

6600895

# National Geophysical Data Center

Annual Report

1980-1981



U. S. DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
National Environmental Satellite  
Data and Information Service

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# Preface

This is the first Annual Report to be prepared by NOAA's National Geophysical Data Center (NGDC). It is intended primarily for our extraordinarily diverse user community, which includes private industry, academia and government, and has a significant international component. We are very proud of the services that we provide to this community, and we are eager to strengthen our interactions with our users, particularly in order to support developments in the private sector.

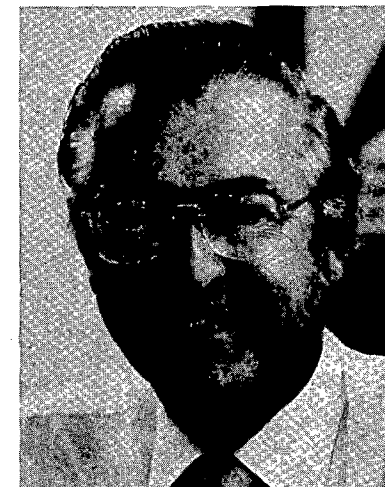
We hope that this report will accomplish two objectives. First, it describes the wealth of earth science data holdings at NGDC, the wide range of services that we provide, and our many programs aimed at new product development and user

accessibility to our data bases. We have a major responsibility to make our data as useful and accessible to our users as we can. Second, the report describes FY-84 activities. This will provide our users with some insight into how NGDC is evolving as we continually try to improve our services.

In conclusion, we send our greetings to all our users, both in the U.S. and in other countries. We welcome your inquiries about our data products and services. We encourage you to let us know how we might improve our services to better fulfill your needs. And we invite you to visit NGDC in scenic Boulder, Colorado, for either a brief tour or a longer stay to work with our data and our scientific staff.

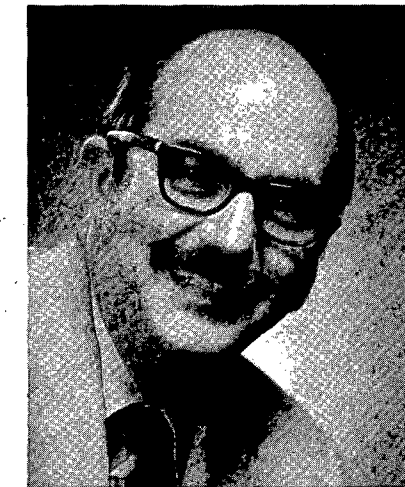
*Michael A. Chinnery*

Michael A. Chinnery  
Director



*James F. Lander*

James F. Lander  
Deputy Director



# Overview

## The National Geophysical Data Center

The National Geophysical Data Center (NGDC) was established in Boulder, Colorado, in 1972. It is one of four national data and information centers that report to NOAA's National Environmental Satellite, Data and Information Service. Its mission, as stated in the code of Federal Regulations, is:

*To acquire, process, archive, analyze and disseminate solid earth and marine geophysical data as well as ionospheric, solar and other space environment data; to develop analytical, climatological and descriptive products to meet user requirements; and to provide facilities for World Data Center A (Solid Earth Geophysics, Solar-Terrestrial Physics, Marine Geology and Geophysics, and Glaciology).*

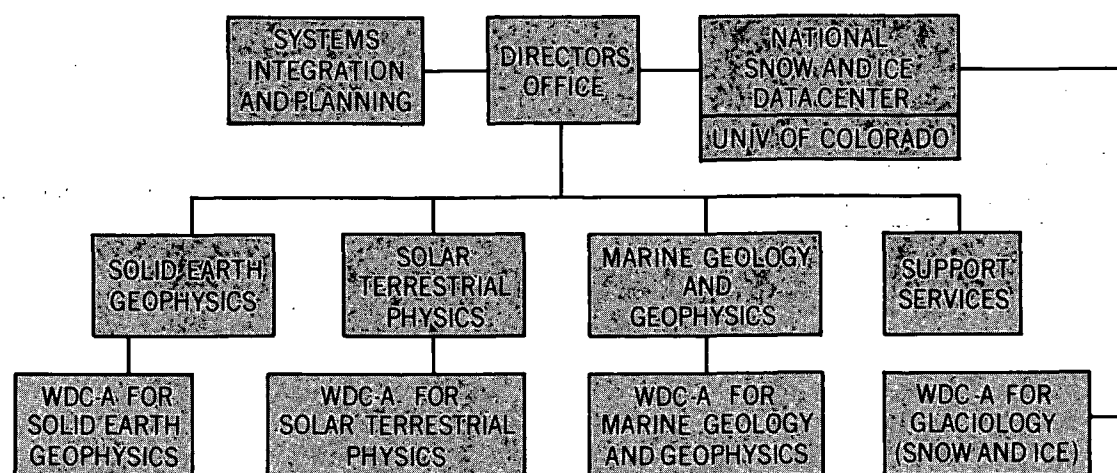
NGDC has four operational groups. Three of these are Divisions, namely Solid Earth Geophysics, Solar-Terrestrial Physics and Marine Geology and Geophysics. The fourth, the National Snow and Ice Data Center, is operated for NGDC under contract by the University of Colorado through its Cooper-

ative Institute for Research in Environmental Sciences (CIRES). Each of these four groups operates the corresponding discipline center of World Data Center A.

In each of these major discipline areas, NGDC acquires data in the public domain from Federal Agencies, private industry, academia and international sources. As the collection of geophysical data by all segments of society increases, so do NGDC's data holdings. NGDC's archives now contain well over 300 separate data bases, some of which are very large. For example, NGDC has microfilmed and archived over 2,500,000 magnetograms, over 6,000,000 seismograms, and over 50,000,000 ionograms; it holds marine geophysical data collected on nearly 10,000,000 miles of ship track; and it houses close to 1,000,000 film images from the Defense Meteorological Satellite Program (DMSP).

NGDC handles over 8,000 requests for data and information every year. Its user community ranges from private industry (the largest single user group) to academic researchers to high school and college educators to government researchers to foreign scientists. Within the industrial group, major users include the oil and mining exploration companies, and engineering firms involved in the design of critical facilities such as nuclear power plants.

### NGDC ORGANIZATION



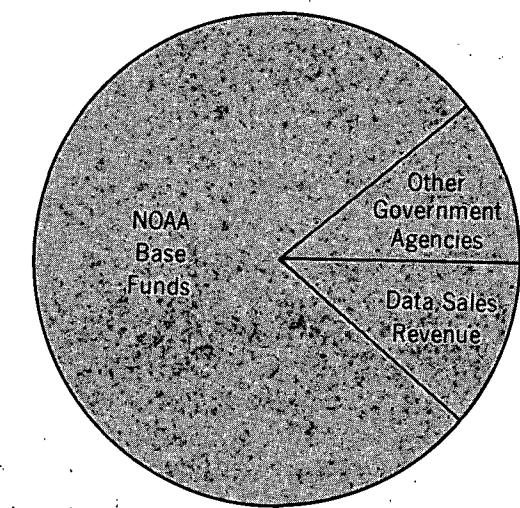
Director: Michael A. Chinnery  
Deputy Director: James F. Lander

Staff: Barbara Abbott, Secretary  
Alan Shapley, Senior Scientist

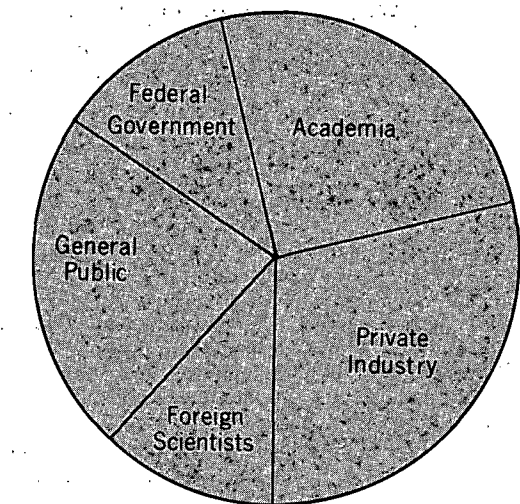
Because environmental processes have no political boundaries, NGDC has an important international role. Through the mechanism of the World Data Center system, NGDC carries out data exchange with many foreign countries, including the Soviet bloc and the People's Republic of China. This makes substantial amounts of foreign geophysical data available to U.S. scientists. This kind of data exchange is particularly active in the Solar-Terrestrial Physics area.

Looking toward the future, NGDC is developing new programs that reflect the changing world of geophysics. Particular emphasis is being placed on the incorporation of satellite data into our data archives. Thus in the Solid Earth Geophysics area, NGDC is embarking on a program that will integrate space remote-sensing and potential field data with its archives of ground-based data. In the Solar-Terrestrial Physics area, a new data base of satellite anomalies has been established, since many of these malfunctions appear to be the result of solar activity. In the Glaciology area, preparations are being made to receive, process and disseminate data from the Special Sensor Microwave Imaging device on board the next generation of DMSP satellites. These data will have many applications in the study of sea ice. In the Marine Geology and Geophysics area, NGDC expects to play a major role in the dissemination of multiple-beam sonar data collected in the Exclusive Economic Zone.

However, NGDC is not just a set of programs. It is also about 100 dedicated people, with talents ranging from the professional scientists to the data management specialist to the provider of user services. In the pages of this report, you will find information about NGDC's programs and its people. It is the combination of these two that has led to our current success, and which promises even more success in the future.



FUNDING FOR NGDC PROGRAMS



THE NGDC USER COMMUNITY

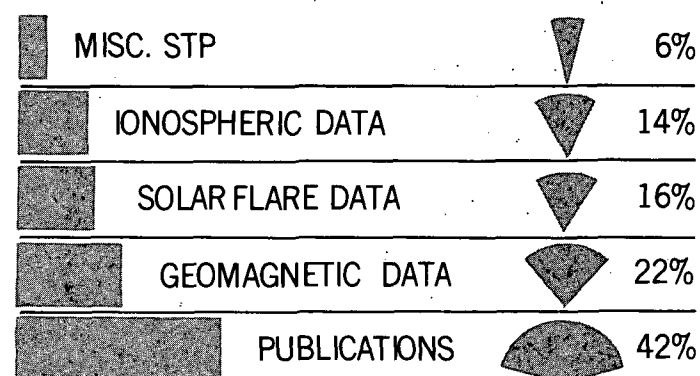
# Solar-Terrestrial Physics (STP)

Solar-Terrestrial Physics studies the processes by which energy is:

- Generated by the sun.
- Crosses interplanetary space.
- Couples into near-Earth space.
- Moves to the upper atmosphere.
- Affects the geomagnetic field.
- Affects technological systems.
- Affects human health & safety.

Everyone recognizes the sun as the source of Earth's life-sustaining heat and light. Many know of the direct connection between the sun's radiant energy and Earth's oceans and atmosphere that forms our weather systems. However, not so well known is the fact that the sun has regular explosive episodes of activity—solar flares and mass ejections hurl vast amounts of radioactive material and intense bursts of electromagnetic radiation into space. When these intersect the orbiting Earth, drastic consequences may result for humans, satellites, HF radio communications, radar systems, and electric

## REQUESTS BY DISCIPLINE



power networks. They may cause changes in Earth's climate and affect other important environmental factors.

To meet the needs of U.S. Government, university and industry scientists, and the general public for STP data, the National Geophysical Data Center (NGDC) is the focus for collecting, processing, archiving, and disseminating all types of data related to solar activity and its effects on Earth.

We also operate World Data Center-A for STP through which data collected around the world are made available to U.S. users. In exchange, through the WDC system, we provide copies of our data to foreign scientists. Because the sun isn't in view from North America at all times when activity occurs, we must rely on foreign sources for some two-thirds of our incoming data.

Responsibility for collecting STP data and providing our many services is divided among four groups:

- Solar & Upper Atmosphere.
- Geomagnetic Variations.
- Ionospheric Data Services.
- Special Projects.

Program highlights from each area are given in the following pages.

Each year around 2,000 requests for STP data or information come to NGDC and are logged into our system. The bar graph at left shows how they were divided by discipline in FY-84. It is easy to see that our publications are the most requested data format.

In addition, we contract operation of the 4-station U.S. ionosonde network, providing daily values to satellite and telecommunications users.



Chief: Joe Allen

## Rosemary Rasmussen, Secretary

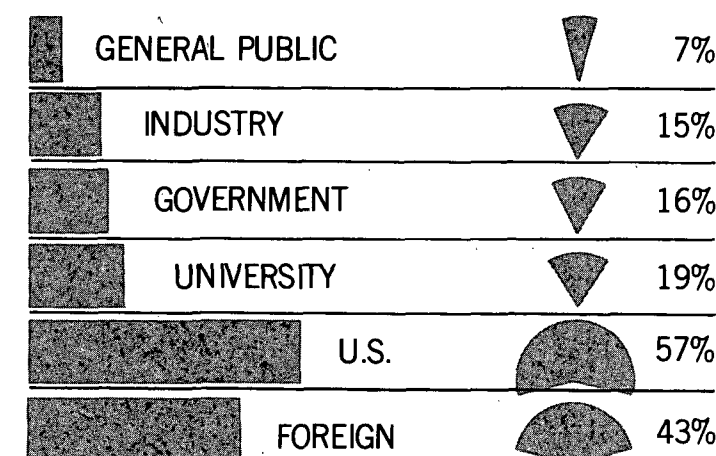
NGDC's STP archives are becoming extensive:

- 18.6 million feet of film.
- 5,000 cubic feet of paper records.
- 80,000 Mbytes of digital data.

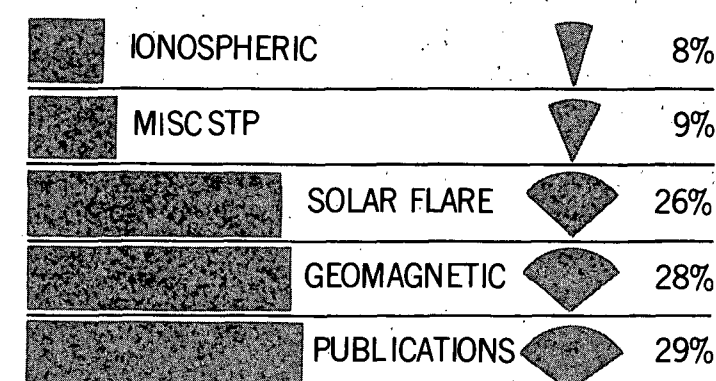
In FY-84, other agencies provided almost \$300K for STP operations in support of joint projects. The value of data obtained through exchanges is difficult to estimate but charges for data copied to users totaled \$125K.

The chart below shows the amount of income received for the same areas used in the request diagram. Often publications are given in exchange for data. Not shown here is the fact that the Ionospheric Data Services and our Special Projects Group are the main sources of programs having other agency support.

## TYPES OF DATA USERS



## DATA SALES



We prepare and send newsletters to thousands of scientists and administrators around the world to inform about STP programs and encourage global coordination.

Our monthly publication "Solar-Geophysical Data Reports" and the special UAG Reports are definitive sources of STP data.

Our staff publish results of analysis projects in scientific journals, give papers at meetings, and work with visiting scientists to improve our data bases and services.

We are on national and international committees responsible for planning scientific programs. Through inter-agency panels, we cooperate with other government agencies to assure that our missions complement theirs.

STP data are held in many different formats: on paper, microfilm, microfiche, magnetic tape and disk, video-tape, and in 16-mm data movies made by a computer. We have old geomagnetic observatory yearbooks dating from the 1840s, and tables of sunspot numbers that begin in 1610 when Galileo first turned his newly invented telescope toward the sun.

# Solar and Upper Atmospheric Physics



Group Leader: Helen Coffey

These data describe what is happening on the sun and how Earth is affected by this activity. The sun emits enough energy in 1 second to energize the U.S. at its current consumption rate for 9 million years. The 11-year cycle of the sun's activity is seen from data bases extending back into the 1700s. Data include:

■ **Solar flares**—enormous eruptions in the sun's atmosphere, which throw particles and radiation into space. The largest explosive events in our solar system, these solar flares are equivalent to 30 billion Hiroshima-size atomic bombs.

■ **Solar radio**—monitors the sun's corona high in the sun's atmosphere. A large coronal mass ejection releases a billion tons of material into space. Solar radio bursts interfere with radio communications on Earth, causing jamming and navigation system problems.

■ **Sunspots**—large cooler areas on the sun where most flares occur. Sunspots have large magnetic fields. When these magnetic fields become twisted enough, the chances of a flare occurring increase dramatically.

■ **Interplanetary phenomena**—solar wind and particle measurements. The solar wind gusts at speeds from 1.5 million mph to 6 million mph. High speeds occur when "coronal holes" are seen on the sun, as well as during large flares or mass ejections.

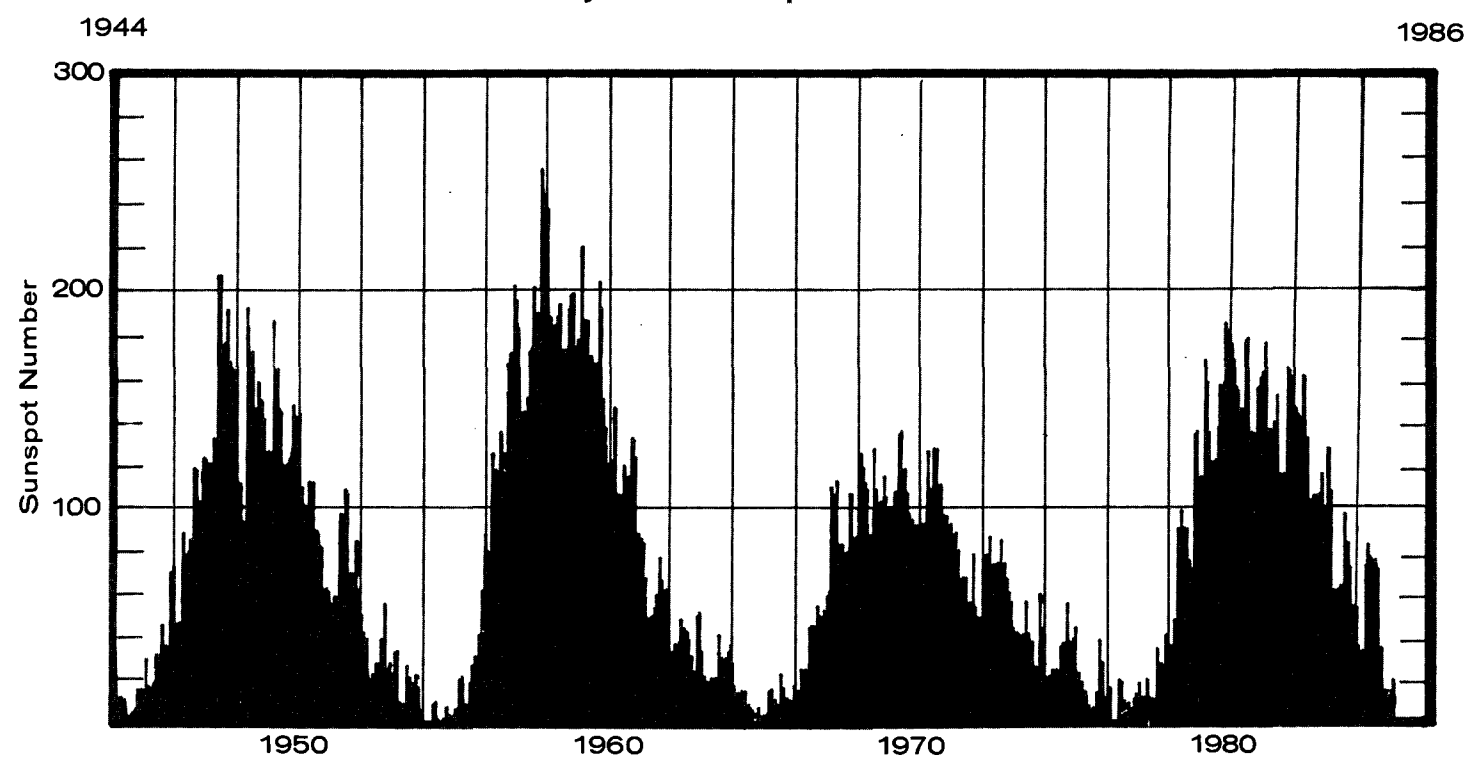
■ **Aurora**—Northern lights (aurora borealis) and Southern lights (aurora australis), which occur when energetic particles from the sun hit Earth. A large proton flare on the sun can cause the aurora to expand much further down from the North and South poles. Occasionally, it can be seen in Boulder.

■ **Cosmic rays**—large changes in the amount of high-energy background radiation, directly related to activity on the sun's surface. Intergalactic cosmic rays decrease when large events on the sun affect Earth.

The histories of activity on the sun and of related Earth phenomena are published monthly in *Solar-Geophysical Data* and stored in digital form on magnetic tape. The sun's activity directly affects satellite communications and operations, ground-based communications, high technology systems, and even the navigation of airplanes. It also affects the weather and human behavior.

**Staff:** John McKinnon, Physicist  
Dan Wilkinson, Physicist  
Viola Miller, Physical Science Technician  
Carol Weathers, Editorial Assistant

Monthly Mean Sunspot Numbers



## FY-84 Highlights:

■ Published monthly article on "Geomagnetic and Solar Activity" in *Journal of Geophysical Research*.

■ Issued 100 copies of "International Geophysical Calendar 1985."

■ Completed publication, "Atmospheric Handbook" by scientist at NOAA, Environmental Research Laboratories.

■ Collaborated with AFGL on MONSEE Directory listing of current solar-terrestrial physics monitoring stations.

■ Published article on NOAA GOES-2 satellite failure in *EO* (article by D. Wilkinson).

■ H. Coffey, President of Boulder County Zonta International, received a Leadership Award.



# Satellite Anomalies and STP Activity

Project Scientist: Joe Allen

Although engineers try to design satellites to withstand the harsh environment in which they operate, increasing demands for more satellite data storage, for electronic components which perform more functions in less time, and for more complex instrument payloads all combine to create more vulnerable systems. Also, changing mission requirements may take future space shuttles and new satellites into more dangerous orbits than those of earlier years.

As the level of solar activity rises and falls in the well-known 11-year cycle, memories of the problems experienced by satellites near solar maximum sometimes becomes dim during the less disturbed years. Often it is difficult to show a convincing linkage between operational failures of a given satellite, our "anomalies," and particular events on the sun. Also,

the necessary security that surrounds both Government and commercial satellite operations sometimes prevents the sharing of experiences that could illuminate satellite problems. To address this situation in a useful way, NGDC has established a Satellite Anomaly Data Base.

Lists of satellite anomalies from the GOES-4 and GOES-5 satellites, from about 10 years of INTELSAT commercial satellites, and from the Indian and Japanese geostationary satellites were combined on the NGDC computer system, which also contains extensive archives of solar-terrestrial activity. The result is an unprecedented collection of data showing some expected patterns of anomalies as well as areas of needed research.

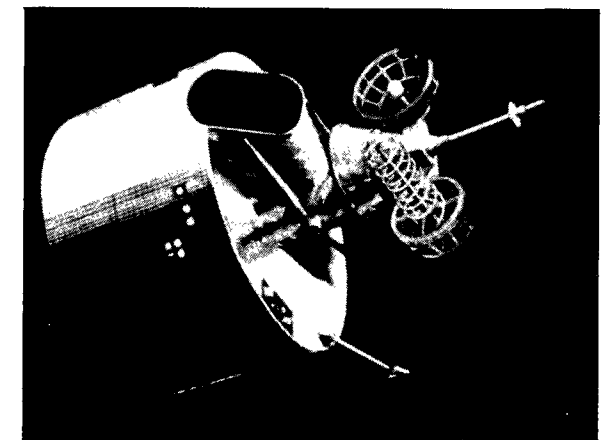
Geostationary satellites, just inside the boundary between magnetosphere and interplanetary space, rotate with Earth and stay above the same location on the equator. They are especially vulnerable to surface charging effects during magnetically disturbed times when the satellite is in the midnight-to-dawn region and instruments begin to execute commands without receiving a signal from Earth.

Streams of charged particles blowing from the sun in all directions are called the "Solar Wind." Earth's magnetic field shields the lower atmosphere and surface from most of the solar wind by trapping particles in the "Van Allen Belts" and in storage regions streaming downwind behind Earth. This large comet-shaped cavity surrounding Earth is called the magnetosphere.

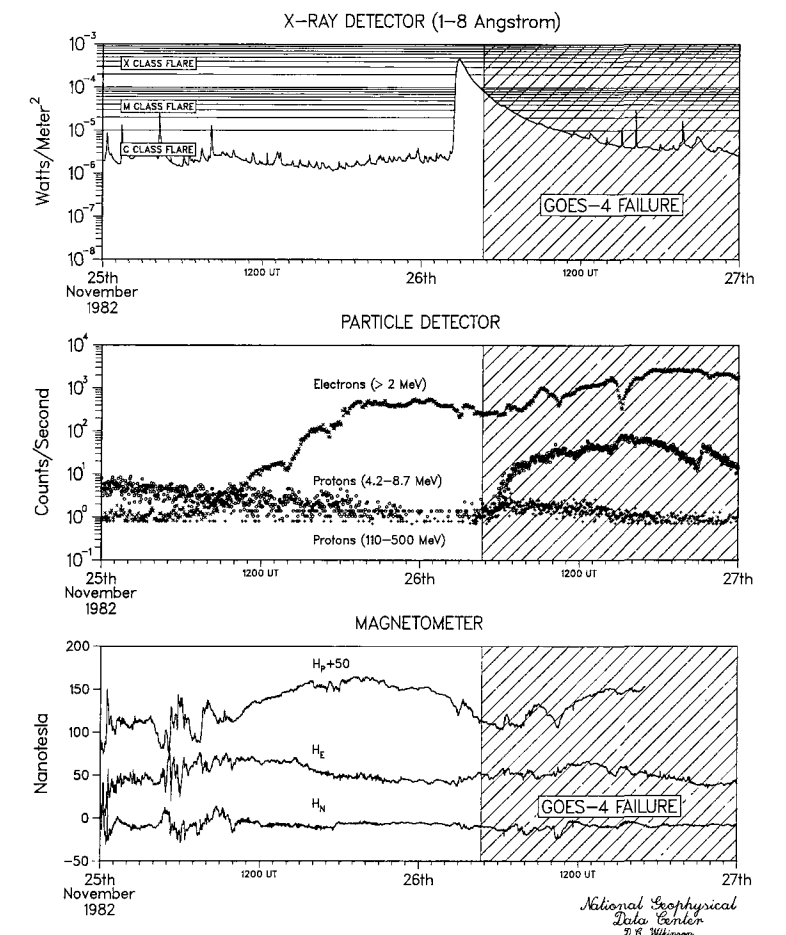
Sometimes the storage regions are disturbed and the charged particles spiral down along magnetic field lines into the polar upper atmosphere where they produce Aurora Borealis and Australis—the Northern and Southern lights. Other energetic particles penetrate directly into the upper atmosphere and may collide with satellites orbiting Earth or, by heating the atmosphere, increase the air resistance and significantly change low-altitude orbits.

Solar flares are temporary bright regions on the sun that can be explosive sources of intense white light, changing patterns of radio waves, hard X-rays, and streams of high-energy charged particles (mostly electrons and protons). The most energetic particles arrive at Earth only a few minutes slower than the light, X-rays and ultra-violet radiation.

In November 1982, the GOES-4 satellite sustained a major part failure at a time when the GOES-2 satellite showed an unusually high flux of electrons and a large solar flare emitting high-energy protons. Similar conditions have been associated with other satellite failures.

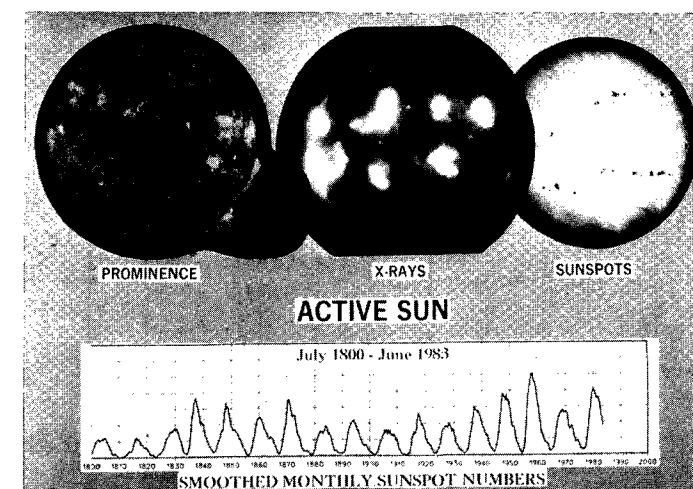
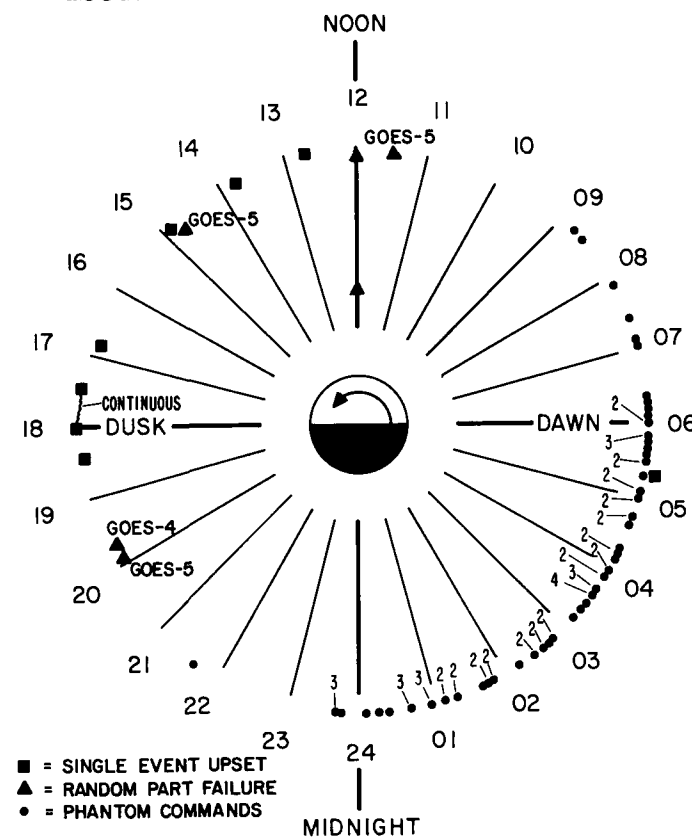


**GOES-2 SPACE ENVIRONMENT MONITOR (108° West Longitude)**



National Geophysical Data Center  
J. G. Williamson

**Local Times of GOES - 4 & 5 Anomalies**





Group Leader: Leslie Morris

# Geomagnetic Variations

Geomagnetic variation data are collected by a worldwide network of about 200 geomagnetic observatories. The archived data describe what is happening to Earth's changing magnetic field. These changes are measured by magnetographs, both analog and digital. Data holdings include:

- Analog magnetograms—strip chart recordings of the variations of Earth's magnetic field.

- Reduced hourly values—scaled averages of hourly variations of the magnetic field.

- One-minute values—samples of geomagnetic variations, usually recorded on magnetic tape.

These raw data also are reduced to several descriptive geomagnetic indices, including:

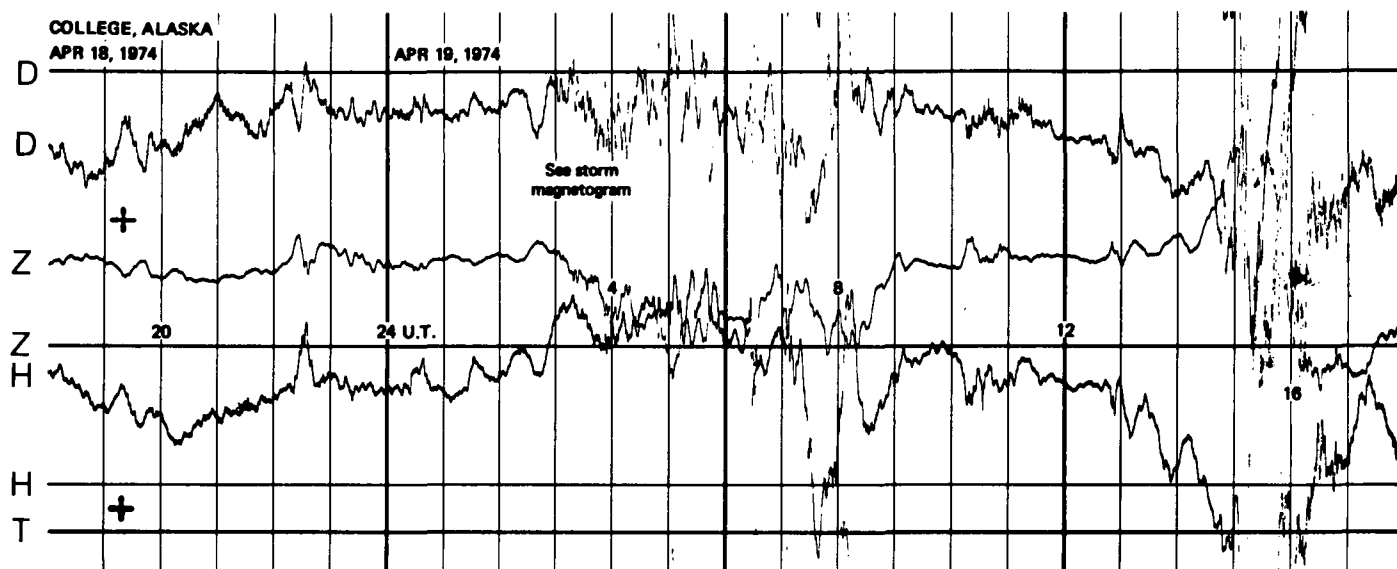
- K-Index—scaled value of geomagnetic activity for each 3-hour interval at a particular geomagnetic observatory.

- Auroral electrojet index (AE)—index of magnetic activity derived from a network of North Polar cap geomagnetic observatories.

- DST index—index of magnetic activity derived from a network of equatorial geomagnetic observatories.

Records of changes in Earth's magnetic field are used by scientists and engineers in Federal laboratories and industry, and by university researchers, medical doctors, psychiatrists, and the general public. Magnetograms show the complex mixture of effects of changing electrical currents overhead in the ionosphere, below in Earth's crust, flowing in space through the Van Allen belts, and along remote boundaries of Earth's magnetosphere. They often give the first signal of Earth-borne consequences of solar activity. From these records, we compute conditions in the upper atmosphere, where heat energy from streams of charged particles increases the drag on satellites and causes orbit decay.

Engineers study conditions during "magnetic storms" to learn why some satellites die and others survive; space scientists try to deduce causes of erroneous messages from satellites. During magnetic storms, Early Warning Radars display unusual signals, radio communications are interrupted, aircraft and ship navigation are impaired, and power



Magnetogram Recorded at College, Alaska

| OBSERVATORY      | COD | KAQ | NORMAL MONTHS   | RAPID RUN    | HOURLY ANY      |
|------------------|-----|-----|-----------------|--------------|-----------------|
| ABINGER          | ABN | KA  | JA J M          | O DI         | IA JFMAMJJASOND |
| ABINCOURT        | ABN | KA  | IA JFMAMJJASOND |              | IA JFMAMJJASOND |
| ALIBAG           | ABG | KA  | IA              | O            | IA JFMAMJJASOND |
| AMBERLEY         | AML | KA  |                 |              |                 |
| APIA             | API | KA  |                 |              | IA JFMAMJJASOND |
| CASTELLACCIO     | CAO | A   |                 |              | IA JFMAMJJASOND |
| CHAMBON-LA-FORET | CLF | KA  |                 |              | IA JFMAMJJASOND |
| CHEL TENHAM      | CLH | KA  | IA              | O            | IA JFMAMJJASOND |
| CHRISTCHURCH     | CHR |     |                 |              | IA JFMAMJJASOND |
| COLLEGE          | CMO | KA  | IA              | JFMAMJJASOND |                 |
| DOMBAS           | DOB | KA  |                 |              | JFMAMJJASOND    |
| EBRO             | EBR | KA  |                 |              | JFMAMJJASOND    |
| ELIZABETHVILLE   | ELI |     |                 |              | IA JFMAMJJASOND |
| ESKDALEMUIR      | ESK | KA  |                 |              | IA JFMAMJJASOND |
| FURSTENFELDBRUCK | FUR | KA  |                 |              | IA JFMAMJJASOND |
| GODHAVN          | GDH | KA  |                 | JFMAMJJASOND | IA JFMAMJJASOND |
| HERMANUS         | HER | KA  |                 |              | IA JFMAMJJASOND |
| HONOLULU         | HON | KA  | IA              | JFMAMJJASOND | IA JFMAMJJASOND |
| HUANCAYO         | HUA | KA  |                 |              | IA JFMAMJJASOND |
| IRKUTSK          | IRT | KA  |                 |              |                 |
| IVIGTUT          | IVI | K   |                 |              |                 |
| KAKIOKA          | KAK | KA  |                 | JFMAMJJASOND | IA JFMAMJJASOND |
| KAZAN            | KZN | KA  |                 |              | IA JFMAMJJASOND |
| LERUICK          | LER | KA  |                 |              | IA JFMAMJJASOND |
| LOVO             | LOV | KA  |                 |              | IA JFMAMJJASOND |
| MAURITIUS        | MRI | A   |                 |              | IA JFMAMJJASOND |
| MEANOOK          | MEA | KA  | IA              | JFMAMJJASOND | IA JFMAMJJASOND |
| MOSCOW           | MOS | K   |                 |              | IA JFMAMJJASOND |
| MT WILSON        | MWC | KA  | IA              | JFMAMJJASOND |                 |
| NIEMEGK          | NGK | KA  |                 |              |                 |
| PILAR            | PIL | KA  |                 |              | IA JFMAMJJASOND |
| RUDE SKOV        | RSV | KA  |                 |              | IA JFMAMJJASOND |
| SAN FERNANDO     | SFS | KA  |                 | JFMAMJJASOND | IA JFMAMJJASOND |
| SAN JUAN         | SJG | KA  | IA              | JFMAMJJASOND | IA JFMAMJJASOND |
| SITKA            | SIT | KA  | IA              | JFMAMJJASOND | IA JFMAMJJASOND |
| SODANKYLA        | SOD | A   |                 |              |                 |
| SREDNIKAN        | SRE | KA  |                 |              |                 |
| SVERDLOVSK       | SVD | KA  |                 |              |                 |
| SWIDER           | SWI | KA  |                 |              | IA JFMAMJJASOND |
| TASHKENT         | TKT | K   |                 |              |                 |
| TBILISI          | TFS | K   |                 |              |                 |
| TOOLANGI         | TOO | KA  |                 |              |                 |
| TROMSO           | TRO | A   |                 |              | IA JFMAMJJASOND |
| TUCSON           | TUC | KA  | IA              | JFMAMJJASOND | IA JFMAMJJASOND |
| VASSOURAS        | VSS | A   |                 |              |                 |
| WATHEROO         | WAT | KA  |                 |              | IA JFMAMJJASOND |
| WIEN-KOBENZL     | WIK |     |                 |              | JFMAMJJASOND    |
| WINGST           | WNG | KA  |                 |              |                 |
| WITTEVEEN        | WIT | KA  |                 |              | IA JFMAMJJASOND |
| YAKUTSK          | YAK | KA  |                 |              |                 |

Output from Computerized Inventory System

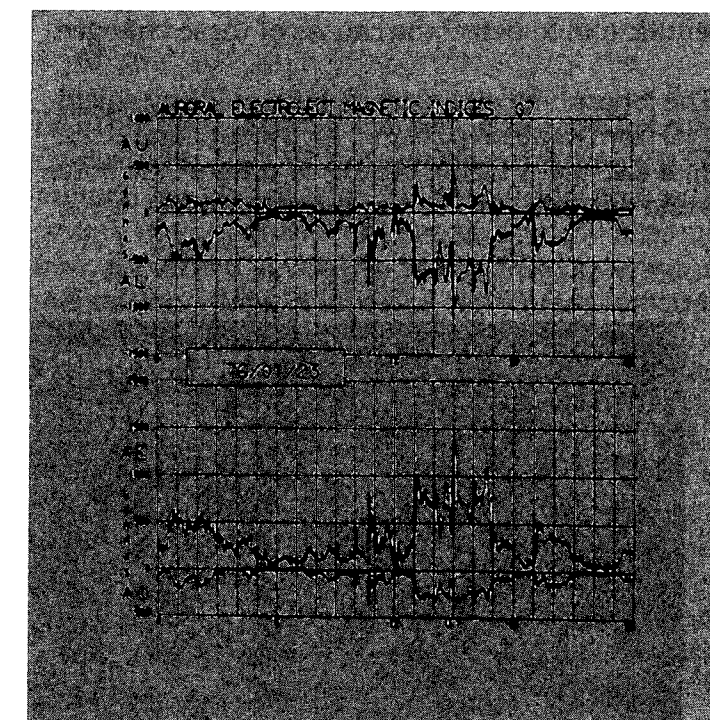
distribution networks overload and fail. Geomagnetic variations, either directly or summarized as indices, provide answers to these and other problems.

## FY-84 Highlights

- Increased geomagnetic archive by more than 2400 observatory months.

- Added to the archive digital 1-minute variation data from the Air Force Geophysics Laboratory magnetic chain stations.

Staff: Betty Weddle, Scientific Data Technician



Auroral Electroject Magnetic Activity Indices

- Developed computerized online inventory system for geomagnetic data holdings.

- Collaborated with NASA/Japan on joint 1982-83 AE Project.

- Published International Catalog of Geomagnetic Data—combined catalog of all geomagnetic holdings.

# Ionospheric Physics



Group Leader: Raymond Conkright

The ionosphere is the ionized part of Earth's atmosphere. The main cause of the ionization is electromagnetic radiation from the sun. This fragile ionized sphere around Earth, which extends from altitudes of about 30 miles to more than 250 miles, is disturbed by changes in the near-Earth environment. For this reason, the ionosphere is an excellent scientific tool to detect the causes of these changes.

The ionosphere also protects human life by shielding us from excessive cosmic rays and ozone radiation; it also gives us the beauty of the aurorae borealis and australis (the Northern and Southern lights).

## Ionosphere Sounding

Once located, ionospheric data are archived, advertised to the scientific community, and distributed upon request. Because the ionosphere perturbs all electromagnetic waves that come in contact with it, the most frequent uses of ionospheric data are for communication activities and the scientific study of Earth's upper atmosphere.

The group also supports the scientific community in ionospheric-related research by operating four ionospheric recording stations, assisting about 100

ionospheric stations operated by other organizations, and publishing an INAG (Ionospheric Network Advisory Group) quarterly bulletin sponsored by the URSI (International Radio Science Union).

Staff: George E. Talarski, Physicist  
 Marcus Ertle, Computer Programmer  
 Doris Stansell, Physical Science Technician  
 Roxzane Sands, Scientific Data Clerk

## FY-84 Highlights

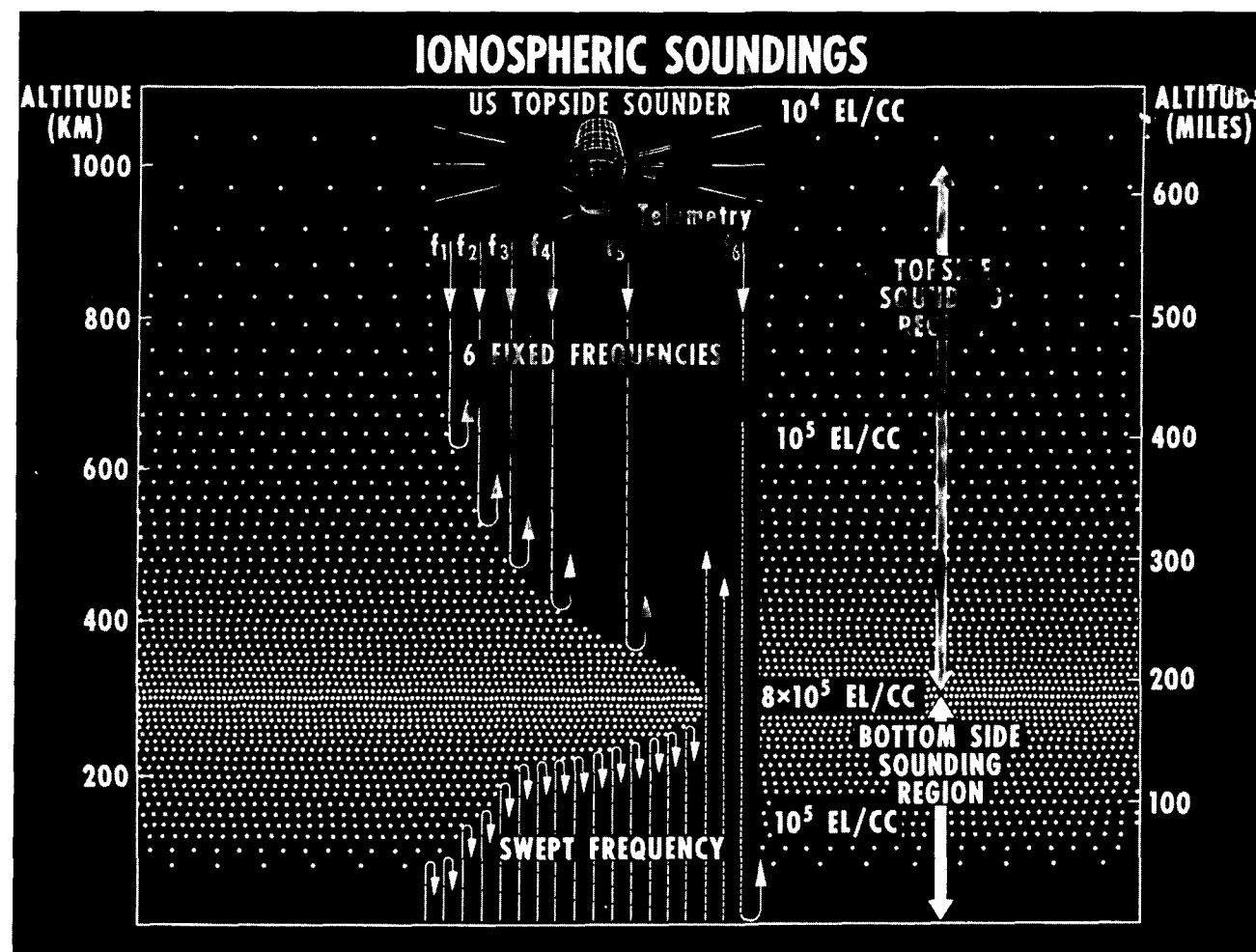
■ Combined World Data Center Catalog—For the first time, an International Ionosphere Vertical Sounding Data Catalog was published. It lists all data held by the four World Data Centers for Ionospheric Data. This landmark of cooperation between data centers was the first successful attempt to sort out the nomenclature, terminology, and coding differences for this discipline. The project was successful in a short time because of the frequent use of the NOAA-Net electronic mail system. Under our guidance, this cooperation led to new international standard formats for the exchange of ionospheric information, catalogs, and data.

■ BATTLETOAD—John H. McElroy received a letter of appreciation from William O. Mehuron, Deputy Director for Research and Engineering, National Security Agency, for the key role played by the Ionosphere Data Group in the recent multiple agency

BATTLETOAD (Beacon Assisted Technique To Locate Emitter with Time Of Arrival Difference) project. The project was designed to locate quickly and accurately a high-frequency (HF) transmitter (such as one from a downed aircraft) in many different environmental conditions. It involved continuous transmission of HF signals from 10 transmitter sites to five receiver sites. The lengths of the radio paths studied varied from less than 50 km to nearly 1600 km. Vertical incidence ionosondes were operated at Boulder, CO; Los Alamos, NM; and Salina, UT; and their observations were used to provide real-time information about the ionospheric structure. The ionosonde information was used with propagation prediction obtained from the Ionospheric Communications Analysis and Prediction program, to provide quasi-real time frequency management for all the radio circuits in the experiment.

■ QSTMUF—A new data product developed is of special interest to radio "HAMS" who have home computers. The program QSTMUF can be supplied on diskette for most small microcomputers. It will predict the Maximum Usable Frequency (MUF) for any path. All the users need to provide are the locations (of the transmitter and receiver) for the path and the sunspot number (which is available from NGDC). This is an effort to reach a new market for ionospheric data and information.

■ Remote Data Access—The first system to allow customer access to the data from remote sites went into operation using the NOAA-Net computer system.





# Magnetosphere-Ionosphere Interaction



Group Leader: Herbert Kroehl

Energetic particles emitted by the sun must transit through interplanetary space before depositing their energy, mass, or momentum in the near-Earth environment. This cavity in space is called the Earth's magnetosphere, which is best described by its population of charged particles. These can be directly measured by satellites or indirectly by remote-sensing techniques. The flow of these particles creates electric currents, some of which deposit their energy in the ionosphere causing atmospheric heating. The Special Projects Group uses data archived by the geomagnetic, ionospheric, and solar groups to study the dynamics of magnetospheric-ionospheric interactions in the hope of eventually being able to predict the near-Earth space environment.

In addition, the Special Projects Group focuses on answering out-of-the-ordinary data requests, providing data products developed for special projects, on developing archival programs for new digital data

bases and on completing special analysis projects partially supported by other agencies. Special data products and services are provided for the following data bases:

- United States Air Force (USAF) satellite-borne measurements of the near-Earth space environment of electrons and protons which cause the aurora.
- USAF digital recordings of solar telescope data at optical wavelengths used to measure solar activity, the magnetic field of active regions, and the velocity of the solar atmosphere.
- USAF digital recordings of solar telescope data at radio wavelengths to determine the activity at different altitudes of the solar atmosphere.
- Graphical displays of digitally recorded data from USAF instruments.

## FY-84 Highlights

- Supported Coordinated Data Analysis Workshop-6, a NASA multi-platform project, by computing the distribution of horizontal and vertical currents at high latitudes.
- Supported NASA sponsored project to compute magnetic activity indices of the auroral electric currents for Oct. 82-Dec. 83.
- Made computer-generated movies in color and with narration of solar wind variations and electrical currents with assistance from the National Center for Atmospheric Research (NCAR) and the University of Alaska.
- Computed, with support from USAF, the distribution of atmospheric heating due to electrical currents as shown in Figure 1.

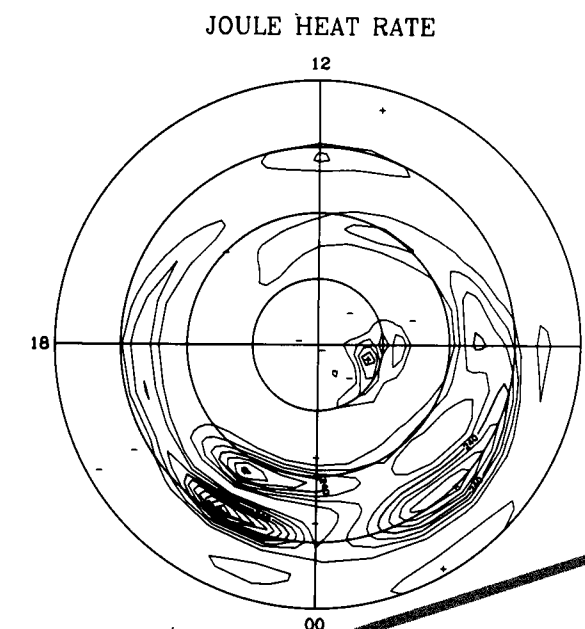
## "Women in Science"

Bonnie Hausman was interviewed for a video tape for a Housing and Urban Development-sponsored, University of Michigan program as a role model for women interested in computer science.



Bonnie Hausman

Staff: Bonnie Hausman,  
Physicist/Programmer  
Lt. Robert Tomic,  
Meteorologist, USAF  
Capt. Gary Wells,  
Meteorologist, USAF



The total heating of Earth for March 22, 1979 (1130 UTC) was computed to be  $3.84 \times 10^{11}$  watts, as compared to a yearly U.S. consumption of  $3 \times 10^{11}$  watts.

The near-Earth space environment population of charged particles.

# Solid Earth Geophysics (SEG)

Tsunami, seismology, gravity, topography, magnetics, geochemistry, and geothermics are a few of the important programs managed by the SEG Division. SEG also operates World Data Center A for Solid Earth Geophysics (WDC-A). The data collections of SEG and WDC-A include survey data, such as magnetic anomalies, and time-varying data such as earthquake observations.

Among the most important data activities of SEG are acquiring and archiving, processing and formatting into standard sets of data, developing descriptive products for users, disseminating data, and conducting specialized workshops.

SEG data and information support many scientific endeavors, both in the assessment and mitigation of hazards (e.g., earthquakes) and in the exploration for minerals and petroleum. They also support basic and applied research in many of the earth science disciplines. Customers range from those in private industry, academia, and Federal and State Governments to the general public, both U.S. and abroad.

Data services provided by SEG are numerous and varied—searches of data files, copies of data tapes, photographs of property damage (caused by earthquakes, tsunamis, and volcanoes), computer plots, and preparation of technical publications and maps.

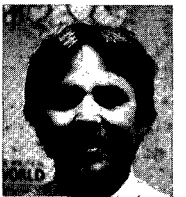
SEG collaborates with many national and international organizations and participates in projects such as the Decade of North American Geology and the Circum-Pacific Map Project. SEG also participates in activities of the International Association of Seismology and Physics of Earth's Interior (IASPEI), International Association of Geomagnetism and Aeronomy (IAGA), United Nations Educational, Scientific, and Cultural Organization (UNESCO), and International Council of Scientific Unions (ICSU).

A major goal of SEG is to provide better data products and services to customers. This means that new sets of data must be acquired, that inhouse data sets must be improved, and that imaginative and useful data products must be developed. In addition, all the data and information must be distributed to users in time to meet their needs.

Seismologist Carl Von Hake discusses earthquakes in the "Ring of Fire"



Chief: Herbert Meyers



Acting Deputy: David Clark

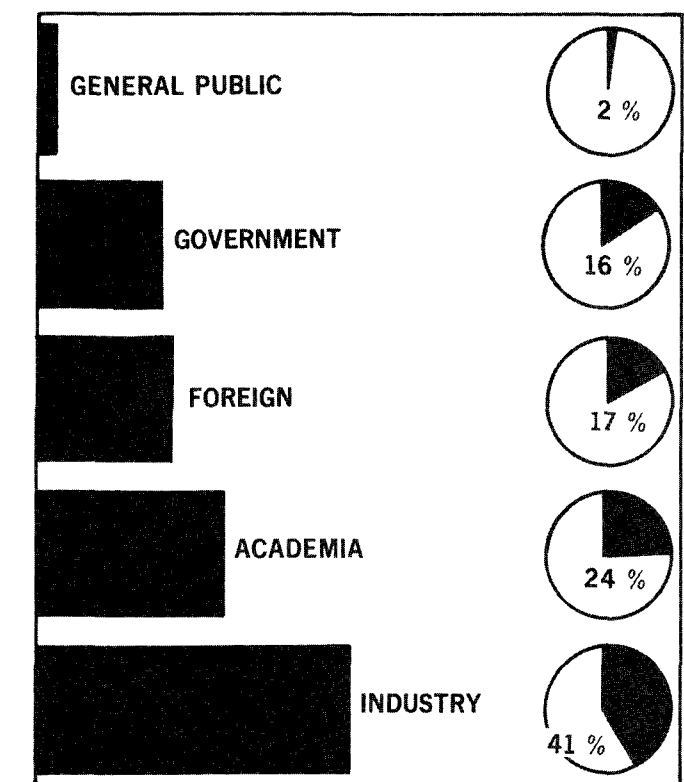
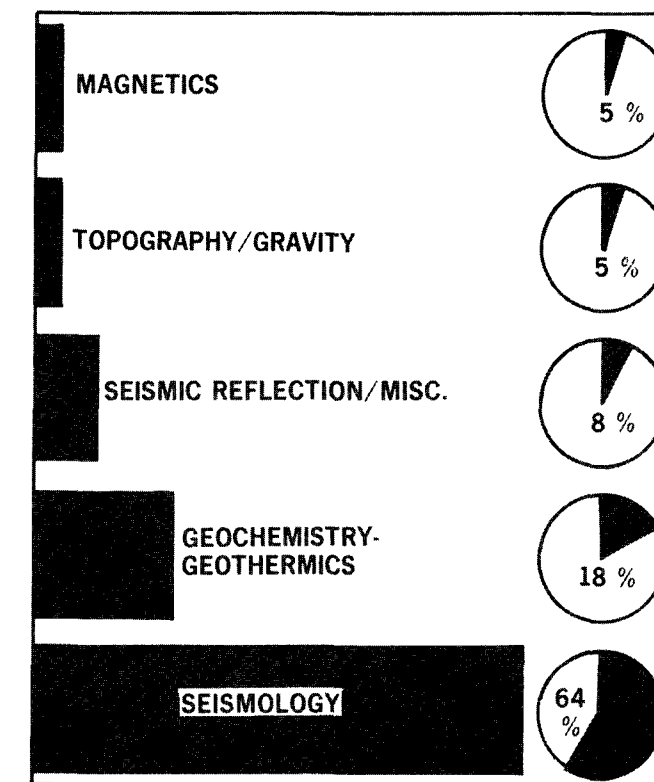
Staff: Jerry Coffman, Technical Writer  
Sarabeth Moynihan, Secretary  
Lorna Sharer, Secretary  
Ronald Smith, Research Associate

Data announcement fliers are issued periodically to advise the public of the availability of new sets of data. These fliers contain brief summaries of data sets, including source, description, geographical coverage, dates, and ordering information. SEG also issues summary catalogs that describe specific sets of data and services available.

## PUBLICATIONS

### Continuing Series

Terrestrial Geophysics Data Services Brochure  
Natural Hazards Photograph Catalog  
Earthquake Data Services and Publications Brochure  
Earthquake History of the United States (Thru 1980)  
Catalog of Seismogram Archives  
Earthquake Data File Summary





Group Leader: David Dater

# Gravity

Gravity data have many applications, both on the surface of the Earth and in space. Applications include:

- Calibrating inertial navigation and guidance systems.
- Searching for deposits of oil, gas, and minerals.
- Identifying hazards.
- Computing Earth gravitational models.

Alone, or in combination with other data (such as satellite, astrogeodetic, or geophysical data) gravity data also are used to calculate Earth's geodetic system.

Digital gravity data sets include:

- U.S. gridded gravity data base.

- U.S. terrain-corrected gravity file.
- U.S. gravity data base (no terrain corrections).
- National Petroleum Reserve in Alaska observations.
- Southwest Alaska and Arctic National Wildlife Range data.
- Global gravity data from the GEOS-3 satellite.
- Antarctic data.
- California/Nevada data.

The U.S. gravity data base, which originated at the Defense Mapping Agency (DMA), contains more than 725,000 gravity stations in the conterminous U.S. and Alaska. The file includes:

- Observed gravity, Bouguer, and free-air anomalies.

- Latitude and longitude
- Elevation
- Standard deviation for the free-air and Bouguer anomalies
- Documentation reference numbers.

The U.S. terrain-corrected file, compiled by the National Geodetic Survey (NGS) of NOAA, contains most of the data in the DMA gravity file without the terrain corrections, plus data from additional sources. Each record has indicators that define the quality. In addition, NGS has included terrain corrections for all point gravity values where substantial variations in local topography exist.

Also available is a gridded gravity data base constructed by the USGS from the DMA land gravity data described above. The data consist of about one million observations for the conterminous U.S. (Bouguer anomaly) and U.S. continental shelf (free-air anomaly).

This gridded data base was contoured to produce the "Gravity Anomaly Map of the United States (Exclusive of Alaska and Hawaii)," which was published by the Society of Exploration Geophysicists in cooperation with USGS, DMA, and NOAA. NGDC participation in the preparation of this map included quality control of data, map layout, and cartographic compilation.

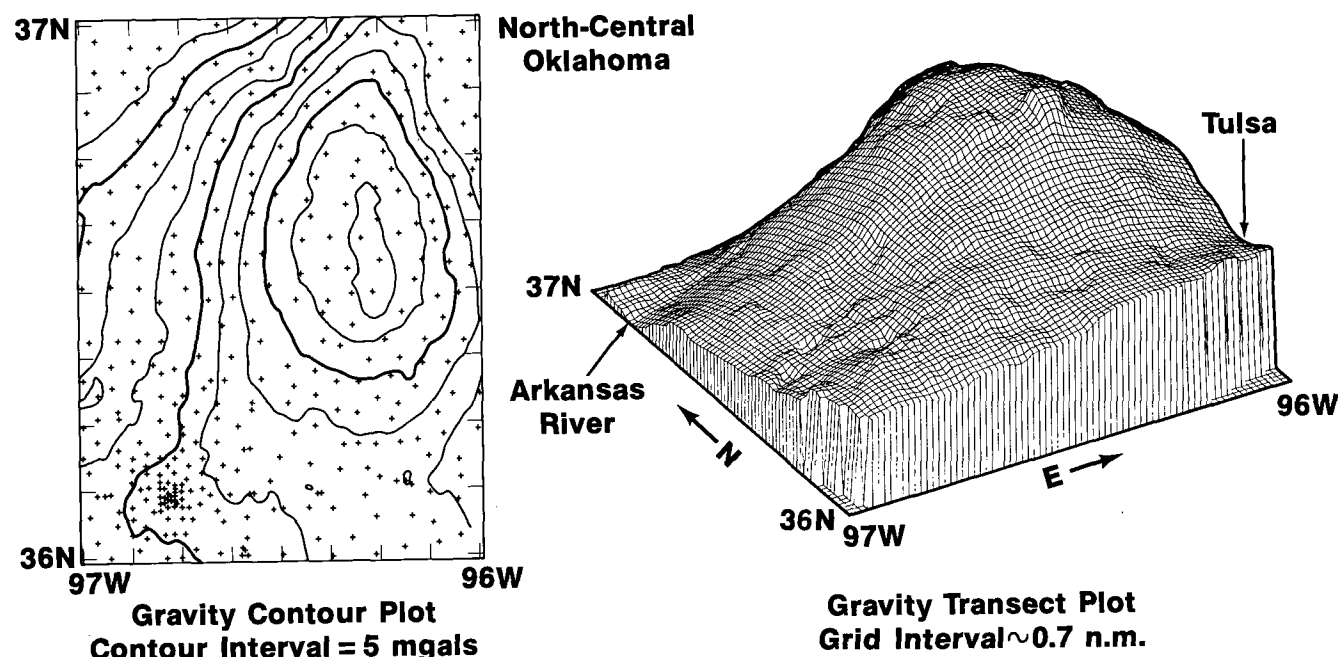
This map was a first step in the process of compiling a gravity anomaly map of North America. Sponsored by the Geological Society of America, the map is part of their wide-ranging project known as "Decade of North American Geology." This project will encompass many scientific maps and reports, which will be the most detailed study of the North American continent to date.

Staff: Joy Ikelman, Physical Scientist  
Mildred England, Physical Science Technician

## FY-84 Highlights

Several new data sets were received, including:

- Alaska gravity and terrain data for the Arctic National Wildlife Range and the Alaska Peninsula.
- Data for the Antarctic (south of 45 degrees South) containing both land and marine data.
- California/Nevada data compiled by USGS. Each observation includes observed gravity; free air, Bouguer, and isostatic anomalies; terrain correction; and elevation.



Gravity Data Produced by Potential Fields Graphic System

# Topography

Topography is the general configuration of a land surface, including its relief and the position of natural or man-made features.

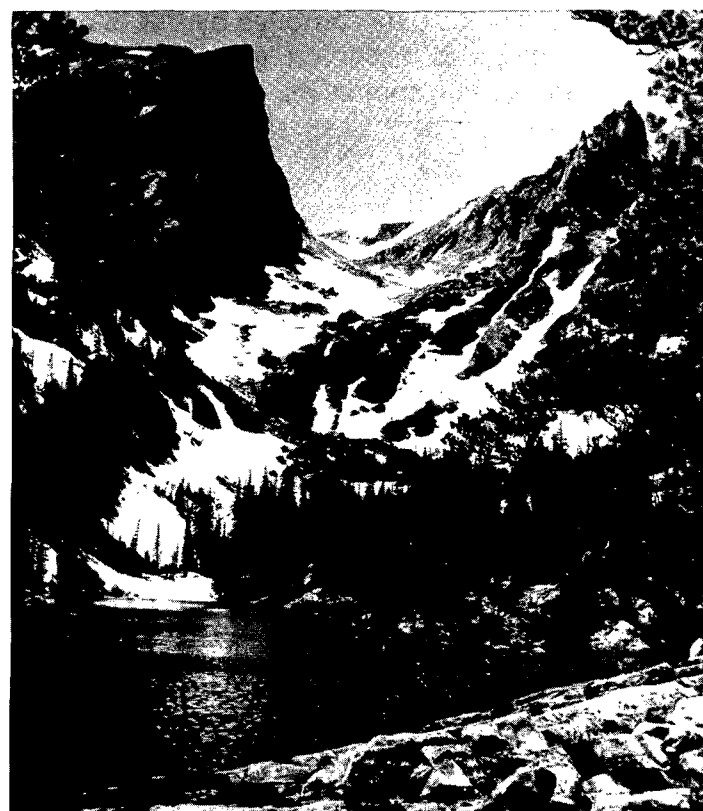
Elevation measurements are collected when surveying by land or by air. These raw data are then used for making surface feature maps. Topography also are used in conjunction with surface or satellite data, often to evaluate resources or hazards.

More than 41 million values of topography data are archived. The resolutions include:

- 30-second point and average elevation for the conterminous United States.

- 1- and 3-minute average elevation for the conterminous United States.

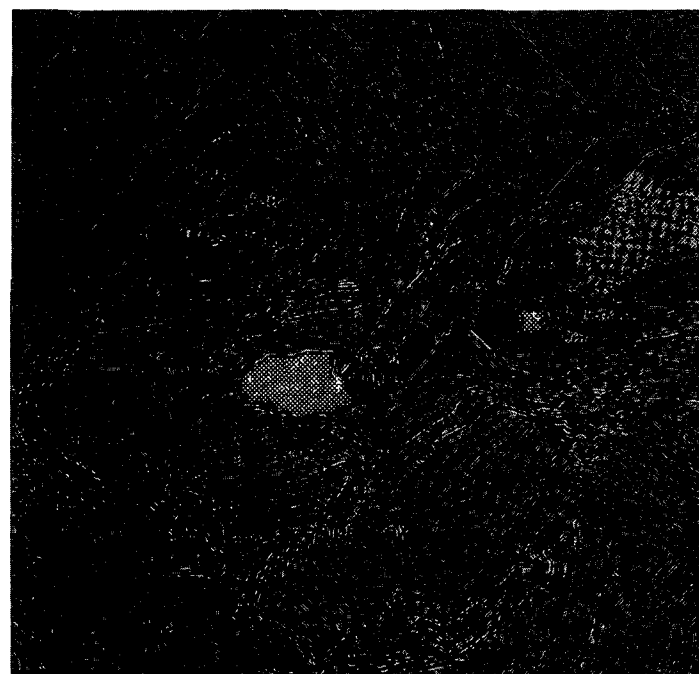
- 5-minute average elevation for North America and Europe.



- 10-minute modal elevation for the world.

- 1-degree average elevation for the world

A popular topography data set made available in 1984 is the 10-minute elevation data for the world. This data set, which contains 2.3 million records, is the only global (land) elevation data available at

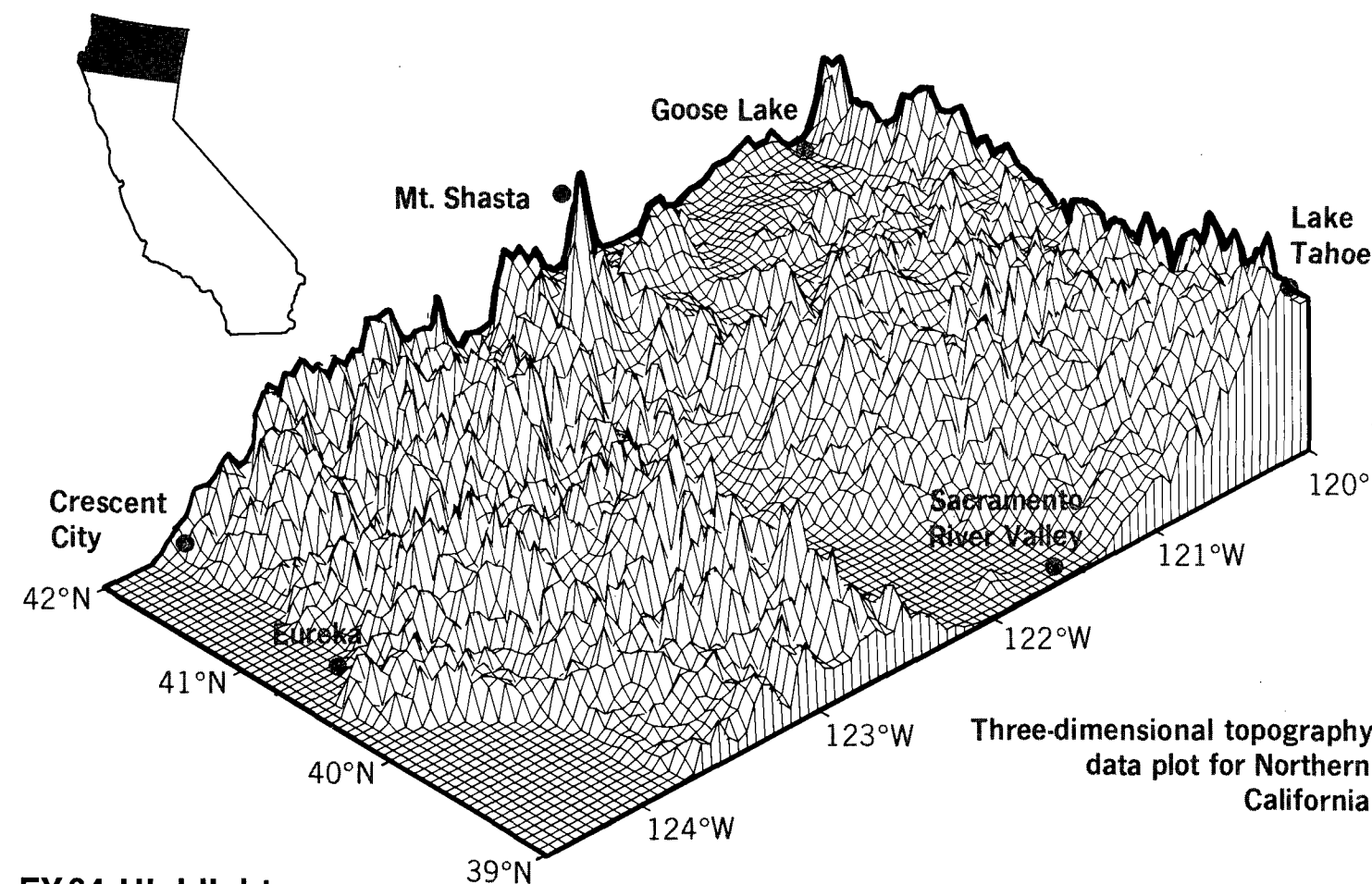


this resolution. These data are often used for surface modeling, and may be used as "ground truth" for satellite data. The data are easily adapted to most image processing (pixel-type) systems.

Topography data are also used for radiowave propagation analyses. The Federal Communications Commission (FCC) has accepted the use of the 30-second point data for this purpose when private companies apply for licensing for public mobile radio service.

**Relief is the difference between the highest and lowest elevations in a region.**

Project Scientist: Joy Ikelman



## FY-84 Highlights

- The FCC (Federal Communications Commission) stated that NGDC topographic data may be used when applying for public mobile radio service licenses. Requests for topographic data have doubled due to the FCC ruling.

- A USGS-compiled digital file of gravity and terrain data for the Arctic National Wildlife Range and the Alaska Peninsula was made available to the public.

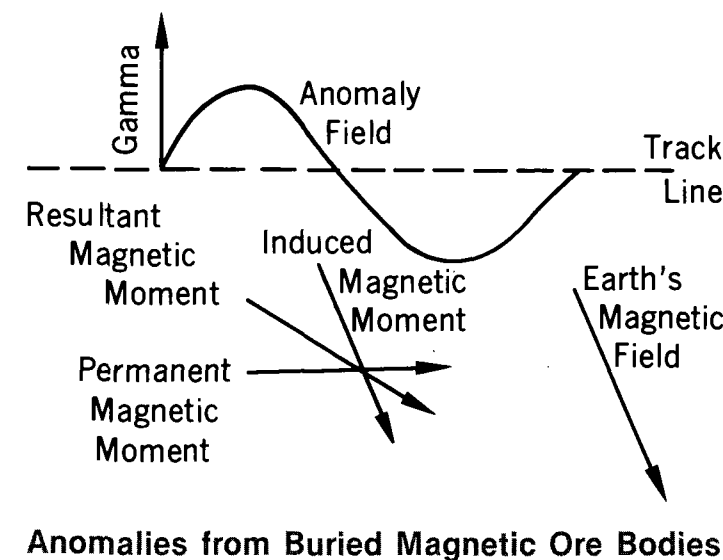
- The 10-minute global data were made available to the public.

# Aeromagnetics

Routine measurements of Earth's magnetic field have been made over the past several decades using airborne magnetometers. Aircraft carrying these devices usually fly regular flight-line spacings, and they take measurements at predetermined observation times and distances. These collected aeromagnetic data have many uses:

- Exploration for energy and minerals.
- Modeling of magnetic fields.
- Geophysical research.
- Integration with Landsat imagery to enhance geological studies.

NGDC has assumed the lead role in the establishment of a national archive for aeromagnetic data. There are 37 million observations (covering more than 250 surveys) in the archive, of which 22 million were assimilated in 1984. One of the major contributors to the archive is the U.S. Geological Survey (USGS). Data are also received from other Federal and State agencies, universities, private organizations, and foreign countries.



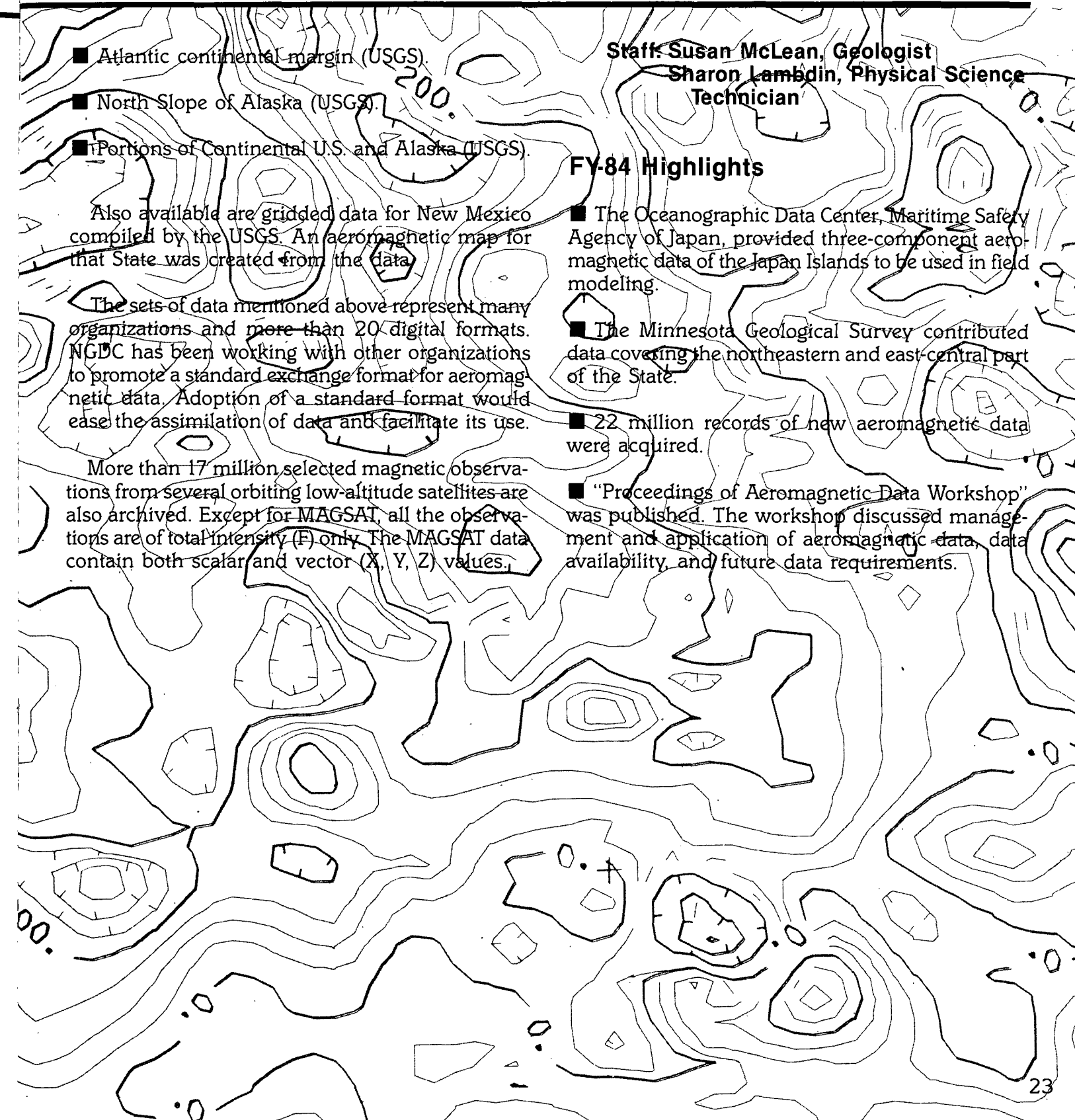
Surveys cover from 1953-83, and include both low- and high-density data. The low-density data are mainly used for magnetic field modeling and charting. Three surveys fall in this category:

- World coverage, mostly ocean areas (Project Magnet: U.S. Naval Oceanographic Office).
- Canada (Department of Energy, Mines and Resources of Canada).
- Nordic countries and Iceland, Greenland Sea; British Columbia Pacific Ocean; Canadian Arctic; western, central, and eastern Canada (Department of Energy, Mines and Resources of Canada).

High-density data are used mainly for magnetic anomaly mapping, mineral and petroleum exploration, and other geologic studies. Surveys available include:

- Greenland Sea (Woods Hole Oceanographic Institute).
- Vale-Owyhee; central and northern Cascades; portions of the Cascades in northern California and southern Oregon (Oregon State University).
- Northeastern and east-central Minnesota (Minnesota Geological Survey).
- Southern Michigan peninsula (Michigan State University).
- Conterminous U.S. (U.S. Naval Oceanographic Office).
- Worldwide (U.S. Naval Oceanographic Office).
- Japan (Japanese Maritime Safety Agency).
- Antarctic, Greenland (National Science Foundation project).

Group Leader: Ronald Buhmann



# Earth's Magnetic Field

Project Scientist: Susan McLean

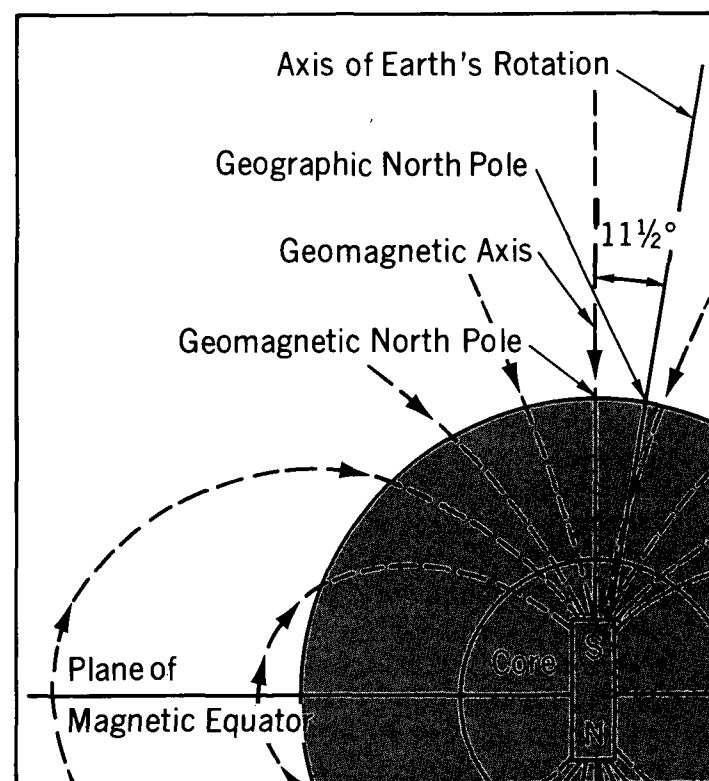
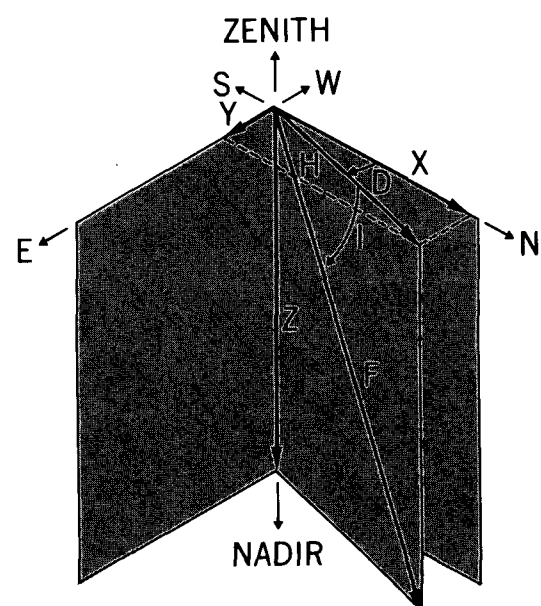


To measure Earth's magnetic field at any location scientists determine the direction, intensity, and variation of the field. Data gathered from these studies have been used in extremely diverse projects such as exploring for natural resources, determining reasons for strandings of marine mammals, and correlating with incidence of multiple sclerosis.

Standard data collected at geomagnetic observatories around the world play a critical role in studies of magnetic elements, secular variation, and development of geomagnetic field models.

The Magnetic Field Survey Data Base contains about 7 million high-quality magnetic observations from air, land, and ocean surveys worldwide. At most locations, three magnetic elements were observed:

- Declination (D), inclination (I), and horizontal intensity (H), or
- Declination, horizontal intensity, and vertical intensity (Z) or total intensity (F).



Earth's Magnetic Field

Where possible, the values for other magnetic elements, usually the north component (X) and east component (Y), were computed.

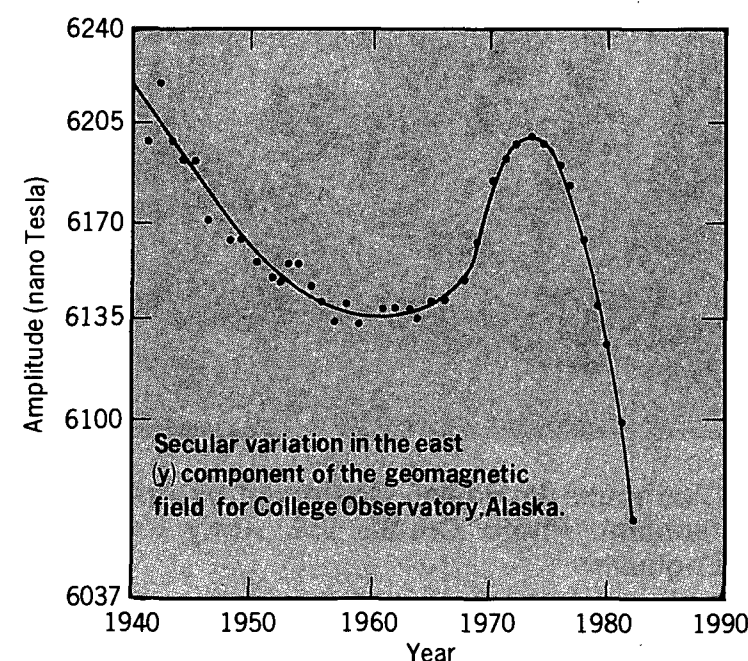
Another important data collection, the Secular Change Data Base, contains the Observatory Annual Means Data and International Repeat Station Data. It is the principal source for tracking the long-period changes in the direction and intensity of Earth's magnetic field.

Data from observatories where the magnetic field is continuously recorded are typically available as mean values for a year. The Observatory Annual Means File contains the results of most of the observatories operating since about 1800. There are over 13,000 observations in this file.

Repeat Station Data contain measurements of the magnetic field at exact reoccupations of sites of previous observations. Occupations of sites are commonly separated by several years. The latitude, longitude, and altitude are recorded for each of the 11,000 measurements.

Mathematical models of Earth's magnetic field are often used in conjunction with observed data for many applications in geophysics and space science. NGDC has several models available for the scientific community. Because models are predictive by nature, data used in developing them must be as up to date and accurate as possible.

New models are due in 1985. Consequently, much effort has been expended to enhance the Observatory Annual Means File by improving quality-control and data-entry procedures, and by expanding the data holdings to include annual mean values for the international quiet and disturbed days as well as for all-day annual means. The resulting data base is the most current, and the most accurate, ever submitted to scientists who model Earth's magnetic field.



Staff: Kendall Svendsen, Research Associate

## FY-84 Highlights

■ WDC-A for Solid Earth Geophysics cosponsored a workshop on Latin American Geomagnetic Observatory and Survey Practice in Rio de Janeiro, Brazil. WDC-A organized the agenda and arranged for experts from Europe and North America to give presentations. The purpose of the workshop was to provide current information and advice to those operating observatory programs in Latin America.

■ NGDC/WDC-A acted as liaison in arranging for magnetometers from two Philippine geomagnetic observatories to be sent to Denmark for rehabilitation and standardization. Denmark acts for IAGA (International Association of Geomagnetism and Aeronomy) in this work of determining corrections to the International Magnetic Standard, and NGDC/WDC-A promotes this process to encourage integrity of observatory data.

■ The development of an interactive data-entry and data-quality control system has made possible the addition of about 500 mean values in less than one month, a substantial increase in efficiency.

The sharp change in slope near 1970 is a reflection of the geomagnetic "jerk" of 1969. Such jerks in the magnetic field variation impact our ability to accurately predict the behavior of the magnetic field.

(Graph courtesy of N. Peddie, U.S. Geological Survey)

# Tsunamis

A tsunami is a series of waves generated in the ocean or in a small, connected body of water by any impulsive disturbance. The term "tsunami" includes waves generated by: abrupt ocean-bottom displacements caused by earthquakes; submarine or shoreline landslides; volcanic eruptions; and explosions. Although these waves threaten no one in the open water, they increase in height as they reach shallow water and cause damage to life and property onshore. Principal tsunami data bases include:

- Historical Tsunami File for Pacific—Includes 1,450 events since 48 B.C. Contains cause and source location of event; magnitude of generating earthquake and tsunami; wave heights and affected locations; description of damage; number of deaths; and event validity.

- Marigrams—3,000 station events (some in digital format) from Pacific tide stations (since 1850).

- Photographs—More than 700 photographs of tsunami wave activity and property damage. Depicts several "before" and "after" views.

## FY-84 Highlights

- Participated in Agency for International Development Project to develop, test, and evaluate an early warning system for tsunamis along the Chilean coast.

- Issued "Map of Tsunamis in the Pacific Basin (1900-83)" to identify areas at risk to destructive tsunamis.

- Acquired photographs from: May 1983 tsunami in Japan; May 1960 tsunami in Chile; and March 1957 tsunami in Alaska.

- Acquired digitized marigrams for 33 station events in Chile; 28 digitized records of 5 major tsunamis recorded at U.S. tide stations; and 35 marigrams for the May 1983 tsunami in Japan.

- Published article describing effects of 1868 Chilean tsunami and the NGDC tsunami data base in UNDRO (United Nations Disaster Relief Organization) journal; also wrote articles on tsunami hazards that were published in "Science of Tsunami Hazards" and "Natural Hazards Observer."



Clubhouse in Hawaii Destroyed by April 1946 Tsunami. Photo Credit: U.S. Army Corps of Engineers



Project Scientist: Patricia Lockridge



Tsunami Strikes Hawaii Beach in April 1946. Photo Credit: Mrs. Harry A. Simms, Sr.

Epicenters of tsunami-generating earthquakes in Japan.

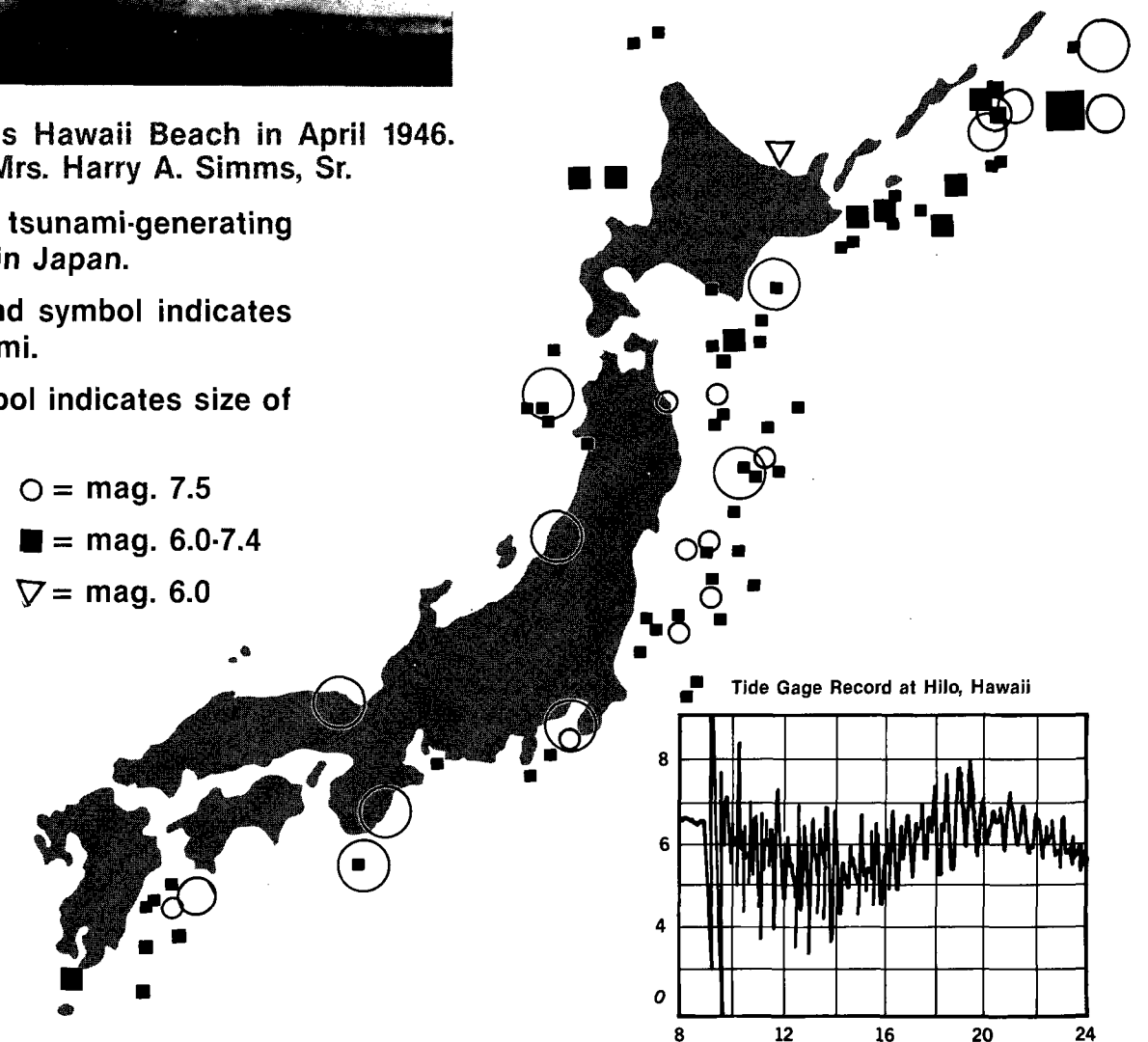
SIZE of legend symbol indicates size of tsunami.

TYPE of symbol indicates size of earthquake.

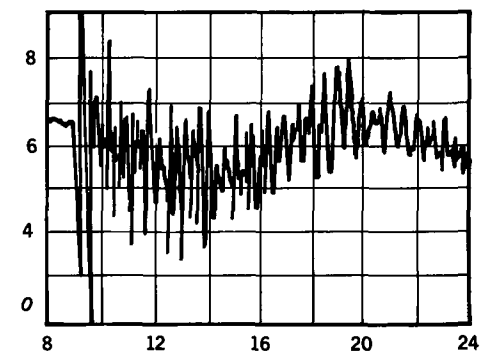
○ = mag. 7.5

■ = mag. 6.0-7.4

▽ = mag. 6.0



Tide Gage Record at Hilo, Hawaii



# Seismology

Seismology comes from the Greek word, seismos, meaning earthquake. A million or more earthquakes occur throughout the world each year, and several of them cause death, damage, and destruction. The Seismology Group at NGDC collects data about earthquakes for the researcher and engineer who are studying ways to reduce the earthquake hazard. Data bases include earthquake hypocenters and intensities, digital strong-motion records, and analog seismograms.

■ **Earthquake Hypocenters**—Customized listings and map plots for any region and time period. Holds information on one-half million events worldwide dating from 2100 B.C.



California Earthquake in April 1984 Damaged Highway at Morgan Hill. Photo Credit: California Geology.

■ **Earthquake Intensities**—Customized listings and map plots for the U.S. Contains data on 21,000 U.S. earthquakes from 1638.

■ **Strong-Motion Accelerograph Records**—Magnetic tape copies of records from 350 earthquakes in 13 countries (including People's Republic of China and USSR) from 1933.

■ **Seismograms**—Analog file of more than 5 million records from 150 seismograph stations. Historical collection boasts one-half million pre-1962 records from selected earthquakes and stations.

■ **Seismograms**—Digital file of 3,227 magnetic tapes, each holding 15 to 25 station-days of long- and short-period digital samples. The Global Digital Seismic Network operates stations throughout the world.

## FY-84 Highlights

■ Prepared seismicity maps and historical narratives of earthquakes to brief 11 U.S. Congressmen.

■ Added observations for 40,000 earthquakes to Earthquake Data Base, including data from Turkey, France, Italy, New Zealand, and Alaska.

■ Finalized Earthquake Intensity Data Base and issued data publication. Data base contains about 137,000 observations on 21,000 U.S. earthquakes.

■ Compiled computerized inventory of all digital strong-motion data. Includes more than 9,000 records (corrected, uncorrected, and response spectra for each event).

■ Acquired digital strong-motion data from 8 events in U.S. and 2 destructive events in Italy and People's Republic of China.



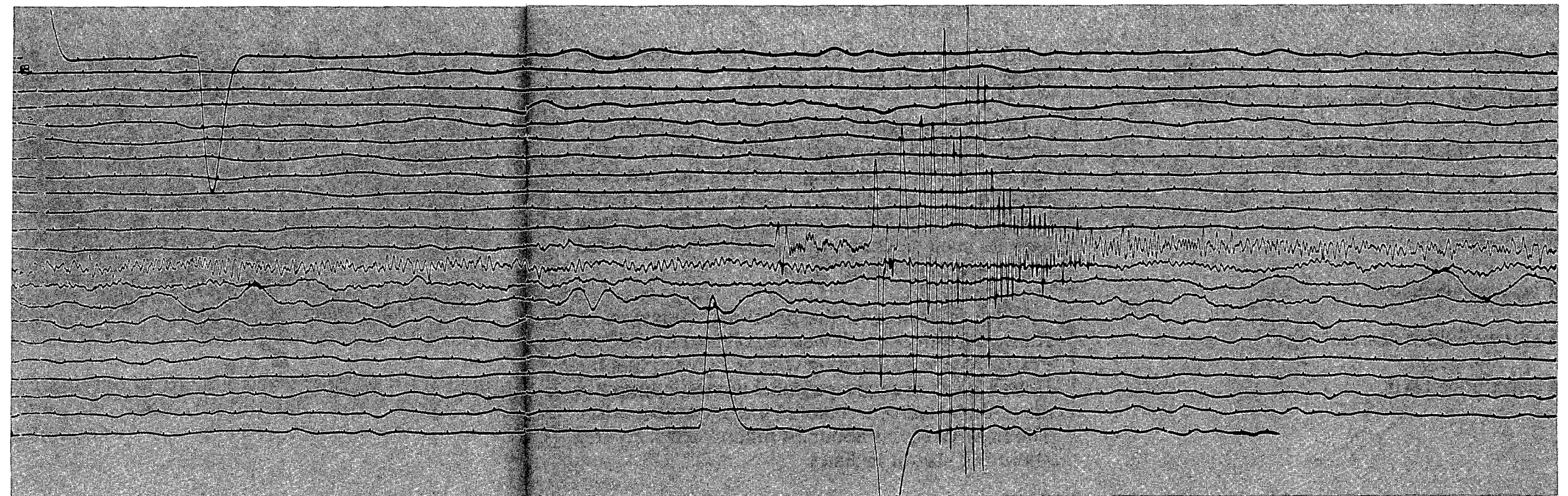
Group Leader: Wilbur Rinehart

Staff: Carl von Hake, Geophysicist  
Mark Rockwell, Mathematician  
Susan Godeaux, Physical Scientist  
Dale Glover, Geophysicist  
Carlos Angel, Geophysicist  
Steven Paull, Scientific Data Clerk  
Virginia Spies, Scientific Data Tech

■ Furnished special cameras to Egypt, Peru, and USSR to copy historical seismograms.

■ W. Rinehart named coeditor of "Earthquake Notes," technical journal published by Eastern Section of the Seismological Society of America.

■ C. Angel received Achievement Award from the Denver Federal Executive Board Hispanic Employment Program.





# Land Seismic Reflection Surveys

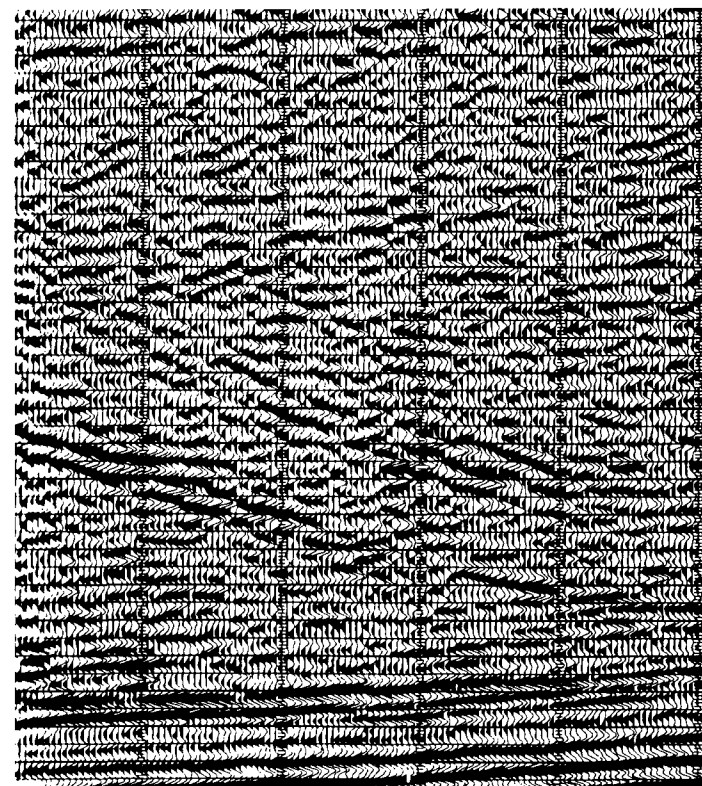
Project Scientist: David Clark

The seismic method of geophysical prospecting uses the generation, reflection, refraction, detection, and analysis of acoustic waves in the Earth. NGDC holds land seismic-reflection data for several U.S. areas:

- Appalachian Overthrust (northeastern Tennessee, northwestern North Carolina)
- Northeastern Mississippi Embayment (New Madrid fault zone)
- Eastern South Carolina
- East-central Wyoming
- Texas Panhandle
- Central Virginia
- National Petroleum Reserve in Alaska (NPRA).

Seismic-reflection data available from these regions come in varied formats:

- demultiplexed field tapes
- unfiltered and ungained stacked tapes
- shot-point location maps
- seismic line location index maps
- stacked sections
- velocity analyses
- survey field notes and logs
- descriptive texts.



Portion of a Seismic Section

NGDC also archives seismic well-log data for the Texas Panhandle and the NPRA.

The NPRA program was the most comprehensive petroleum land exploration program ever Federally funded. The data resulting from this program have enabled private industry to make accurate predictions of the resource potential of one of the last frontiers for major petroleum resources in the United States—Alaska's North Slope.

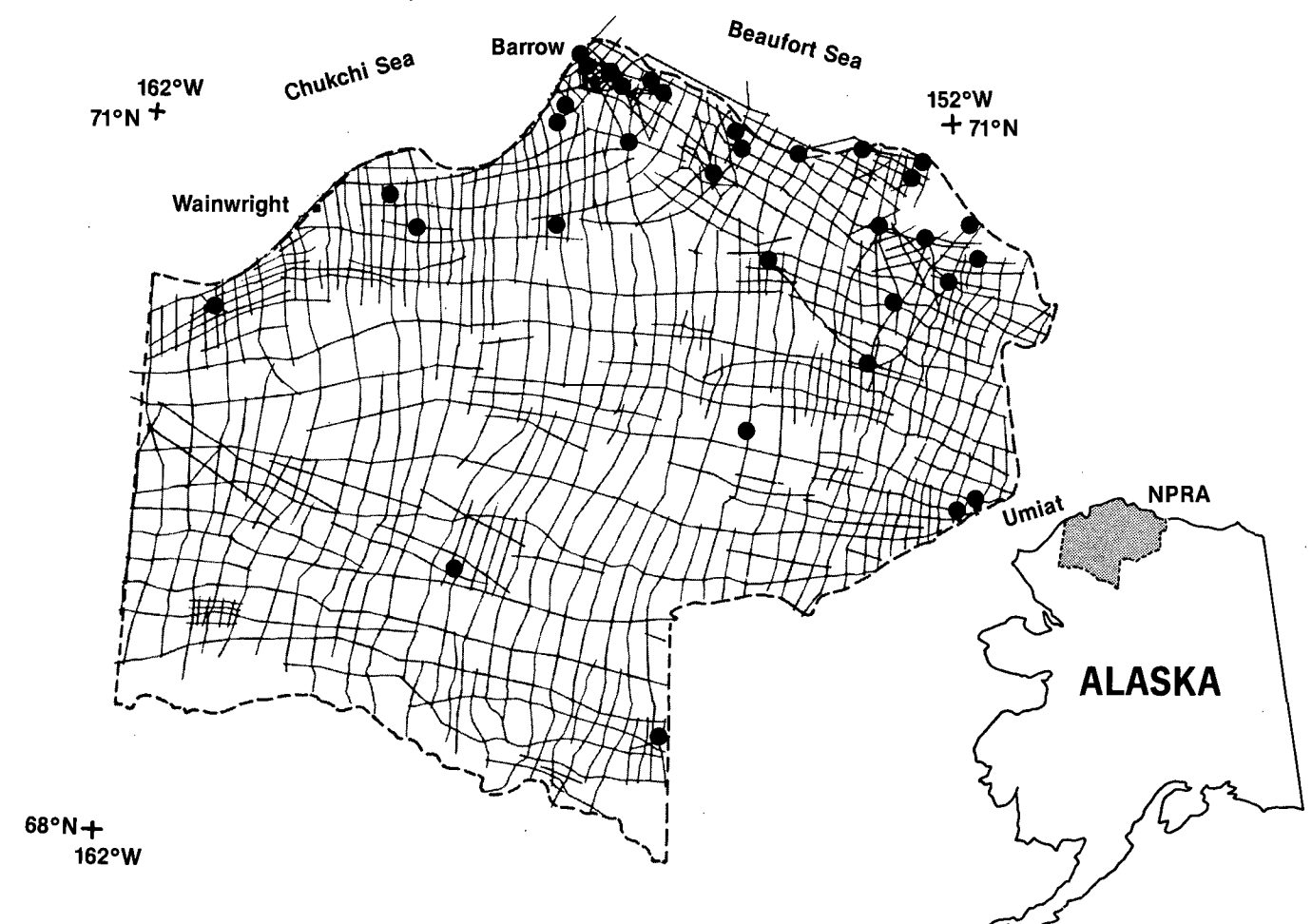
NPRA is located in the primitive wilderness of Alaska's North Slope. It was established in 1923 by President Warren Harding who recognized that the United States needed a potential domestic source of oil in the event of a national emergency or crisis. The Reserve covers about 24 million acres, an area about the size of Indiana.

NGDC became the dissemination agency for NPRA data in late 1977. NGDC announced the availability of the first NPRA data sets in mid-1978. Since then, NGDC has supplied industry over 15,000 magnetic tapes and several hundred thousand square feet of paper records. The data provided range from common depth point seismic-reflection and well-log data to gravity, aerial gamma ray, and magnetic survey profiles.

## FY-84 Highlights

- NGDC acquired land seismic-reflection data collected in central Virginia by the USGS. The data were originally collected to establish a correlation between mapped surface units and subsurface seismic events.
- The U.S. Department of Energy (DOE) provided NGDC with various borehole seismic data from the Texas Panhandle. These data were collected as part of DOE's studies to assess the Panhandle salt deposits as a possible site for disposing high-level nuclear waste.

## Land Seismic-Reflection Surveys



# Geothermics and Geochemistry

Group Leader: David Clark

Geothermics is the study of heat generated in the interior of Earth and its manifestation at the surface. Hot springs represent the most common example of Earth's internal combustion chamber. In addition to their recreational benefits, geothermal resources have become practical, alternative systems for providing hot water and for heating homes and factories in many areas of the world, including the United States.

Between 1978 and 1984, NGDC was an active participant in the State Geothermal Resources Assessment Program, a cooperative program designed by the Department of Energy to identify geothermal energy resources of the Western United States.

NGDC produced many geothermal maps from State-provided data, significantly increasing public awareness of innovative energy resources. As a result, interest has increased in funding, exploration, and usage of geothermal resources.

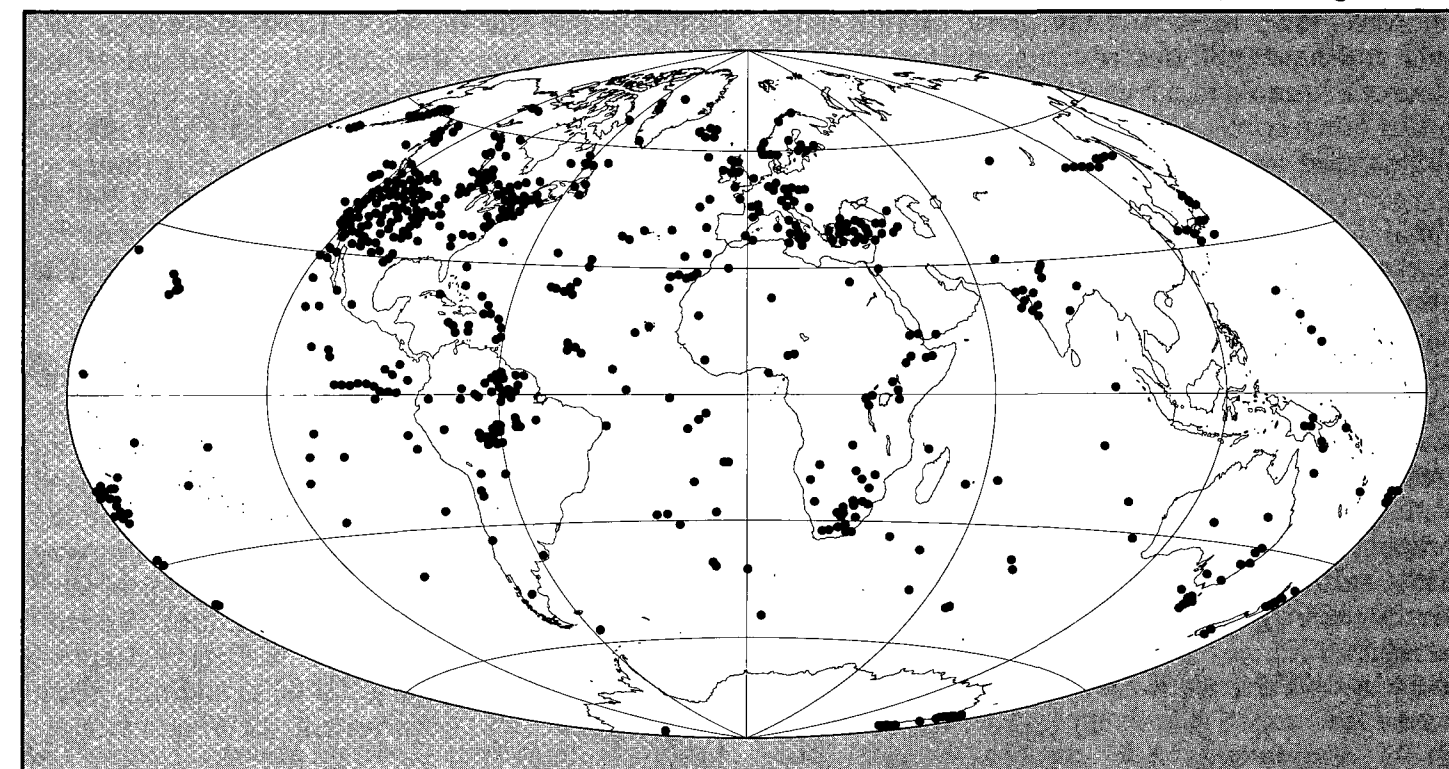
Geothermal maps and other data products are now available because of this and other cooperative projects:

- 27 State and regional maps showing geothermal energy resource potential, geothermal gradient, and heat flow;
- A computer file containing geothermal gradient and heat-flow information on hot springs;

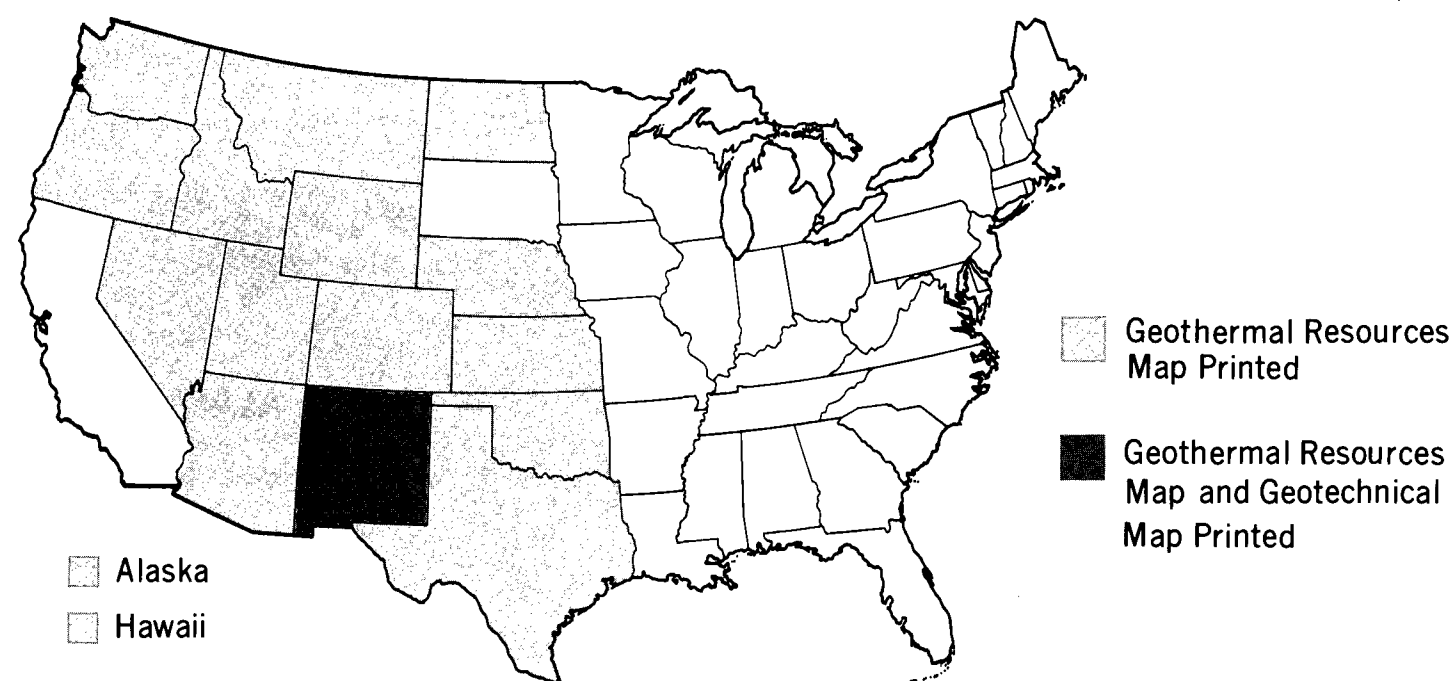
## FY-84 Highlights

- NGDC geothermal maps were cited in the American Congress on Surveying and Mapping Bulletin (June 1984) as "Distinctive Recent Maps."
- Published State maps for Alaska, California, Nevada, New Mexico, Oklahoma, and Wyoming.
- Provided to the public digital observations used in the map publication program.

Staff: Joy Ikelman, Physical Scientist  
Susan McLean, Geologist



Data Coverage of the Igneous Petrological Data Base



## Geochemistry

Two significant data sets used by the geophysical community to study the distribution and amounts of chemical elements in igneous rocks are PETROS, compiled at Eastern Washington University, and IGBA (Igneous Petrological Data Base). The IGBA data set was begun by the International Geological Correlation Program under the joint sponsorship of UNESCO and the International Union of Geological Sciences. Petrologists participating in the project extracted from published sources all information suitable for inclusion in the data base.

IGBA data, archived at NGDC in 1984, include nearly 8,000 analyses from 700 geographic groups.

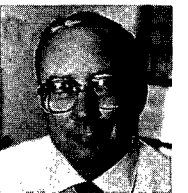
## FY-84 Highlights

- IGBA data were processed into a standard data set and archived.
- IGBA data were organized into System 2000 on the UNIVAC mainframe computer, which allows access of data by user-defined parameters and output.
- Geologist Susan McLean attended the International Geological Correlation Program meeting in Lisbon, Portugal, where she spoke on NGDC's role in assimilating and disseminating the IGBA data.

# Marine Geology and Geophysics (MGG)



**Chief: Michael S. Loughridge**



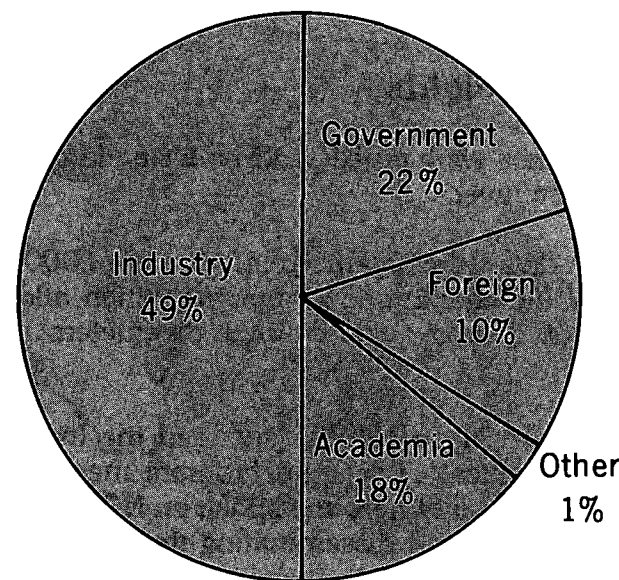
**Deputy: Troy L. Holcombe**

MGG is the national repository for marine geological, marine geophysical, and related data. Major programs include bathymetry, marine sediment and hard-rock descriptions, marine mineral resources, hazards to navigation, geophysics in support of outer continental shelf lease-sales, seismic profiles, and well logs.

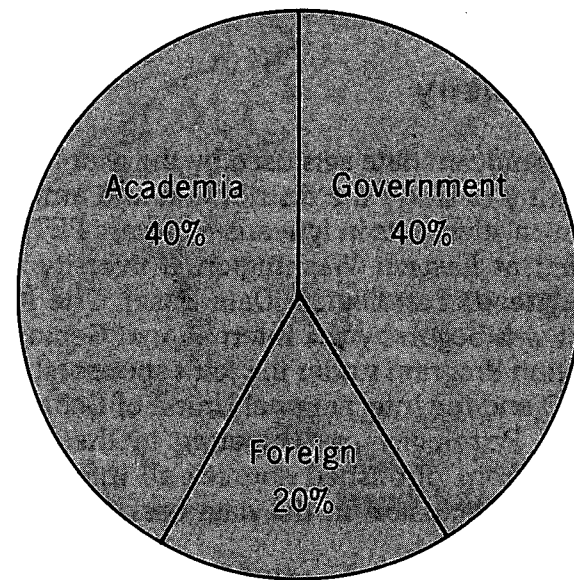
MGG acquires, processes, archives, and disseminates data that result from international and national programs. MGG acquires data from Federally funded field operations, and makes the data from such programs available to other clients. Data that are disseminated for Government agencies include: data related to hazardous geological structures or other constraints to drilling in the outer continental shelf lease areas, well-log, physical properties of sediments, and common-depth-point (CDP) seismic-reflection data collected by the Minerals Management Service, the U. S. Geological Survey (USGS), and digital hydrographic data collected by NOAA's National Ocean Service (NOS).

In 1983, President Reagan proclaimed that the ocean area from a line 3 miles off the coast of the United States and its island territories out to 200 nautical miles was the Exclusive Economic Zone (EEZ) of this Nation. This action gives the United States jurisdiction over the vast living and nonliving resources within that area. The importance of the EEZ is emphasized when its size (3.9 billion acres) is compared to the total onshore area of the U.S. and its territories (2.3 billion acres). MGG data bases include substantial coverage of the EEZ.

In FY-84, MGG provided marine geological and geophysical data or information to more than 1,000 users. Though geophysical data were requested more often, requests for geological data increased substantially over those of past years. MGG added more than 1 million nautical miles of underway geophysical survey data, over 5,000 geological sample analyses, and about 1.5 million coastal bathymetric soundings to its holdings. Users of MGG data are: industry, 49%, academia, 18%, general public, 1%; Government, 22%; and foreign, 10%.



**USER COMMUNITY**



**DATA SOURCES**

International exchange of data increased last fiscal year. Large data sets were received from the People's Republic of China, France, Canada, and New Zealand.

## FY-84 Highlights

■ New agreements were initiated with the Minerals Management Service and with the U.S. Geological Survey regarding public release and dissemination by NGDC of data collected by these agencies.

■ A multifaceted program of acquisition of new bathymetric data resulted in the transfer of 3.6 million soundings into Department of Defense data files maintained by the Defense Mapping Agency Hydrographic-Topographic Center.

■ NGDC became the primary repository for the accumulated digital marine geological and geophysical data holdings of the Deep-Sea Drilling Project as that program is phased out.

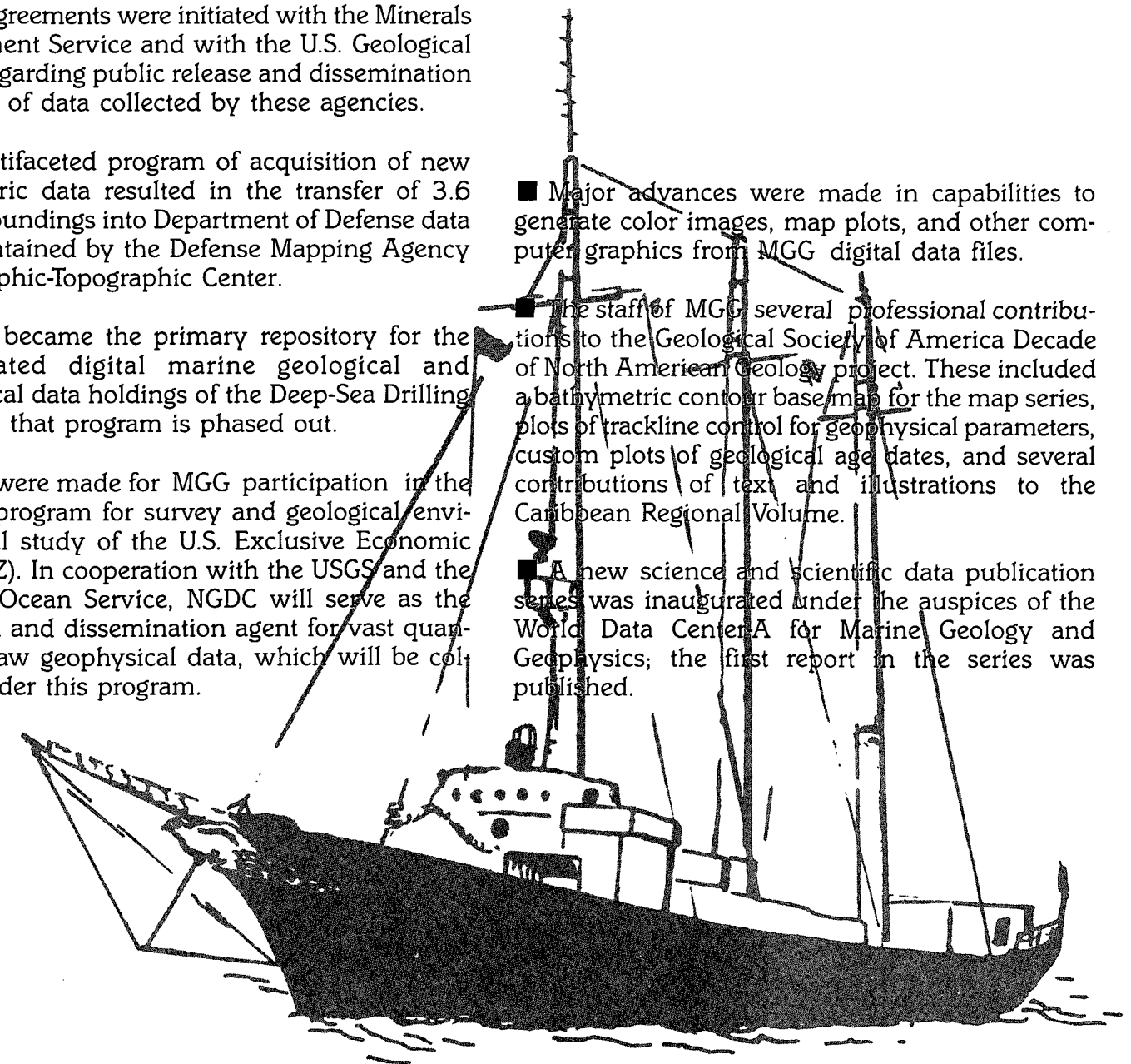
■ Plans were made for MGG participation in the national program for survey and geological environmental study of the U.S. Exclusive Economic Zone (EEZ). In cooperation with the USGS and the National Ocean Service, NGDC will serve as the custodian and dissemination agent for vast quantities of raw geophysical data, which will be collected under this program.

**Staff: Betty Morlan, Editor  
Kathy O'Day, Technician  
Marcia Betz, Secretary  
Donna Williams, Data Clerk**

■ Major advances were made in capabilities to generate color images, map plots, and other computer graphics from MGG digital data files.

■ The staff of MGG several professional contributions to the Geological Society of America Decade of North American Geology project. These included a bathymetric contour base map for the map series, plots of trackline control for geophysical parameters, custom plots of geological age dates, and several contributions of text and illustrations to the Caribbean Regional Volume.

■ A new science and scientific data publication series was inaugurated under the auspices of the World Data Center-A for Marine Geology and Geophysics; the first report in the series was published.



# Bathymetry, Hydrography, and Boundaries



Project Scientists: Lt. Christine Schomaker NOAA Corps



Peter Sloss

## Worldwide Gridded Bathymetric Data:

The data base holding the U.S. Navy 5-minute worldwide gridded bathymetric observations (called DBDB5 for 'Digital Bathymetric Data Base, 5-minute') was requested by 38 clients.

Requests were mainly from other Government agencies and academia. The data were requested for projects in hydrodynamic modelling and large-scale ocean studies, rather than for localized interests of the energy industry.

Data products from this data base included contour maps for the Decade of North American Geology Project and shaded relief depictions of the ocean floor.

## Digital Hydrography for U.S. Coastal Waters:

The most accurate and extensive digital bathymetric data coverage available for the coastal waters of the Continental United States, Alaska, Hawaii, and Puerto Rico is the Hydrographic Data Base provided by the NOAA National Ocean Service (NOS). The dense onshore and shallow-water bathymetric data are well suited to computer generation of grids to be used in numerical models of estuaries and other coastal areas. These data are also valuable for compiling base maps for geophysical exploration, coastal engineering studies, and other research and reference purposes.

## Shaded-Relief Depiction of the Mariana Trench Area as Represented by the DBDB5 Bathymetric Data Base.

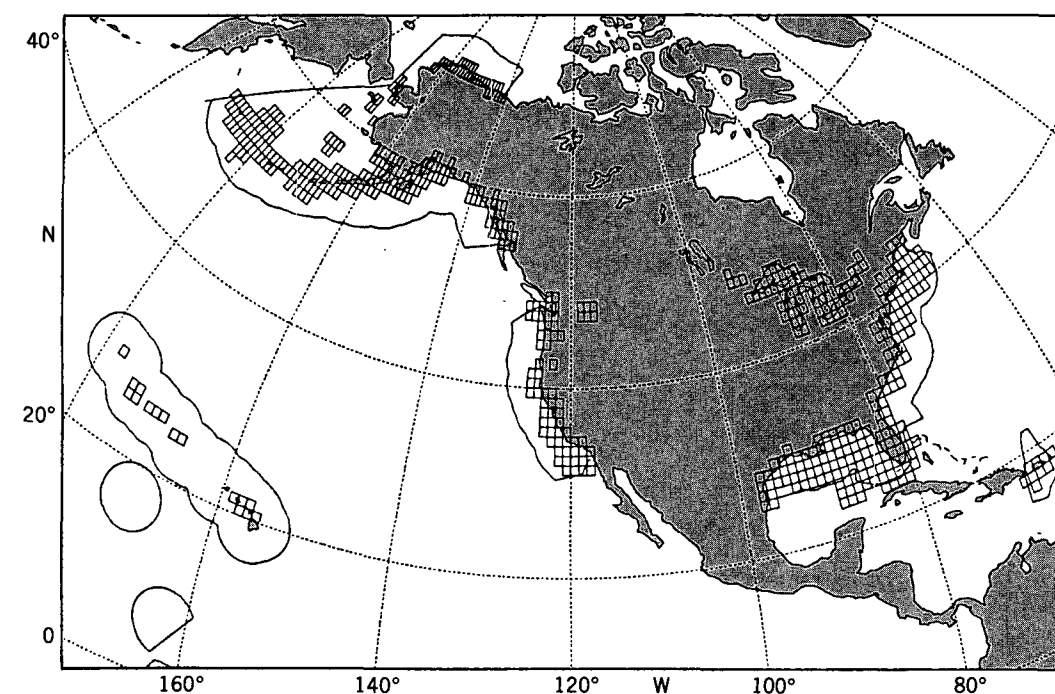


The core of this data base consists of digitized depths, hazardous features, and bottom characteristics from hydrographic surveys completed between 1930 and 1965. Survey data since 1965, now digitized in the field, are added to the data base as they are received.

## Boundaries:

Marine boundary data in digital form are vital to the preparation of illustrative maps and charts using computer-graphic systems. Another important use for boundary data is for searching files to determine the amounts and types of data available from various data bases that lie within a region delineated by commonly used boundaries, such as the EEZ.

One-degree squares show the areal extent of the NOS Hydrographic Data Base. The U.S. Exclusive Economic Zone (EEZ) boundary is shown as a solid line.



## FY-84 Highlights

- New techniques for display of gridded bathymetry were developed, including the use of 3-dimensional and color graphics.
- Complete update was received for gridded bathymetry—DBDB5 replaces SYNAPS. First data coverage of Arctic Ocean.
- The transfer was begun of a large backlog of digital hydrographic surveys from the National Ocean Service to MGG. During FY-84,85 of the total of 571 backlog surveys were received.
- The digitized representation of the EEZ was provided by the National Ocean Service. Portrayals of this boundary may be included in any MGG computer plot.

# Marine Geophysics

Marine geophysical data are used mainly by the industrial community in exploring for oil, gas, and other minerals. Some of the data, however, are used to design offshore platforms, pipelines and cables, and other engineering activities. In FY-84, MGG filled requests from 171 oil and gas companies for data and information. These requests represent about 50% of the total requests for marine geophysical data for the year.

Although industry officials request all types of marine geophysical data, the most commonly requested are underway marine high-resolution and multichannel seismic-reflection data. These data are essential to industry because they disclose the structure of the continental shelves and ocean basins and indicate where favorable areas for exploration exist.

Most of the underway seismic data are provided by Government agencies, such as the U.S. Geological Survey and the Minerals Management Service of the U.S. Department of the Interior. The data are gathered mainly on the U.S. continental shelves and slopes. Data from deep ocean basins are provided by several U.S. academic institutions such as the University of Texas at Austin, the Woods Hole Oceanographic Institution, the Lamont-Doherty Geological Observatory, and the Scripps Institution of Oceanography.

Data holdings include 8.7 million miles of cruise trackline coverage contributed by about 30 institutions. The GEODAS (GEOphysical Data System) inventory contains data for about 2,200 cruises, including more than 15.5 million digital records and nearly million track miles of analog records (on microfilm).

## FY-84 Highlights

■ MGG received the first data from the People's Republic of China (PRC). The data include gravity observations collected by a PRC ship on cruises in the Pacific Ocean in 1976.

■ The first data sets of digital seismic profiling data were received from the Deep Sea Drilling Project (DSDP). There are 237 magnetic tapes, covering DSDP Cruise Legs 89 to 96 available for dissemination. Also, underway data on bathymetry and magnetics for legs 89-96 have been received by MGG, as well as microfilm records of bathymetry, magnetics, and high-resolution seismic-reflection data for DSDP legs 82-96, thus completing NGDC's underway geophysical holdings derived from DSDP.

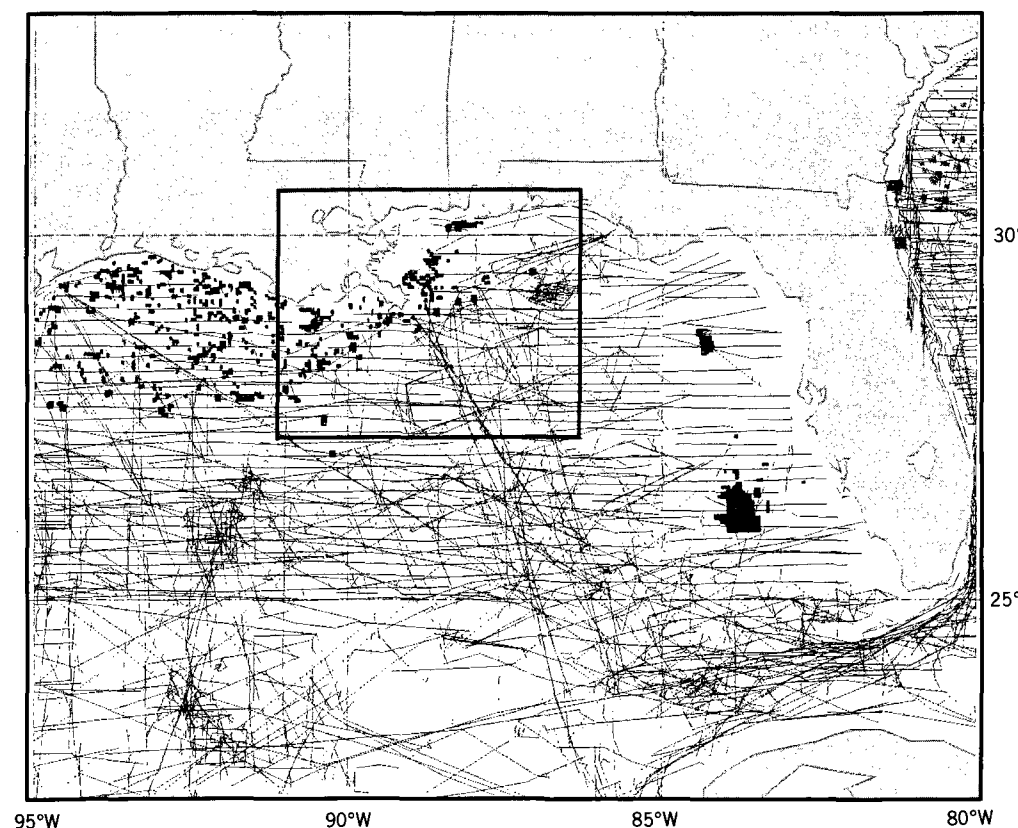
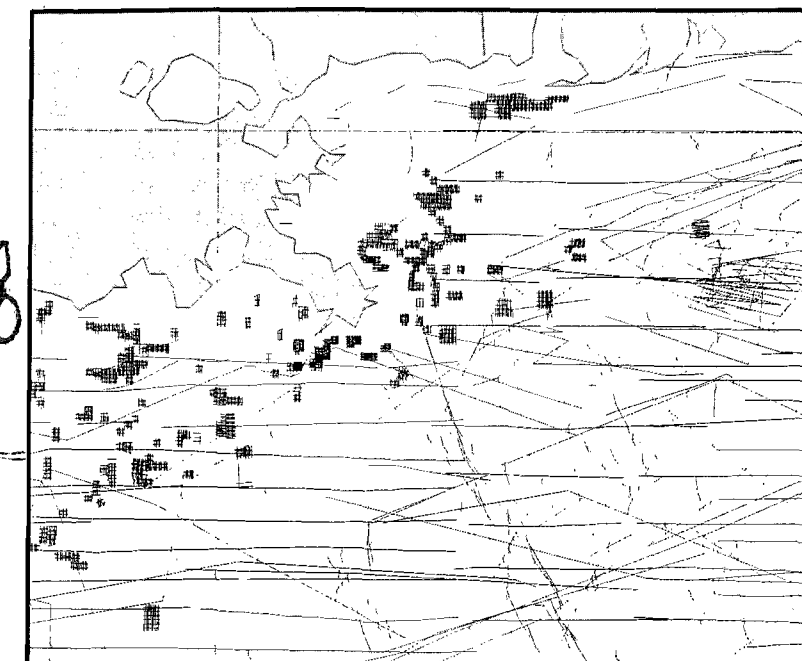
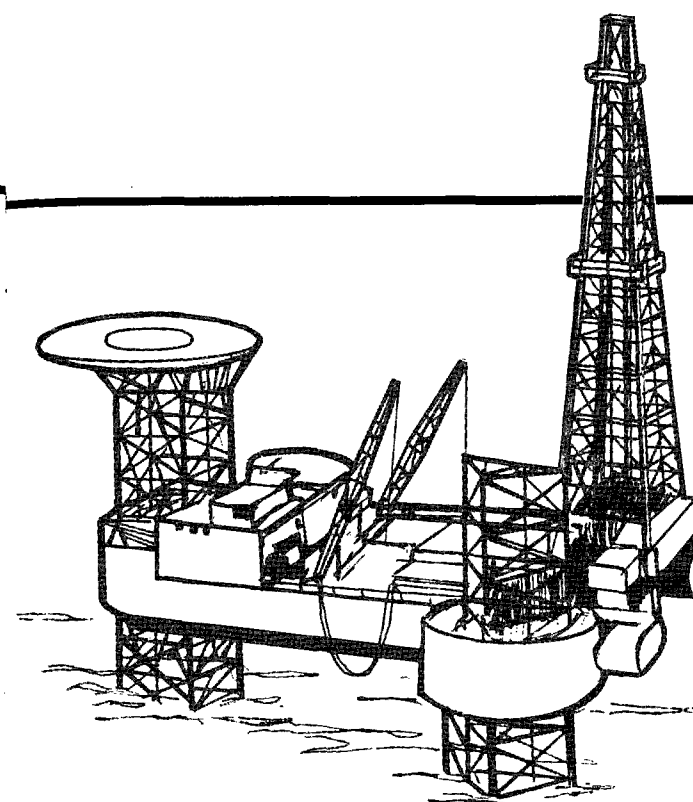
■ As part of the decade of North American Geology Project, processed data and data plots were provided to the Geological Society of America.

■ New developments in handling digital data include providing data on diskettes for use on microcomputers. Access to two new super-microcomputers and a color-graphics terminal made possible several new data products and services.

**Sample of Trackline Coverage of Gulf of Mexico data holdings. Small dark squares are tracklines of intensive high-resolution seismic profiling for lease-sale hazards studies (more visible in inset, top right).**



Project Leader: Dan Metzger



# Marine Geology

## Marine Sediment Data:

Within MGG are three major marine sediment data bases: the Index to Marine Geological Samples (the "Core Curators' File"), the digital grain-size data base, and the geotechnical properties data file. All geological data bases, digital and nondigital, are summarized in, and searchable through, the Marine Geological Digital Inventory (GEOLIN). These data sets provide valuable auxiliary data for assessment of seabed resources worldwide.

The Marine Core Curators' file was established in 1978 as a means of uniformly distributing information on the contents of the sample collections of the major U.S. oceanographic institutions. During FY-84, information for 1,835 samples was processed into this file, increasing the number of records to 210,000 representing over 51,000 individual marine geologic samples.

The digital grain size data base increased in size by nearly 25% as about 5,000 analyses of 1,400 individual samples were added. Many of these analyses were the result of Government programs such as the Bureau of Land Management's Outer Continental Shelf program, and studies performed under contract to the Minerals Management Service.

The new digital geotechnical properties data base was started with inhouse coding of engineering properties data for 235 samples from 29 data reports generated by the U.S. Naval Oceanographic Office.

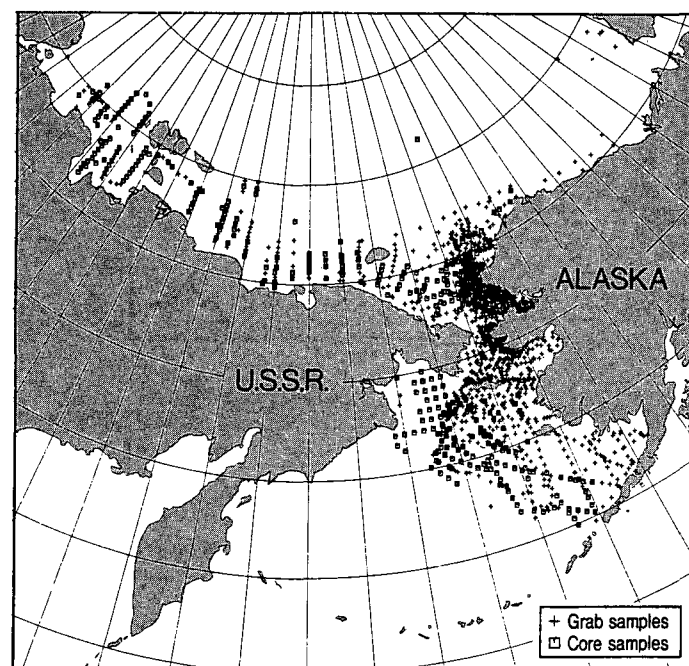
## Marine Minerals Data Base and Bibliography:

During the past 2 years, permits to mine marine deposits of manganese were issued to private consortia, and President Reagan proclaimed the U.S. Exclusive Economic Zone. Both actions greatly stimulated interest in marine minerals and data about them, as both private companies and government move to assess the economic potentials of offshore mineral deposits.

In 1983, MGG began to compile a bibliography and data base on marine minerals, funded by the Ocean Minerals and Energy Division of NOAA's National Ocean Service.

The bibliographic portion of the marine minerals project is a comprehensive, worldwide, online computerized compilation of information about literature on marine manganese, polymetallic sulfide, and phosphorite deposits. By fall of 1984, the bibliography contained over 5,000 entries.

The actual geochemical data base portion of the marine minerals project also grew rapidly. MGG placed the historic Scripps Institution of Oceanography manganese nodules analysis file (discontinued in 1979) on the NOAA mainframe computer in Asheville, N.C. The file contains about 6,700 analyses. During the summer of 1984, MGG coded an additional 1,000 manganese analyses for entry into the marine minerals data base; more analyses are being coded as new sources of data are discovered.



Locations of Grain-Size Data



Project Scientists: Carla Moore



Bruce Grant

## FY-84 Highlights

■ By the end of September 1984, MGG had received final copies of the following Deep Sea Drilling Project digital marine geologic files: site summary, age profile, and core depths.

■ Custom plots from the Core Curators' file of dredge compositions and surface ages were constructed for the Decade of North American Geology Project to aid in compiling their new geologic map series.

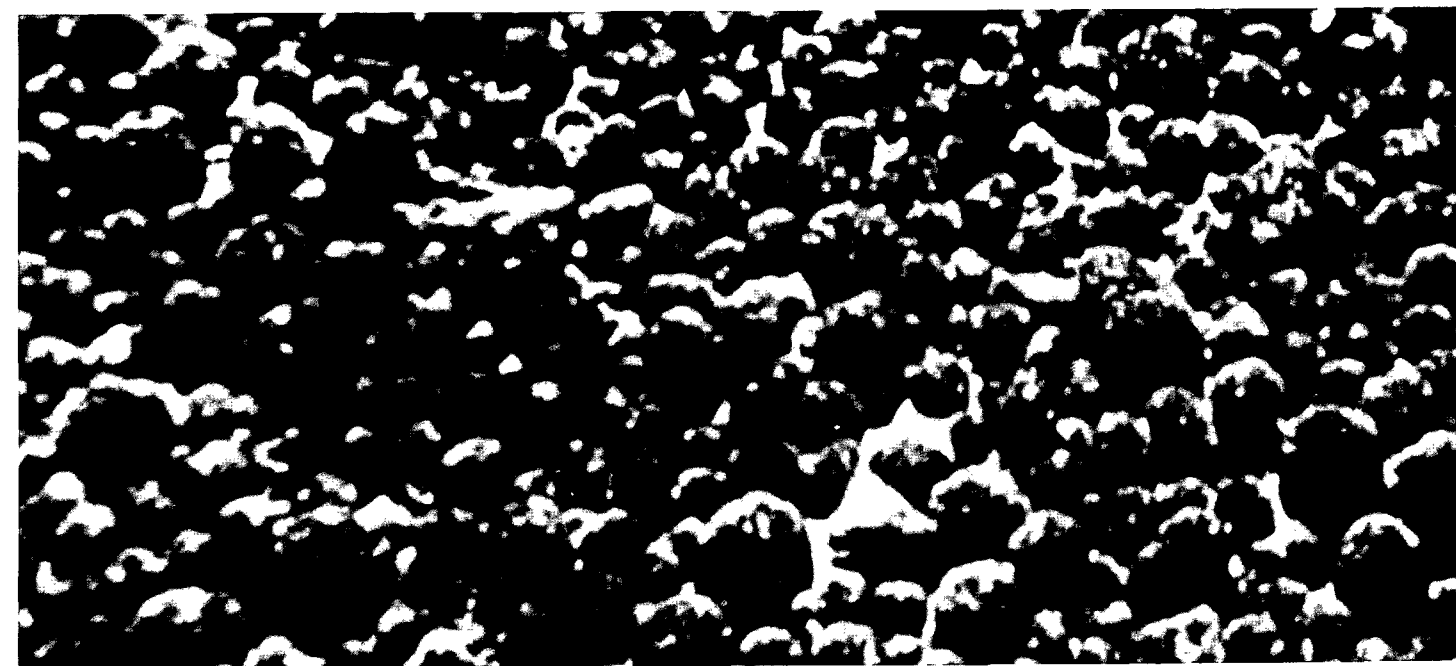
■ A new exchange format for geotechnical properties data was finalized, and construction of the geotechnical data base was begun.

■ Access/retrieval software for the Curators' file was rewritten to allow remote access to the data base through a new, faster, record-addressible system organized by 10-degree squares of latitude and longitude.

Staff: Robin Christiansen, Research Associate

■ The historic Scripps Institution of Oceanography manganese nodule analysis file was brought up on the NOAA/DAMUS computer system as the first part of the Marine Minerals Data Base.

■ Parameter lists for polymetallic sulfide and phosphorite geochemical analysis data were drafted and circulated to the scientific community as a first step in incorporating these data types into the Marine Minerals Data Base.



Ferromanganese Deposits on the Ocean Floor

# Marine Applications of Computer Graphics

Project Scientist: Peter Sloss

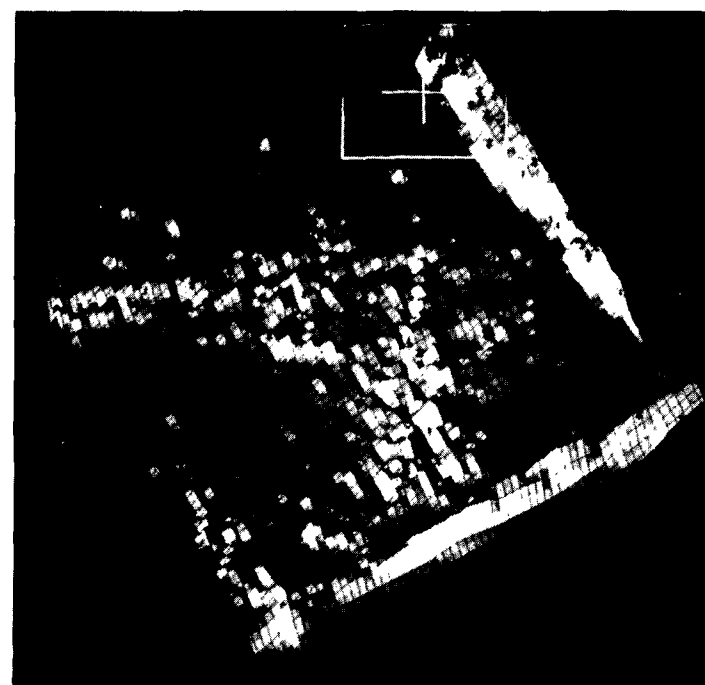
## New Data Systems:

The year 1984 marked the beginning of the micro-computer era for MGG as well as for NGDC. MGG's first microcomputer-oriented data product, "Echo-Sounding Correction Tables, Third Edition," was offered on floppy disk for IBM and Apple micro-computers. This item consists of data bases and programs for the correction of echo-sounding depth data for variations of the speed of sound in water in 85 different areas of the world's oceans. The original computer programs and data were translated from the large-computer FORTRAN language into the microcomputer BASIC language; the data files were modified to be compatible with the small computers. We have received several requests for this handy, new format.

As the number of completely computerized data systems increases, so does the ability to access all available data in response to user requests. Much work still needs to be done to reconcile disparate data sets that are scattered over several large and small computers, but the groundwork is being laid for vertical integration of many geologic and geophysical data bases.

## New Data Display Systems:

Late in FY-84, NGDC acquired a high-resolution color graphics terminal that offers a whole new universe of potential data products. For the first time, several different data sets can be displayed together, e.g., bathymetry and type and location of geologic samples as shown in the figure that follows. MGG took the lead in implementing the necessary driv-

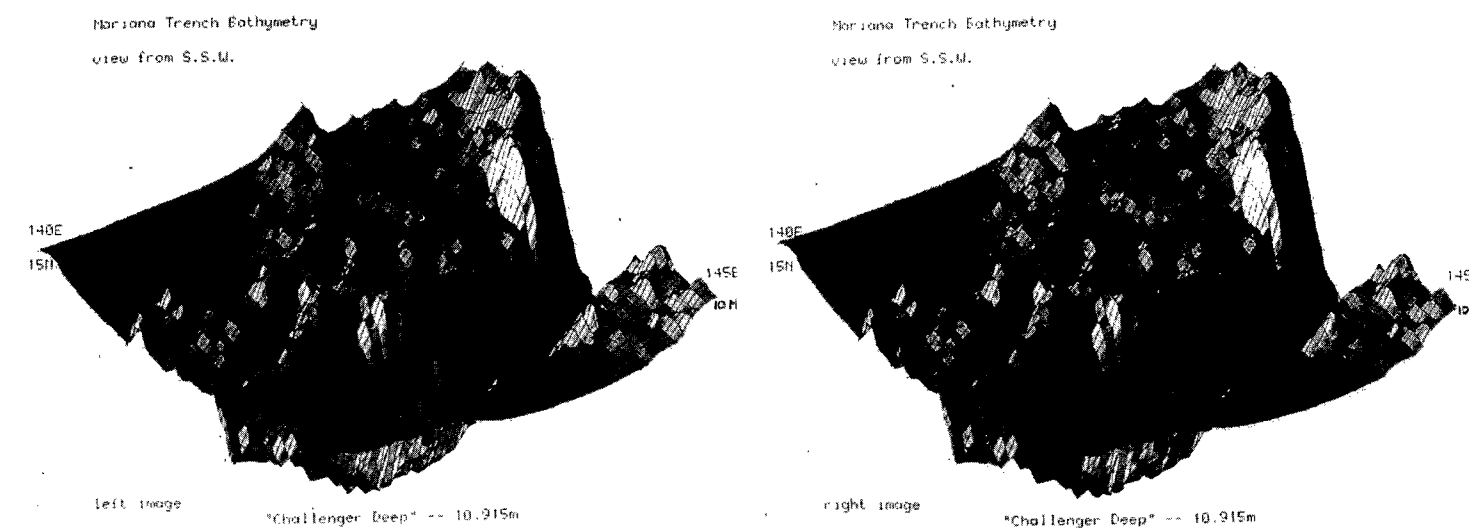


Three-dimensional perspective image showing locations of geologic samples indexed in the "Core Curators' File" for the Gorda Rise area of the EEZ off Oregon and Washington.

ing programs and is therefore the major producer of color graphics in NGDC. Other examples of black-and-white renditions of color outputs from this system appear in the Bathymetry section of this report. Experimental color graphics systems are currently available on the micro, mini, and mainframe computers used by NGDC.

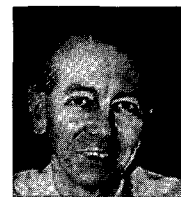
## FY-84 Highlights

- Development of color graphics software for production of stereo pair, color pseudocontour, and shaded-relief depictions of the ocean bottom.
- First MGG use of microcomputers (32-bit, 16-bit, and 8-bit systems) for product and software development.
- First release of microcomputer floppy-disk data products.



Stereoscopic image pair of a portion of the Mariana Trench area shown above. This area contains the Challenger Deep, which at 10,915 meters is the deepest known place in the Oceans.

# National Snow and Ice Data Center/World Data Center-A For Glaciology



Director: Roger G. Barry



Scientific Manager: Ronald Weaver

The National Snow and Ice Data Center (NSIDC) was established by NOAA in 1982. Directed by Dr. Roger G. Barry, the center functions as a national information and referral center for the snow and ice community. Roger Weaver is Scientific Manager, and the center has eight staff members. The subject matter includes avalanches, freshwater ice, glaciers, ground ice and permafrost, ice sheets, paleo-glaciology, sea ice, and snow cover.

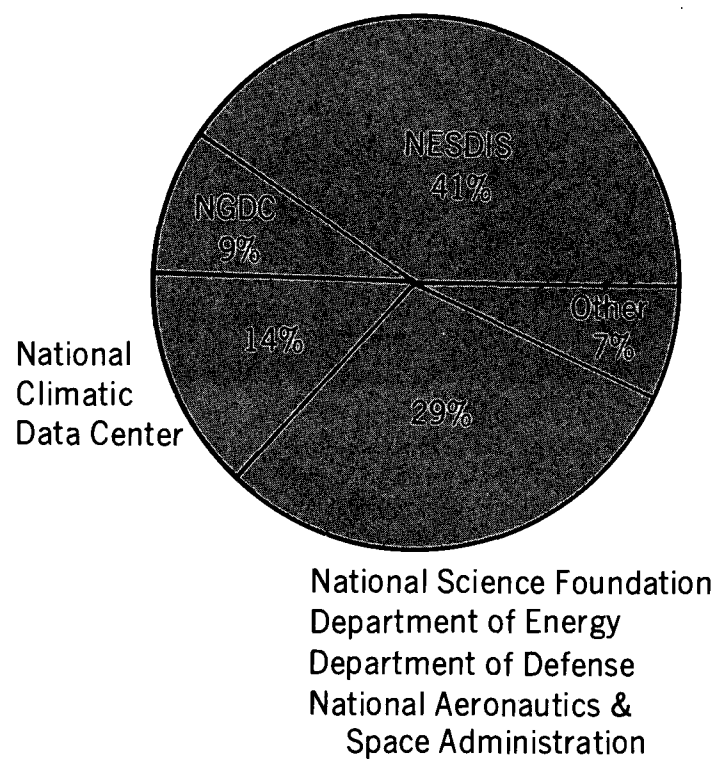
The NSIDC and collocated World Data Center A for Glaciology (Snow and Ice) is operated under a contractual agreement between the University of Colorado, Cooperative Institute for Research in Environmental Sciences (CIRES) and the National Environmental Satellite, Data, and Information Service (NESDIS) of NOAA. The center is housed in research buildings adjacent to the NOAA-Environmental Research Laboratories and the National Geophysical Data Center.

World Data Center A for Glaciology [Snow and Ice] (WDC-A) is one of three international data centers serving glaciology. The other two are WDC-B in Moscow, USSR and WDC-C in Cambridge, England. The centers were established during the International Geophysical Year to facilitate the international exchange of data on all forms of snow and ice.

In November 1976, WDC-A was formally included among the WDC responsibilities and was transferred to NOAA (in Boulder) from the U.S. Geological Survey in Tacoma, Washington.

## Funding:

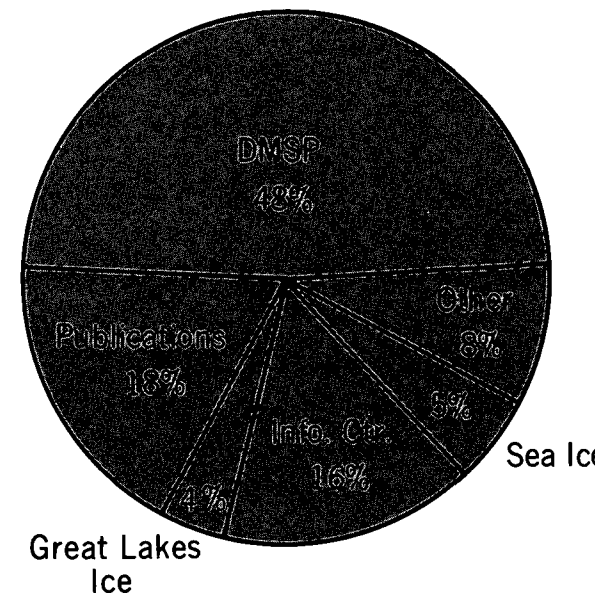
WDC/NSIDC operations are supported by a combination of NOAA funding and research projects funded by other government agencies. During FY-84 NOAA base-funding accounted for 49 percent of WDC/NSIDC support.



## Users:

The Center provides access to snow and ice data and information to a diverse clientele. About 35 percent of user requests are from U.S. academic institutions, 22 percent are from outside the U.S., and 20 percent are from the Federal government. Private industry and various State and local government units supply the balance of requests.

The areas of interest indicated by data request statistics are shown below.



Margaret Strauch, Secretary

## Applications:

Uses to which snow and ice data may be applied are varied. Some examples are:

- |            |  |
|------------|--|
| SNOW COVER | <ul style="list-style-type: none"> <li>•Runoff</li> <li>•Snow Disruption</li> <li>•Avalanche Hazards</li> </ul>                                  |
| SEA ICE    | <ul style="list-style-type: none"> <li>•Shipping</li> <li>•Arctic Energy Resources</li> <li>•Global Climate</li> <li>•Iceberg Hazards</li> </ul> |
| GLACIERS   | <ul style="list-style-type: none"> <li>•Hydropower</li> <li>•Scenic Value</li> <li>•Climate Change Index</li> </ul>                              |
| ICE SHEETS | <ul style="list-style-type: none"> <li>•Global Sea Level Trends</li> <li>•Antarctic Treaty</li> <li>•Paleoclimate Information</li> </ul>         |
| PERMAFROST | <ul style="list-style-type: none"> <li>•Cold Region Resources, Engineering</li> </ul>  |



# Defense Meteorological Satellite Program (DMSP)

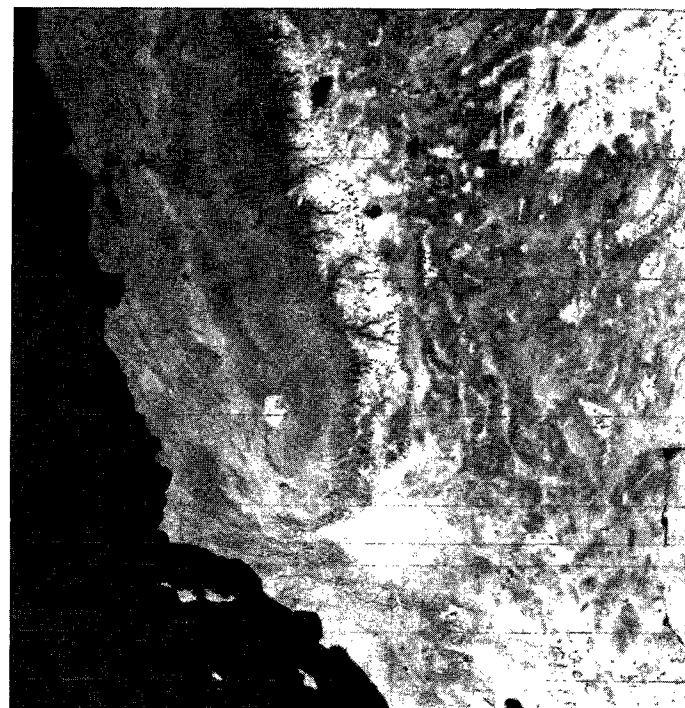


Project Scientist: Greg Scharfen

NSIDC archives data from the U.S. Air Force Defense Meteorological Satellite Program (DMSP).

## DMSP data features:

- Visible and thermal infrared spectral bands.
- Global coverage up to four times daily.
- 10 year record, about one million pieces of film.
- 3 positive transparency products, with a complete photographic service.
- The highest resolution of any meteorological satellite (0.6 km).
- The only meteorological satellite providing nighttime visible-band imagery, with applications to astronomy and studies of man-made and natural lighting.



## FY-84 Highlights

- NASA Scientific Working Group formulated data-management plans for the cryospheric data to be generated by a DMSP satellite planned for launch in 1985/6.
- Data requests and data sales are up 85% and 95%, respectively, from the same period last year.
- Compilation of nighttime visual-band mosaics, now being considered for publication by National Geographic Society.
- Coverage by Japanese television; special aired March 1985.
- Participation in Private Industry Partnership Program.
- Design and implementation of data request tracking system to monitor DMSP and other data center requests.



## Applications

- Snow and ice studies
  - sea ice extent and variability;
  - snow cover extent and variability.
- Cloud climatologies
  - synoptic scale climatologies;
  - interaction with cryosphere.
- Astronomy
  - support for legislation on limits on suburban lighting;
  - siting of observatories.
- Demography
  - studies of population, migration.
- Meteorology
  - visual evidence used in litigation involving weather;
  - military tactical applications.



Fig. 1. High-resolution (0.6 km) DMSP image of California on December 3, 1978 showing snow cover in the Sierra Nevada and the Great Basin.

Fig. 2. Expanded-scale, high-resolution (0.6-km) image of the Chesapeake Bay area on 17 April 1975.

Fig. 3. The Eastern United States on the night of March 6, 1978, visible band, 2.7-km resolution. DMSP is the only meteorological satellite to operate visible band sensors at night.

# Snow and Ice Information Center



Group Leader: Ann M. Brennan

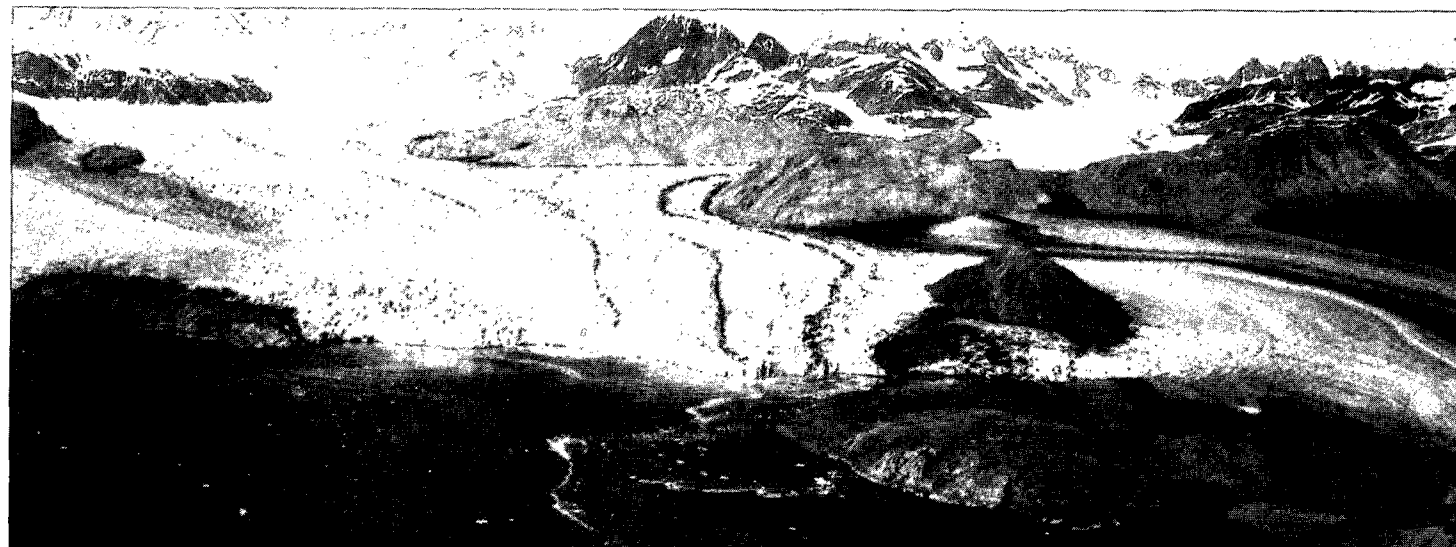
NSIDC serves as an archive for published material relating to all aspects of snow and ice research. The Information Center features:

- Library collection of 3500 monographs, 7000 reprints, and 70 journals.
- CITATION data base that provides online access to the collection.
- Microfiche indexes.
- Sea ice charts—U.S., Canada, Japan, U.K., Norway, Sweden, Denmark.
- Reference and referral service.

Glacier Photo Collection:

- 10,000 aerial and terrestrial photos.
- Coverage dates from 1880s to 1970s.

An example from the Glacier Photo Collection showing the Muir Glacier, Alaska, 1929.



■ Areas covered—Alaska, Western Canada, Pacific Northwest, the Alps.

■ Computerized data base that can be accessed by glacier name, location, features, photographer.

■ Microfilm browse file of 60,000-item U.S. Geological Survey photo collection.

## Publications:

■ New Accessions List is a product of the CITATION data base. It is a quarterly list of documents received, categorized by subject. It is mailed worldwide to 350 scientists, research institutions, and libraries.

■ Glaciological Data (GD), is a report series generally published twice each year. Issues focus on a single topic and include specialized bibliographies, inventories, and survey reports relating to snow and ice data prepared by NSIDC staff, as well as invited articles on glaciological data sets, data collection and storage, methodology, and terminology.

■ Specialized Bibliographies published to date include: Arctic Sea Ice, Ice Cores, Glacial Hydrology, Snow Cover, Permafrost, Avalanches, Marginal Ice Zone.

## FY-84 Highlights

■ GD-14, Permafrost: A Bibliography, 1978-1982 (1983) prepared for the Fourth International Conference on Permafrost. Approximately 4400 citations.

■ GD-15, Workshop on Antarctic Climate Data (April 1984) contains Workshop report, recommendations, preliminary survey of Antarctic data sets.

■ GD-16, Soviet Avalanche Research; Avalanche Bibliography Update, 1977-83 includes eight translations of Soviet research on avalanche dynamics and a 400 citation bibliography.

Staff: Patricia Hofman  
Carol Pedigo

■ Four New Accessions Lists published.

■ "Snow and Ice" chapter compiled for the CODATA Directory of Data Sources for Science and Technology.

■ Review of "Research on Snow and Ice" published in Reviews of Geophysics and Space Physics (1983).

■ Annals of Glaciology article on availability of sea ice and snow cover data published.

■ Chapter titled "Snow and ice data" by R. Barry will be published in Paleoclimate Data and Modeling.



Carol Pedigo (left)  
Terrill Nickerson (center)  
Patricia Hofman (right)

# Snow and Ice Studies

NSIDC archives digital data on all areas of snow and ice research. Most of the sets of data relate to snow cover and sea ice, but data also are available in the areas of glacial geophysics, Great Lakes ice-related environment studies, and satellite microwave research. Specific data available include:

## ■ Snow cover

- global and/or hemispheric coverage, 1940s-present.
- snow limits, snow depth on the ground.
- digital and analog, derived from satellite observations, published climatologies, ground observations.
- avalanche event data, Western U.S., 1950s-present.
- mountain snow cover, Western U.S., daily snowfall, depth on the ground, 1950s-present.



Artificially released powder snow avalanche, north of Silverton, Colo.



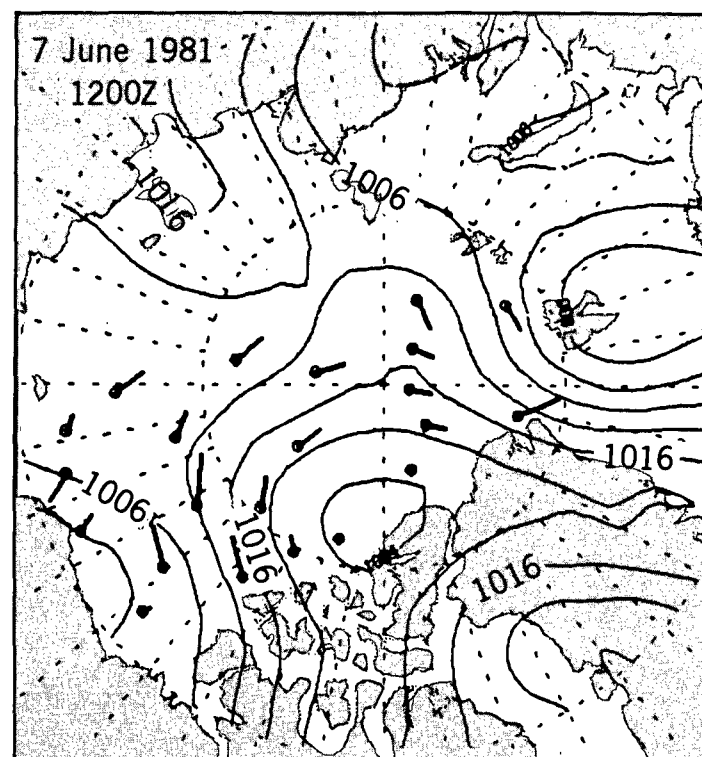
Group Leaders: Richard Armstrong



Claire Hanson

## ■ Sea ice

- global and/or hemispheric coverage, 1901-present.
- digital data, primarily satellite-derived, older data from published sources and ice charts.
- sea ice extent and concentration; ice drift and velocity from Arctic Ocean buoys; North Atlantic icebergs.



Graphical presentation of Arctic Ocean buoy locations for June 7, 1981.

## ■ Ice geophysics

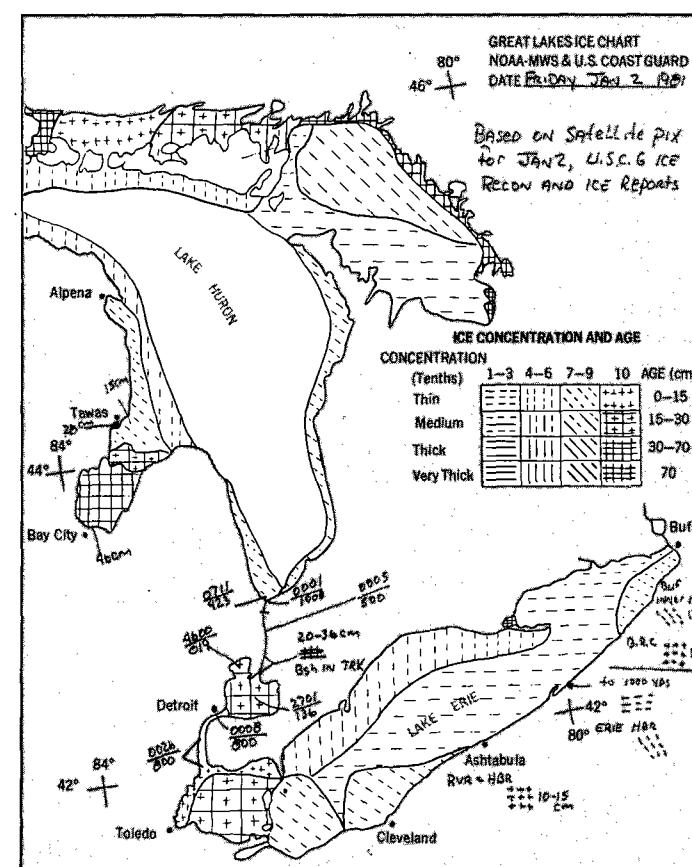
- polar ice sounding microfilm keyed to digital geomagnetics, Greenland and Antarctica, 1978-79.

## ■ Ice coring

- digital microparticle and  $O_{18}$  data from ice sheet drill cores (Greenland and Antarctica).

## ■ Lake ice

- Great Lakes, 1956-present.
- ice concentration 1960-79, aerial photography, 3x weekly ice charts, station observations.



Sample of Great Lakes ice chart, 1973-74 to present.

## FY-84 Highlights

- Provided input to the NESDIS Environmental Data Inventory for the Antarctic area.
- Participated in the NOAA Polar Ice Technical Working Group as ex officio members.
- Received Joint Ice Center digitized data set for the Antarctic (1973-82).
- Archived International Ice Patrol iceberg position data, 1981-83.
- Updated Arctic Ocean buoy digital data from January 1979-December 1983.

# Cryospheric Data Management System (CDMS)



Systems Manager: Vincent Troisi

Microwave Data Management for Snow Cover and Sea Ice Research:

The CDMS was conceived in 1983 to augment NSIDC's capability to provide improved access to digital cryospheric data. The management system is designed to provide a multi-disciplinary research data set comprising both cryospheric and atmospheric data, improve the ease of information transfer, and anticipate new data needs and requirements.

The Data:

■ Special Sensor Microwave Imager (SSM/I) data from the Defense Meteorological Satellite Programs will be available in 1986. Polar grids of brightness

temperatures, sea ice extent, sea ice concentration, and multi-year ice fraction will be placed in CDMS.

- The functions of the CDMS are to:
  - create mapped data sets.
  - distribute data to the user community (foreign and domestic).
  - provide an interactive data catalog.
  - provide facilities for visiting scientists.
  - provide special products upon user request.
  - anticipate future data requirements and develop guidelines for data-collection/management.

The System:

- Computer hardware
  - VAX 750 computer with laser optical disk.

- Computer software
  - an implementation of the Pilot Ocean Data System (PODS) developed by NASA's Jet Propulsion Laboratory, arranged through technology transfer from JPL/PODS to NSIDC.

- Interactive user access through a packet switched communication network such as Telenet.

## FY-84 Highlights

Facility improvement:

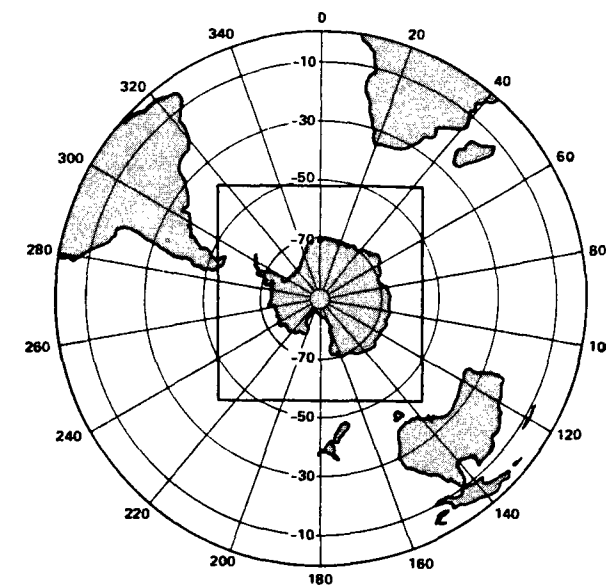
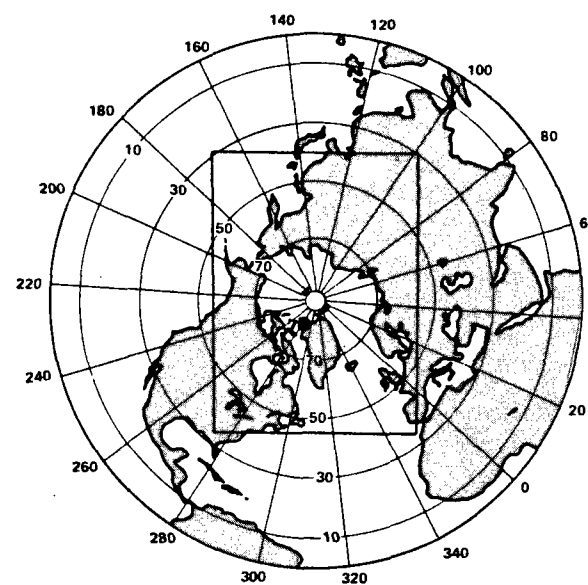
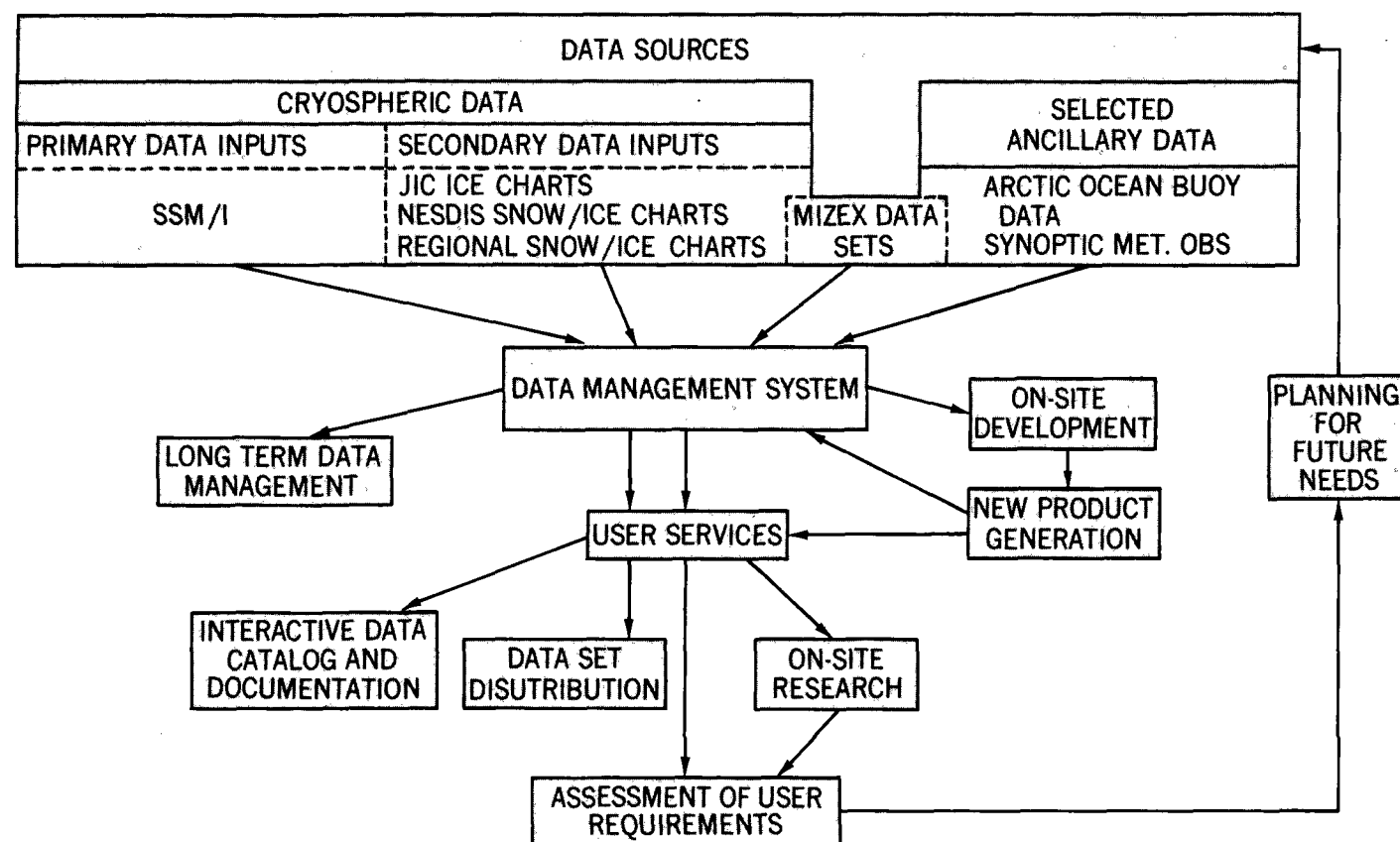
- Computer System acquired—The VAX 750 and support peripherals were installed.

- Computer facility—Environmentally controlled rooms for the computer and supporting operations were constructed.

System Design:

- Preliminary software design for SSM/I data processing was completed by JPL/PODS.

- Science plan completed by Science Working Group for SSM/I, which outlines priorities for data archiving and processing. (NSIDC participated in completion of the report.)



Geographical areas in the Northern and Southern Hemispheres to be covered by the CDMS archive of SSM/I data.

# Administrative Services



Chief: Arza Straight

The Administrative Services group in the Office of the Director performs budget/finance operations, liaison with Department of Commerce and NOAA agencies, management of NGDC finances, and conducts management studies.

## Budget/Finance:

- Advises NGDC managers on annual budget preparation and controls, and on property procurement and management.
- Keeps budget plans responsive to mission changes by conducting financial operations according to NOAA directives.

## Liaison with Commerce/NOAA agencies:

- Finance—assures that the NGDC financial picture is known to higher management, that records are uniform and complete, and that changes in fiscal policy are implemented. Administrative Services uses the NOAA accounting system.
- Personnel—assists in management of employee hiring, pay, contracts, awards, retirement, and insurance.
- Procurement—obtains equipment, supplies and services through the Regional Administrative Support Centers.
- Facilities—arranges for office and storage space.

## Management of Center finances:

- Assures that agency base funds are obligated within legal and monetary limitations.
- Assures that reimbursible funds received from other agencies for specific projects are used within funding agreements.

## Management studies:

- Analyzes needs for, and cost effectiveness of, labor, employee training, travel, office space, contracts, and various equipment.
- Assists managers in decision-making, particularly as related to finance and interagency relationships.

## FY-84 Highlights:

- Several microcomputers and peripherals were installed. Their use with sophisticated accounting and planning software increased administrative service efficiency.
- The User Services Group was established to centralize and standardize the filling of customer requests, to economize by limiting data-copying contracts, and to keep data sales receipts in a secure environment.

Staff: Georgina Pickering, Administrative Officer  
Pamala Grisham, Budget Assistant  
Randy Aragon, Budget Clerk  
Serena Kierein, Typist  
Sandy Fender, Secretary  
Karen Erbert, Budget Assistant



Randy Aragon (left),  
Georgina Pickering (center),  
and Pamala Grisham (right)

# User Services

A wide range of technical and general support services is provided to NGDC and the scientific community by groups that handle customer requests, marketing, publications support, and archiving/storage. These services are under the Office of the Director.

## Customer requests and marketing:

■ User Services keeps customers informed of the ever-changing geophysical data and services and makes the products available in the form they can use most effectively. Forms of data include magnetic tape; diskettes; microforms; paper copies, instrument charts; blackline, sepia, and plastic copies; maps; photographs; and computer graphics.

■ Scientific data technicians interpret and fill requests for geophysical data and services and guide users in selecting types and formats of data suitable to their needs. Often, reformatting is needed. For example, analog charts may be digitized, or EBCDIC-coded magnetic tape may be reformatted in ASCII.

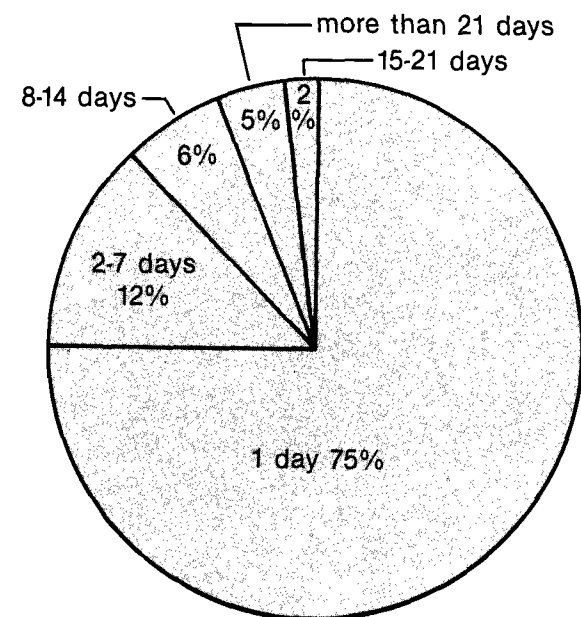
■ User Services develops and uses search-and-recall devices to answer customer requests for information from the many types of archived data. An automated data request system maintains accountability of all data activities. Some requests can be filled with data in standard formats. Others require custom preparation of data packages by division specialists.

## User Services also:

—maintains about 100 automated mail lists for rapid, targeted distribution of data, such as marine mining and solar activity newsletters to specific customers.

—ships many kinds of geophysical data worldwide.

—manages and staffs displays at scientific meetings.



TIME TO FILL DATA REQUESTS

Chief: Arza Straight

Group Leader: Mai Edwards



## Publications support:

■ Assists and coordinates the publications program. Monitors Commerce and NOAA publication guidelines. Writes and edits certain publications and marketing fliers describing data sets.

■ Provides design, drafting, and graphics services best provided in-house, and coordinates services obtained commercially. For example, many of the technical illustrations for *Solar-Geophysical Data* are prepared each month inhouse, as are numerous viewgraphs for conferences.

■ Acts as consultant on publishing. Obtains printing services within Federal guidelines at lowest cost.

## Archiving and storage:

■ Operates a 10,000 ft<sup>2</sup> warehouse with humidity-controlled space in Boulder! Also archives data at Federal Records Centers in Denver and in Suitland, Md.

■ Keeps track of stocks, discards items no longer needed, and coordinates transfers between NGDC offices and storage centers.



Staff: William Winkler, Writer/Editor  
 Charles Shanks, Scientific Illustrator  
 Helen Bailey, Scientific Data Technician  
 Clara Corners, Scientific Data Technician  
 Craig Clark, Scientific Data Technician  
 Glory Grube, Scientific Data Technician  
 Henrietta Kissel, Scientific Data Technician  
 Doreen Ardourel, Scientific Data Technician  
 Kathy Briscoe, Data Clerk  
 Johanna Lang, Data Clerk  
 Ruth Shenko, Clerk Typist

Doreen Ardourel copies a seismogram for a customer



Glory Grube (left), Kathy Briscoe (center), and Craig Clark (right)

# Computer Services

The Automated Data Processing (ADP) Division provides many support services to the technical and administrative personnel of NGDC. These services are important to the day-to-day operations, as well as the long-term mission of data storage and retrieval.

The computers at NGDC are nodes of the Data Archive Management and User Services (DAMUS). These computers include the Data General M-600 minicomputer, Charles River and Wicat microcomputers, IBM XT, LISA, Compac, and several other models of personal computers. NGDC also has a direct line to the DAMUS mainframe in Asheville, N.C.

Personnel in the ADP Division are involved in all aspects of computer usage. This includes support and assistance in the use of all systems, including software and hardware as well as operations, file integrity, and security. ADP is responsible for maintaining the Data Request System, Tape Library System, Calcomp Plotter, and Tektronix Graphics Terminal. It also provides communications using a data switch to all the computers in use at NGDC.

Listed below are several of the important services ADP provides to NGDC personnel:

- Operates the Data General M-600 minicomputer at NGDC Headquarters in Boulder.
- Provides data-entry service for solar-terrestrial physics, marine geophysics, and seismology.
- Maintains a magnetic tape-storage facility and an automated tape-tracking and inventory system.
- Maintains an automated data request accounting system that tracks all customer data requests; provides management information reports and statistics from this system.

- Maintains an automated mail list system and data base to generate mail labels.

- Tests and evaluates state-of-the-art hardware and software systems.

- Provides data communications support in a distributed processing environment of mainframe, mini-, micro-, and personal computers.

- Provides support for computer graphics hardware and software systems, including plotters, digitizers, and graphics terminals.

- Provides systems level programming support for all local computers.

- Studies, plans, and recommends methods for ADP and data base management to improve productivity, save funds, and develop new data products.

## FY-84 Highlights

- Purchased, installed, and tested the Charles River multiuser super-microcomputer system.

- Added a pair of high-density tape drives to the Data General minicomputer. This provided local 6250 BPI tape processing capability for the first time.

- Installed a front-end digital switch to provide local computer users access to NGDC computers from their office terminals. Cost savings from removing data communications lines will pay for the data switch in 2 years.

- Established standards for procuring personal computers at NGDC.



Chief: Carl Abston

**Staff:** Nettie Bunch, Computer Specialist  
John Kinsfather, Computer Specialist  
Brenda Cooke, Computer Clerk  
Mary Duggan, Computer Clerk  
Thomas O'Callahan, Computer Assistant  
Joan Barrett, Computer Programmer  
Ruth Dahlke, Computer Operator

- Established an Ethernet Local Area Network between the Data General and the Charles River computers, providing high-speed file transfers in both directions and allowing Charles River users to print files on the Data General line printer.

- Installed a Sperry UNIVAC data communications processor, which provides better quality and higher speed communications for NGDC users of the DAMUS mainframe.

- Purchased additional ADP hardware for the current systems, including a second line printer for the Data General, a publication-quality laser printer for the word-processing section, and a Tektronix color graphics system with an ink-jet plotter.

- Completed a feasibility study and a proposal for replacing the Data General computer system, which is 5 years old.

- Designed a new version of the Data Request System. The new system uses less computer resources and contains more standardized code. This system also has an interface to the NESDIS data request accounting system in Washington, D.C.

- Digital and analog entries for NGDC data bases were included in the DAMUS data dictionary system.



Joe Salazar and Mark Szymanowski discuss a computer project.

# Fiscal Year 1984 Publications

## SOLAR-TERRESTRIAL PHYSICS (STP)

IONOSPHERIC NETWORK ADVISORY GROUP BULLETIN. Issues 40, 41, and 42 were published. This international newsletter informs operators of world ionospheric network stations of latest updates and changes. Published several times a year.

SOLAR-GEOPHYSICAL DATA, Parts I and II. Twelve monthly issues of each part and an annual explanation volume. This is the major international periodical of STP data.

SOLAR INDICES BULLETIN. Monthly summary page of daily solar, optical, and radio activity indices published rapidly and sent to more than 100 subscribers worldwide.

SOLAR-TERRESTRIAL PHYSICS DATA SERVICES AND PUBLICATIONS. Describes the many resources of the STP Division available to researchers and the public. Updated as needed. Each of the NGDC Divisions, and National Snow and Ice Data Center, maintains a similar catalog.

UAG REPORT 88, Numerical Modeling of Ionospheric Parameters from Global IMS Magnetometer Data for the CDAW-6 Intervals. Presents the results of efforts to model distribution of ionosphere electric potential, currents, field-aligned currents, and Joule heating from ground-based magnetic records for two selected intervals.

UAG REPORT 89, Atmospheric Handbook: Atmospheric Data Tables Available on Computer Tape. NOAA components NGDC, National Climatic Data Center, and Environmental Research Laboratories cooperated in producing this data catalog.

UAG REPORT 90, Experience with Proposed Improvements of the International Reference Ionosphere (IRI). Papers from the June 1980 URSI COSPAR Workshop in Budapest, Hungary.

## Journal Articles

A Current System for the March 22, 1979, Sudden Commencement. EOS, American Geophysical Union, Vol. 65, 1984, p. 263.

GOES-4 Satellite Failure Investigated. Dan Wilkinson, NGDC, EOS, American Geophysical Union, Nov. 24, 1983, p. 953.

International Geophysical Calendar for 1984. EOS, American Geophysical Union, Dec. 6, 1983, pp. 971-972. Widely used to coordinate worldwide geophysical observations that are not made continuously.

Solar and Geomagnetic Data. Journal of Geophysical Research, summary page published monthly by STP Division.

## SOLID EARTH GEOPHYSICS (SEG)

COGEOLOGICAL NEWSLETTER. Volume 8. An irregular publication that reports on the work of the Commission on Data Processing, Storage, and Retrieval of the International Union of Geological Sciences.

ENVIRONMENTAL DATA INVENTORY FOR THE ANTARCTIC AREA. NESDIS Environmental Inventory No. 1, May 1984. Has numerous maps portraying availability of NGDC data from Antarctica.

KGRD-9. Catalog of Seismogram Archives (revised). Gives details of the extensive collection of original and filmed seismograms held by NGDC and how to obtain them.

KGRD-20. Catalog of Natural Hazards Photographs. Describes hundreds of photographs available that show earthquakes, volcanoes, or tsunamis and the damage they have caused.

MAP OF WORLD SEISMIC STATIONS. Shows the location of all stations of the world's major seismograph networks.

PROCEEDINGS OF THE AEROMAGNETIC DATA WORKSHOP, November 16-18, 1982. Thirteen papers presented at the SEG Division-sponsored workshop are published in this volume.

SE REPORT-35. Documentation of Earthquake Algorithms. Details the availability of many international computer programs for reduction of seismic data.

SE REPORT-36. Catalog of Submarine Volcanoes and Hydrological Phenomena, 1500 B.C. - A.D. December 31, 1899.

## Journal Articles

National Geophysical Data Center Data Bases Supporting Investigations of Geological Hazards. Science of Tsunami Hazards, Vol. 2, No. 1, 1984.

Maps of Geothermal Resources of New Mexico and Seismicity of Middle America, produced by NGDC, were described in the "Distinctive Recent Maps" section of the American Congress on Surveying and Mapping Bulletin, June 1984.

## MARINE GEOLOGY AND GEOPHYSICS (MGG)

MGG REPORT-1. Sedimentology, Physical Properties, and Geochemistry in the Initial Reports of the Deep Sea Drilling Project, Volumes 1-44: An Overview.

This new World Data Center-A for Marine Geology and Geophysics report series parallels the SE, UAG, and GD report series in the other World Data Centers A operated by NGDC.

## NATIONAL SNOW AND ICE DATA CENTER/WORLD DATA CENTER-A FOR GLACIOLOGY

GD REPORT-14, Permafrost: A Bibliography, 1978-1982, contains about 4400 citations.

GD REPORT-15, Workshop on Antarctic Climate Data. This World Data Center A for Glaciology report is based on the August 1983 workshop sponsored by the Scientific Committee for Antarctic Research.

GD REPORT-16, Soviet Avalanche Research; Avalanche Bibliography Update, 1977-1983 includes eight translations of Soviet research and a bibliography of 400 citations.

Glaciology New Accessions List. Issues 19-22 were published. This computerized publication describes new holdings in the WDC-A Glaciology library. Printed approximately quarterly.