: Catalogue of heavy rainfall cases of six inches or more over the continental U.S. During 1993. *NOAA Technical Report NESDIS 80*, U.S. Department of Commerce, Washington, DC, 154 pp.

Boyer, T.P. and S. Levitus, 1994: Quality control of oxygen temperature and salinity data. *NOAA Technical Report No. 81*, National Oceanographic Data Center, Washington, DC, 65 pp.

Conkright, M.E., T.P. Boyer, and S. Levitus 1994: Quality control and processing of historical oceanographic nutrient data. *NOAA Technical Report NESDIS 79*, National Oceanographic Data Center, U.S. Department of Commerce, Washington, DC, 75 pp.

Conkright, M.E., S. Levitus, T.P. Boyer, 1994: *World Ocean Atlas 1994, Vol. 1: Nutrients. NOAA Atlas NESDIS 1*, 150 pp.

Ellrod, G.P., 1994: Detection and analysis of fog at night using GOES multispectral infrared imagery. *NOAA Technical Report NESDIS 75*, U.S. Department of Commerce, Washington, DC, 22 pp.

Everson, N.A., 1994: NESDIS Publication Listing, 1994. *NOAA Technical Memorandum NESDIS 39*, U.S. Department of Commerce, Washington, DC, 26 pp.

Hudson, R.D., and W.G. Planet (Eds.), 1993: Dobson data re-evaluation handbook. *NOAA Technical Report NESDIS 74*, U.S. Department of Commerce, Washington, DC, 128 pp.

Levitus, S., T.P. Boyer, 1994: *World Ocean Atlas 1994, Vol. 2: Oxygen. NOAA Atlas NESDIS 2*, U.S. Department of Commerce, Washington, DC, 186 pp.

Levitus, S., T.P. Boyer, 1994: *World Ocean Atlas 1994, Vol. 4: Temperature. NOAA Atlas NESDIS 4*, U.S. Department of Commerce, Washington, DC, 117 pp.

Levitus, S., R. Burgett, T.P. Boyer, 1994: *World Ocean Atlas 1994, Vol. 3: Salinity. NOAA Atlas NESDIS 3*, U.S. Department of Commerce, Washington, DC, 99 pp.

Paris, C.A., 1994: NOAA polar satellite calibration: A System Description. *NOAA Technical Report NESDIS 77*, U.S. Department of Commerce, Washington, DC, 64 pp.

Rao, C.R.N., 1994: Post-launch calibration of the visible and near-infrared channels of the Advanced Very High Resolution Radiometer on NOAA -7 -9, and -11 Spacecraft. *NOAA Technical Report NESDIS 78*, U.S. Department of Commerce, Washington, DC, 31 pp.

Reale, A., M. Chalfant, R. Wagoner, T. Gardner, and L. Casey, 1994: TOVS operational sounding upgrades: 1990-1992. *NOAA Technical Report NESDIS 76*, U.S. Department of Commerce, Washington, DC, 76 pp.

Other Reports

Anderson, D.L., Sustainable Development: A bibliography for middle school teachers. 4 pp.

Baker, B., W. Brown, M. Changery, K. Gallo, N. Guttman, R. Husar, T.R. Karl, and C. Miller, 1994: *National Environmental Watch.*

Chinnery, M.A. 1994: Accessibility of global change data, in crop modeling and related environmental data, *CODATA*, 87-92.

Daddio, E. "Information infrastructure technology and applications," *Report of the IITA Task Group to the HPCCIT*, March 1994.

Daddio, E., "Environmental monitoring and the NII," in putting the information infrastructure to work. *Report of the IITF Committee on Applications and Technology*, Department of Commerce, May 1994.

Díaz, H. and T.R. Karl (Eds.), 1994: Information needs for precipitation sensitive systems. *Workshop Report, NOAA's Environmental Watch Report*, 94.1, Boulder, CO.

Guttman, N.B., 1994: Spatial comparability of the Palmer Drought Severity Index. *NOAA National Environmental Watch.*

Guttman, N.B., 1994: Regional temporal trends of U.S. precipitation. *NOAA National Environmental Watch.*

Guttman, N.B. (Ed.), 1994: *NOAA National Environmental Watch.*

Guttman, N.B., 1994: Data continuity in the climatological record. *Federal Plan for Meteorological Services and Supporting Research*, OFCM.

Hastings, D.A., 1994: GIS applications using NOAA data. National Geophysical Data Center Mosaic Server (from Solid Earth Division Home Page), Boulder, CO.

Hittelman, A.M., L.W. Row, J. Kineman, R.E. Habermann, and D.A. Hastings, 1994: *Global View User's Manual.* National Geophysical Data Center, Boulder, CO.

Hittelman, A.M., and R.E. Habermann, 1994: A new technique for integrated data access. *Earth System Monitor*, March 1994.

Hittelman, A.M., H. Iredale, M. Hollinger, and D. Field, 1994: *Coastal change analysis project, Chesapeake Bay region (1984-1989); CD-ROM User's Manual.* National Geophysical Data Center, Boulder, Colorado.

Hittelman, A.M., D. T. Dater, R.W. Buhmann, and S.D. Racey, 1994: *Gravity-1994 Edition, CD-ROM User's Manual.* National Geophysical Data Center, Boulder, Colorado.

Hittelman, A.M., P.A. Lockridge, and P.J. Hayes, 1993: *Geologic Hazard Photos CD-ROMs User's Manual.* National Geophysical Data Center, Boulder, Colorado.

Karl, T.R. and N.B. Guttman, 1994: Global warming update. *NOAA National Environmental Watch*, National Climatic Data Center, NOAA, 2732.

Karl, T.R., 1994: Recent rise of nighttime temperatures. *NOAA National Environmental Watch*, National Climatic Data Center, NOAA, 100-111.

Koster, E.A., M.E. Nieuwenhuijzen, and A.S. Judge, 1994: Glaciological data report GD27, permafrost and climate change, an annotated bibliography.

Kuntz, L.S., NOAA Central Library Catalog of CD-ROM holdings. National Oceanographic Data Center, Library and Information Services Division, Silver Spring, MD, 102 pp.

Lander, J. F., P. Lockridge and M. Kozuch, 1994: Tsunamis affecting the west coast of the United States 1806-1992.

Levitus, S., R. Gelfeld, T. Boyer, and D. Johnson, 1994: Results of the NODC and IOC data archaeology and rescue projects. *Key to Oceanographic Records Documentation No. 19*, National Oceanographic Data Center, Washington, DC, 67 pp.

Lott, N. and T. Ross. Lillehammer 1994, An Olympic climatology. Technical report 94-01. National Climatic Data Center, Research Customer Service Group, 1994.

Lott, N. and T. Ross: A climatological summary for the 1994 World Cup Soccer tournament. Technical Report 94-02. National Climatic Data Center, Research Customer Service Group, 1994.

McLean, S., W.M. Davis, and L.D. Morris, 1994: Geomagnetic observatories and observations, 1994. *World Data Center-A for Solid Earth Geophysics Publication SE-52*, National Geophysical Data Center, Boulder, CO.

McLean, S., and D. Smith, 1993: Bibliography of historical geomagnetic main field surveys and secular variation reports at the *World Data CenterA for Solid Earth Geophysics, World Data CenterA for Solid Earth Geophysics Publication SE-51*, National Geophysical Data Center, Boulder, CO.

Petersen, E.G., Selected El Nino bibliographies (supplement to "Reports to the Nation: El Nino and climate prediction), 4 pp.

Row, Lee W., and D.A. Hastings, 1994: *TerrainBase: worldwide digital terrain data; documentation manual.* National Geophysical Data Center, Boulder, CO.

Sobolev, G., Yu. Tyupkin, I. Frolov, N. Sergeeva, S. Arefev, A. Govorov, E. Rogozhin, R. Tatevasyan, M. Zhizhin, Yu. Schukin, P. Lockridge, R.E. Habermann, L. Whiteside, A.M. Hittelman, H. Meyers, A. Malitzky, 1994: *Spitak Earthquake, December 7, 1988*, CD-ROM User's Manual. National Geophysical Data Center, Boulder, CO.

Venneestrom, S., E. Friis-Christensen, O.A. Troschev, and V.G. Andresen, 1994 Geomagnetic Polar Cap (PC) Index 1975-1993.

FY 1994 NESDIS CD-ROMs

CCAP, Chesapeake Bay Region (1984-1989) - Based on analysis from LANDSAT Thematic Mapper scenes, this CD shows the Chesapeake Bay Area over a five-year interval, National Geophysical Data Center and the National Oceanographic Data Center.

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Experimental Calibrated GVIs - Two versions of an experimental Normalized Difference Vegetation Index (NDVI) based on Advanced Very High Resolution Radiometer (AVHRR) data, National Geophysical Data Center.

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Global Daily Summary (GDS) - Provides access to a 10,000-station set of daily maximum/minimum temperature, daily precipitation, and three-hourly present weather for the 1977-1991 period of record, National Climatic Data Center.

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Global Historical Fields (GHF), Ver 1.0 - Allows users to view daily surface charts for the period 1899 through April 1994, and daily upper-level charts from the 1940s through April 1994 (version has no data for the Southern Hemisphere), National Climatic Data Center.

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NOAA's National Environmental Watch CD-ROM - Is an attempt to communicate, in an easily understood format, important aspects of problem specific, NOAA-sponsored research and analysis, National Climatic Data Center

NOAA and MMS Marine Minerals CD-ROM - A computerized bibliography and geochemical data base of offshore hard minerals resources, National Geophysical Data Center.

NODC Taxonomic Code, Version 7.0 (1 disc) - NODC Taxonomic Code Version 7.0 provides a hierarchical system of numerical codes associated with scientific names of organisms to facilitate computerized storage and retrieval of biological data, National Oceanographic Data Center.

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Glossary

AFGWC - Air Force Global Weather Command
ASOS - Automated Surface Observing System
ATOVS - Advanced TOVS (Tiros Operational Vertical Sounder)
AVHRR - Advanced Very High Resolution Radiometer
CCEH - Center for Ecosystem Health
CD-ROM - Compact Disk-Read Only Memory
CDA - Command and Data Acquisition
CEOS - Committee on Earth Observation Satellites
CENR-R - Committee on Environmental and Natural Resources Research
CGMS - Coordination Group for Meteorological Satellites
CIASTA - Cooperative Institute for Aerospace Science and Terrestrial Applications
CICS - Cooperative Institute for Climate Studies
CIMSS - Cooperative Institute for Meteorological Satellite Studies
CIRA - Cooperative Institute for Research in the Atmosphere
CIRSBP - Cooperative Institute for the Remote Sensing of Biogeophysical Processes
CPU - Central Processing Units
DMSP - Defense Meteorological Satellite Program
DOC - Department of Commerce
EC - European Commission
ENSO - El Niño Southern Oscillation
EROS - Earth Resources Observation System
ESA - European Space Agency
ESSA - Environmental Science Services Administration
EUMETSAT - European Organization for the Exploitation of Meteorological Satellites
FAO - Food and Agriculture Organization
FTP - File Transfer Protocol
FY - Fiscal Year
GCOS - Global Climate Observing System
GILS - Government Information Locator System
GIMTACS - GOES I-M Telemetry Command Systems
GLERL - Great Lakes Environmental Research Laboratory
GODAR - Global Oceanographic Data Archaeology and Rescue
GOES - Geostationary Operating Environmental Satellites
GOIN - Global Observation Information Network
GOLD - Geophysical On-Line Data
GPO - Government Printing Office
GUI - Graphic User Interface
GVAR - GOES Variable
ICSU - International Council of Scientific Units
IGBP - International Geosphere-Biosphere Program
IGY - International Geophysical Year
IOC - Intergovernmental Oceanographic Commission
IR - InfraRed
ITDC - International Telecommunications Development Corporation (Taiwan)
JSTC - Joint Scientific and Technical Committee

LGSOWG - Landsat Ground Station Operations Working Group
METOP - European Polar-orbiting Environmental Satellite Series
MOBY - Marine Optical Buoy
NARA - National Archives and Records Administration
NASA - National Aeronautics and Space Administration
NASDA - National Space Development Agency
NCDC - National Climatic Data Center
NESDIS - National Environmental Satellite, Data, and Information Service
NEXRAD - Next Generation Weather Radar
NGDC - National Geophysical Data Center
NMC - National Meteorological Center
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NWS - National Weather Service
OASIS - On-line Access and Service Information Service
OATS - Orbit and Altitude Tracking System
OGE - Operational GOES Equipment
ORA - Office of Research and Applications
OSD - Office of Systems Development
OSDPD - Office of Satellite Data Processing and Distribution
PACS - Polar Acquisition and Control Subsystem
POES - Polar-orbiting Operational Environmental Satellites
PM - Product Monitoring
RADARSAT - Radar Satellite
RAMM - Research and Application's Regional and Mesoscale Meteorology
RAMDIS - RAMM Advanced Meteorological Satellite Demonstration and Interpretation System
SAA - Satellite Active Archive
SBUV/2 - Solar Backscattered Ultraviolet Instrument
SCT - Stored Command Table
SeaWiFS - Sea-viewing Wide Field of View Sensor
SOCC - Satellite Operations Control Center
SPS - Sensor Processing System
SSM/I - Special Sensor Microwave/Imager
SSM/T - Special Sensor Microwave/Temperature
SST - Sea Surface Temperature
SWG - Science Working Group
TCS - Telemetry and Command Subsystem
TIROS-1 - Television and InfraRed Observation System
TOVS - Tiros Operational Vertical Sounder
UNEP - United Nations Environmental Programs
URL - Uniform Resource Locator
USGS - United States Geological Survey
VISSR - Visible and InfraRed Spin Scan Radiometer
WAIS - Wide Area Information Servers
WDC - World Data Center
WMO - World Meteorological Organization

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND INFORMATION SERVICE
Washington, D.C. 20233

SEP 15 1995

MEMORANDUM FOR: All NESDIS Employees

FROM: Robert S. Winokur
Assistant Administrator for Satellite and Information Services

SUBJECT: State of NESDIS

There have been a considerable number of articles in various publications regarding the Department of Commerce and NOAA's FY 1996 budget and associated personnel contingencies. You may also have heard that some other NOAA line offices are having town meetings regarding Reductions in Force (RIF).

The budget marks from both the Senate and House for NESDIS are not as we requested. We are fortunate that the FY 1996 budget under either of these Congressional scenarios is adequate for NESDIS to continue to operate within our current level of employees and there will not be any RIF action due to any budget impact.

We have had a very productive and satisfying year in FY 1995 and I want to express my sincere appreciation for each of your contributions toward making NESDIS such a success.

I am attaching for your information and enjoyment a copy of the first annual report issued by NESDIS covering FY 1994. As you read through this document you may discover aspects of the organization that are new to you and some of our history that you might not know. I hope you will find it entertaining and informational and that you take pride in all you have helped accomplish.

Attachment

Cover: First GOES-8 image

Page v. NOAA-12 Image of fires in California