NSSDC NATIONAL SPACE SCIENCE DATA CENTER

NSSDC/WDC-A-R&S 92-06

1991 ANNUAL STATISTICS AND HIGHLIGHTS REPORT

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NASA

April 1992

Goddard Space Flight Center
Greenbelt, Maryland 20771

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James L. Green
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Greenbelt, Maryland 20771

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PREFACE

I am delighted to provide this year's National Space Science Data Center (NSSDC) report card, which reviews some of the highlights and distribution statistics for most of the basic NSSDC operational services for 1991. It is my intention to provide this report to the science user community on an annual basis to tell how well we are doing in supporting the space science user community.

What is noticeably absent from this year's report card is the usage statistics from the many Earth science data systems that were managed outside the NSSDC. In 1991 the NASA Climate Data System (NCDS), the Crustal Dynamics Data and Information System (CD-DIS), and the Pilot Land Data System (PLDS) were migrated to and are now being managed by the Global Change Data Center. This new data center will be a major facility for archiving the massive Earth science data that are expected to be returned from the National Aeronautics and Space Administration (NASA) Earth Observing Missions. The establishment of the Global Change Data Center should significantly help users access key Earth science data and will allow the NSSDC to support the space science community better.

Current archiving plans with future NASA space science missions indicate that the NSSDC's holdings will significantly increase over the next several years. We expect a massive amount of data will be delivered to the science community for further analysis from the archive. This next year (1992), data from spacecraft such as the Dynamics Explorer (DE) 1 and 2, Hawkeye, the International Sun-Earth Explorer (ISEE) 1 and 2, Magellan, the Roentgen Satellite (ROSAT), and the Cosmic Background Explorer (COBE)– just to name a few–will become publicly available. Our intention is to continue to provide rapid access to larger volumes of data held at the NSSDC by improving our on-line services and to point to the other important data holdings elsewhere.

Dr. James Lauer Green, Director
National Space Science Data Center
April 1992

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GENERAL SERVICES

1. NSSDC On-Line Data and Information Services (NODIS)

The NSSDC On-Line Data and Information Services (NODIS) is a menu-driven utility accessible nearly 24 hours a day, seven days a week to anyone able to reach the NSSDC computers via dial-up or network. This service allows access to on-line information held at NSSDC as well as limited amounts of on-line data. Data available via NODIS include International Ultraviolet Explorer (IUE) extracted spectra data, Nimbus 7 (NIMB) Gridded Total Ozone Mapping Spectrometer data, Coastal Zone Color Scanner (CZCS) data, and the OMNI data set of hourly solar wind parameters. The information services include the NASA Master Directory (MD); the Personnel Information Management System (PIMS), which is an interface to a personnel data base containing over 30,000 users of NSSDC services; the American Institute for Aeronautics and Astronautics (AIAA) *Canopus* newsletter; and the Astronomical Data Center (ADC) On-Line Information System for Astronomical Catalogs. Access to ionospheric, atmospheric, magnetospheric magnetic field, and magnetospheric energetic trapped particle models are available for downloading or executing. There is also a menu option that facilitates requests for off-line data services. The chart below shows the annual session totals for each of the NODIS services.

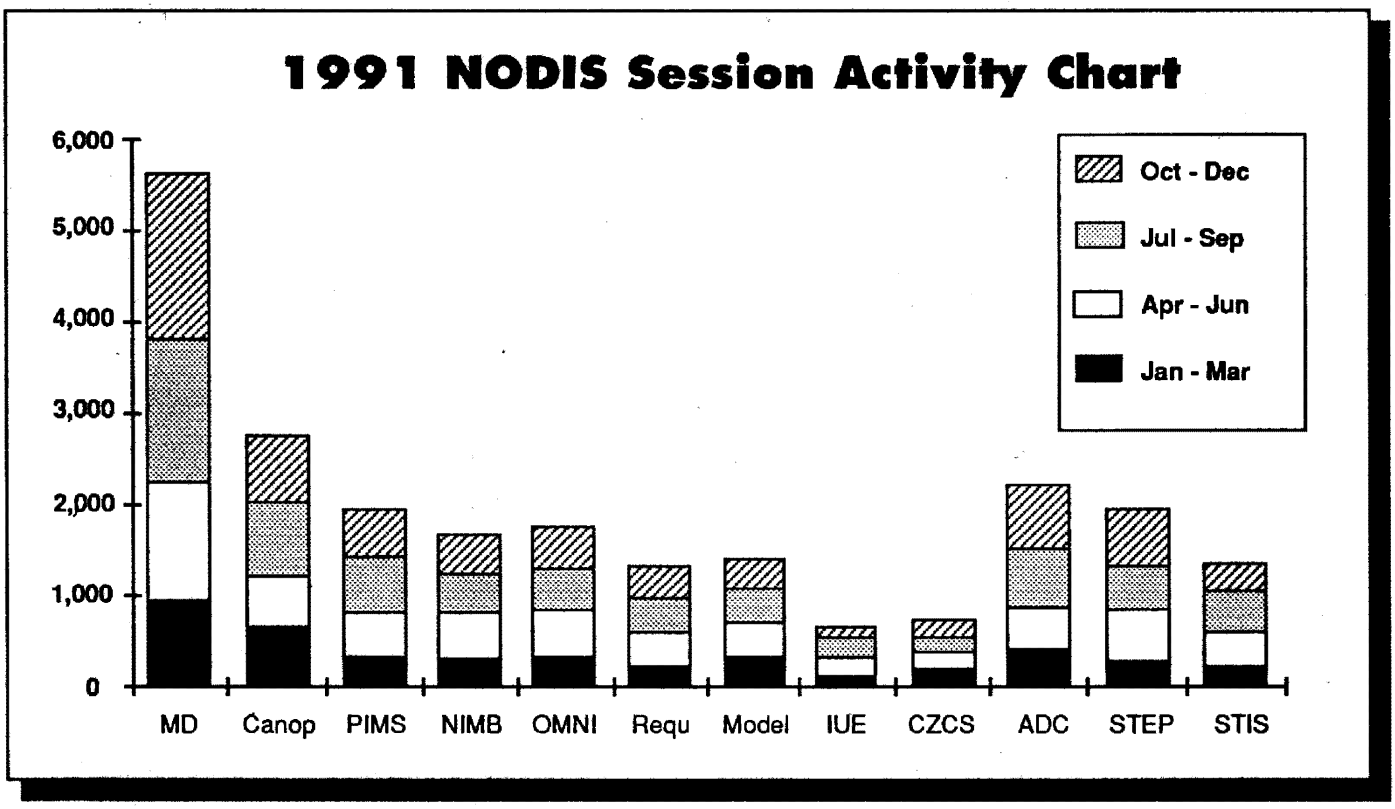

Figure 1. Annual Session Totals for Individual NODIS Services

2. The Master Directory (MD) and Catalog Interoperability (CI)

For more than five years a project called "Catalog Interoperability" or CI has been seeking to enable rapid and efficient identification, location, and access to data of interest to the science community. It started as a NASA effort but now includes representatives from other U.S. federal agencies, international agencies, and academic institutions. The goal of the CI group is to create a worldwide data information network composed of interconnected directory, guide, and inventory systems.

The first steps to establishing this network were to create directories to aid in finding data. The directories contain brief summary information about data sets, sufficient for researchers to determine whether further investigation is warranted. They also provide automated links to other information systems that give more detail on data sets of interest (guides) or on the parts of the data sets (inventories), or they indicate whom to talk to for additional information. The NASA Master Directory was created to serve this purpose for NASA. The directory served its purpose very well and other agencies, and international organizations have been given copies of the NASA directory software to perform the same function within their groups. These directories have been interconnected via computer network to enable information sharing to the benefit of all. In addition, the directory at Goddard Space Flight Center (GSFC) has been requested to serve as the centralized Global Change Master Directory (GCMD) for describing the global change data holdings of the U.S. federal agencies.

The Catalog Interoperability group has developed for describing data sets on the directory level a common format called the Directory Interchange Format (DIF), which is used as the basis of information to be shared among the directories. These DIF files can be passed among the directories to keep their information up-to-date.

THE INTERCONNECTED DIRECTORY SYSTEM

With the development of the DIF, the sharing of information among directories was made significantly easier. An interconnected International Directory Network (IDN) that shares information via DIF file exchange was formed. Figure 1 (see page 6) shows the present configuration of the directory system. These are just the directory nodes. Connections to other data information systems (guides, inventories) are not shown. The directory nodes include the three coordinating nodes that are identical copies of each other and that have the main responsibility for gathering, reviewing, and distributing data information throughout the network. The coordinating nodes are located at GSFC; at the European Space Agency (ESA) office in Frascati, Italy; and at the Earth Observation Center in Hatoyama, Japan.

Cooperating nodes share in the information distribution by contributing directory information. They may have full or partial directory data bases according to their needs. The present nodes are the Canadian Centre for Remote Sensing (CCRS) node in Ottawa, Canada; the NOAA Earth System Data Directory (NESDD); the United States Geological Survey (USGS) Earth Science Data Directory (ESDD); the DLR node in Munich, Germany; the United Nations Environmental Programme/Global Resources Information Data Base (UNEP/GRID) node in Geneva, Switzerland; the Japan Information Center for Science and Technology (JICST); and the Consortium for International Earth Science Information Network (CIESIN) distributed nodes.

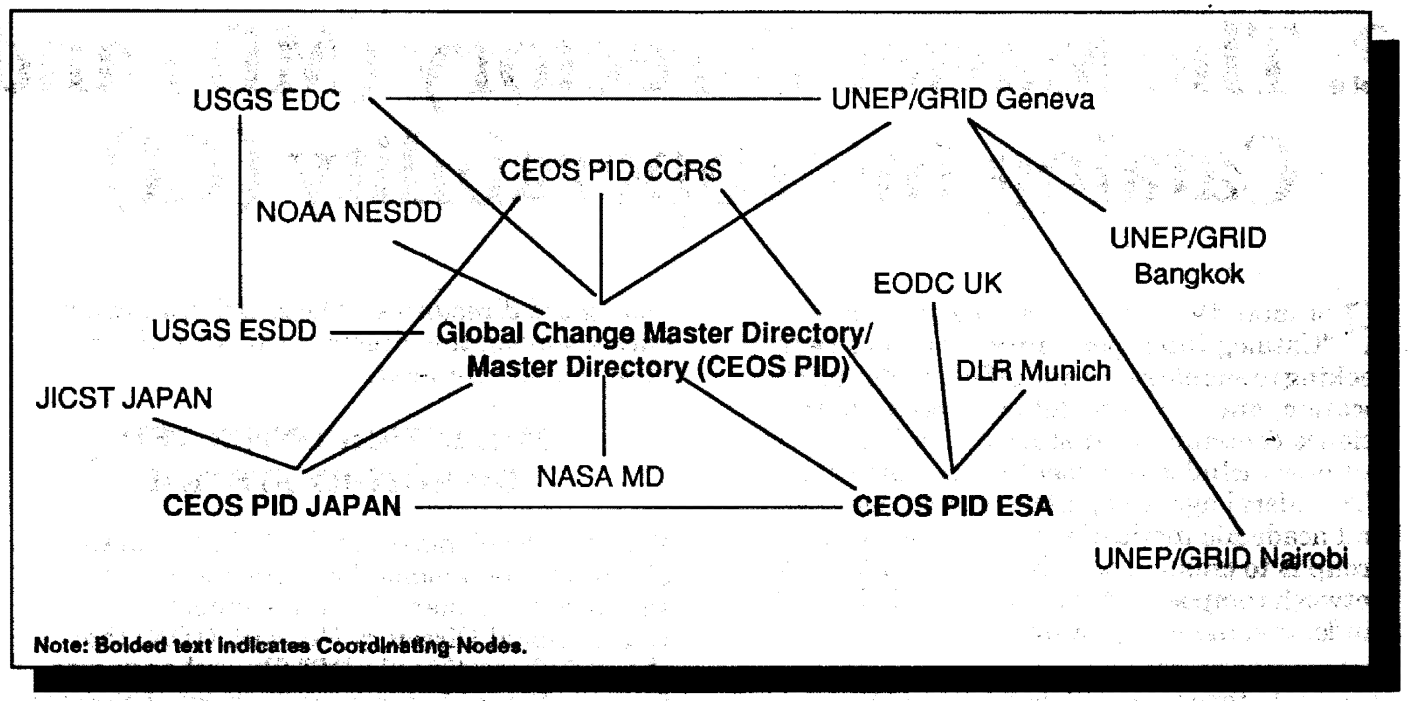

Figure 1. International Directory Network

MASTER DIRECTORY STATUS

The directories represent the most widely-used part of the interoperable data information system. This is evident from their ever-increasing usage. The Master Directory at GSFC has been operational for four years, and present usage is approaching 10,000 user sessions per year at the GSFC node. Since the directory is intended to provide quick information to users and lead them on to actual data sources, wherever those may be, users do not need a large number of sessions to obtain results. Thus, several thousand users were accommodated by the Goddard node during last year.

The information content of the directory has made similar progress. As shown in the diagram, over 1,300 entries are contained in the directory, describing the most useful and usable data sets in the five major discipline categories. Since more than one data set can be described in a single entry (and sometimes tens to hundreds may be aggregated in this way), there are many more than 1,300 data sets described in the directory. Several hundred of these were added in the past year, and most of the existing entries were reviewed and/or revised. This reflects the emphasis on keeping information current as well as maintaining quality and utility of the entries rather than concentrating only on increasing quantity. The number of entries will increase more rapidly as the new directory nodes of the IDN begin to describe their data holdings and the data in their surrounding community.

Not just data sets are described in the directory. There is also supplementary information about other data information systems and data archives, organized data collecting campaigns and projects, data sources such as spacecraft or Earth-based observing platforms, and data sensors that were used to acquire the data. The number of data information systems described in the directory has nearly reached 80. More than a third of these may be directly accessed from the directory through an automated network link that is performed automatically upon request by the user.

DIRECTORY ACCESS

The best way to reach an understanding of the nature and utility of the directories is to try them. Figure 2 below shows the procedures for accessing the directory at NASA/GSFC through several networks or via dial-in line.

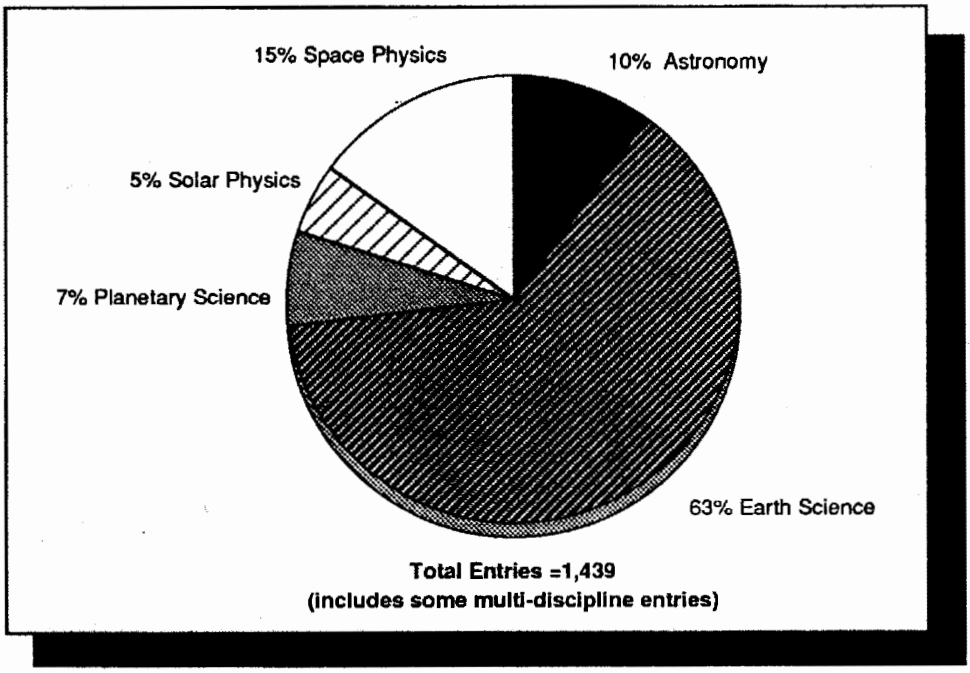

Figure 2. Percentage of Directory Entries by Discipline–FY91

CATALOG INTEROPERABILITY

As mentioned previously, the directories are only the first step in achieving the goals of catalog interoperability. Once users have determined from the directory where data of interest might reside, they usually need to obtain more information about the data and/or determine whether data exist for a particular criterion, such as time or location. The CI project seeks to make the simple interconnection process (level 1 interoperability) ever more efficient.

Several methods of potential use to increase interoperability are currently being applied in limited situations. Context passing (level 2 interoperability) was demonstrated in 1990 using the Master Directory and several remote systems. A limited form of automated multi-system searching (one form of level 3 interoperability), which does not assume Standard Query Language (SQL) data bases in remote systems, is being developed for version 0 of the Earth Observing System (EOS) project Data and Information System (EOSDIS). The Astrophysics Data System (ADS) is testing multi-system searching through uniformity of data base overlay software. Other groups are also testing different methods of multi-system searching. The lessons learned from these various approaches will be applied more generally in the future to improve the overall search process and access to data. Figure 3 below suggests for various disciplines a future scenario that combines the IDN with a variety of automatic connections into the discipline information systems using a mixture of levels of interoperability. The goal is to provide the highest level of interoperability for the user wherever it proves valuable and can be done in a cost-effective manner.

SPAN	DIAL-IN LINES
$ SET HOST NSSDCA	Dial 301-286-9000
USERNAME: NSSDC	*CONNECT 1200 (or 2400 or 300)*
	Enter several carriage returns
INTERNET	*ENTER NUMBER*
TELNET 128.183.36.23	MD
USERNAME: NSSDC	*CALLING 55201 (or 55202)*
	CALL COMPLETE
OMNET	Enter several carriage returns
GOTO NSSDC	*USERNAME:* NSSDC

ITALICS INDICATE RESPONSE FROM THE COMPUTER.

Figure 3. Directory Access

3. Distribution of NSSDC Data Via Non-Interactive Modes

The National Space Science Data Center archives and distributes a great variety of scientific data and information related to spacecraft and ground-based observations. In 1991 the Coordinated Request and User Support Office (CRUSO) handled close to 5,000 requests received by various modes (described later) and involving the transmission of data mostly by mail or networks. Of these, 26% were for astrophysical data, 50% for spacecraft and model data spanning the range of scientific disciplines, 13% for related documents, and 10% were referred to other agencies or the Goddard Space Flight Center Public Affairs Office for processing. Not included in Figure 1 are hundreds of inquiries that were satisfied on the phone or via electronic mail.

These various requests were received in three main categories: 1) through oral communication (39.9%), such as telephone calls, on-site visits, and from conferences; 2) as electronic messages (29.3%) via the NSSDC On-Line Data and Information Service (NODIS), the NSI/DECnet, or other networks; and 3) by written correspondence (30.8%), including regular mail and telefax. (See Figure 2.)

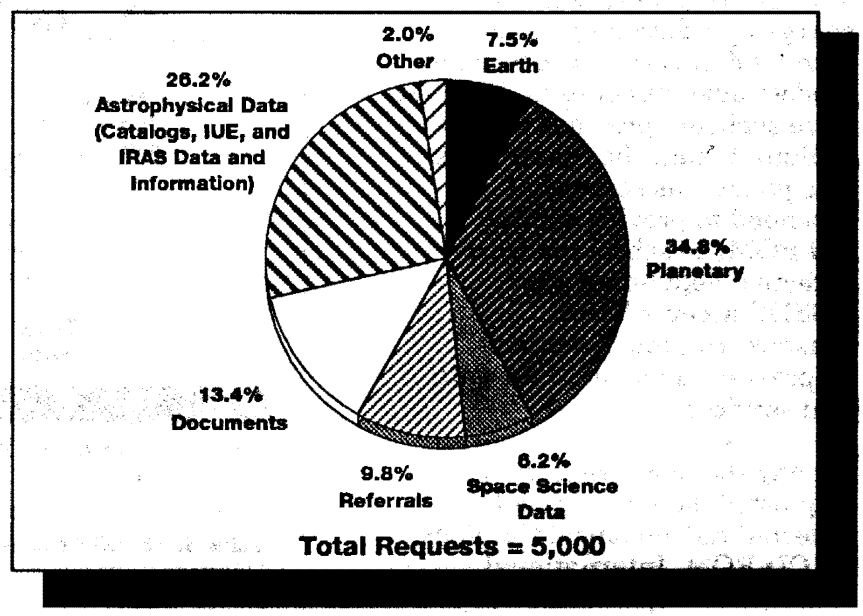

Figure 1. Mainline NSSDC Requests by Categories

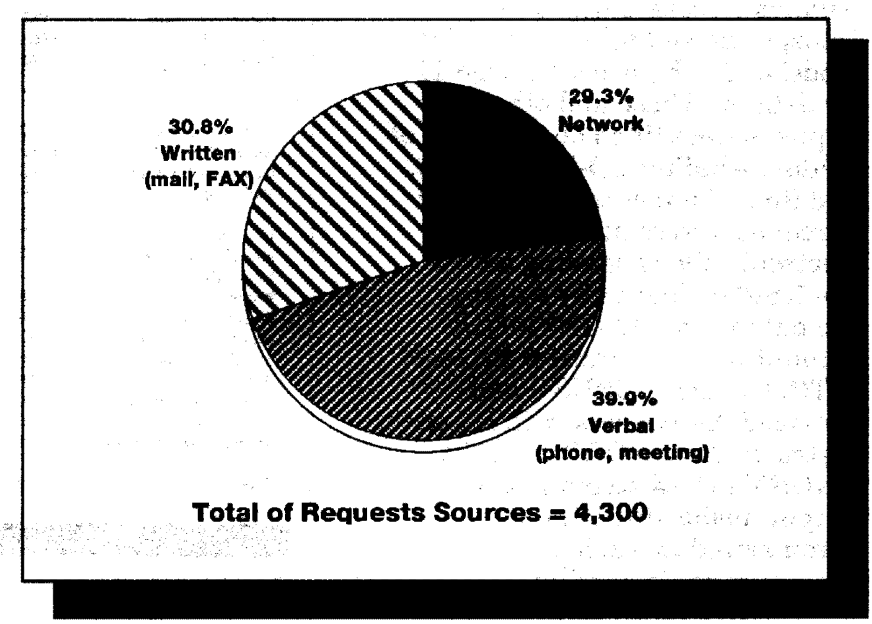

Figure 2. Requests Sources Categories

Virtually all requesters used NSSDC data and information for scientific research. Only a small percentage was commercially oriented. The user community covered a wide spectrum of institutions. (See Figure 3.) In accordance with NSSDC charge and service policy, users were charged for data only on an incremental cost recovery basis. Modest amounts of data, however, were typically provided free to affiliated scientific researchers. The policy was somewhat extended to provide sample CD-ROMs to school teachers. Effective September 1991, NSSDC accepts VISA, MasterCard, and American Express card payment for data and services.

Among the most frequently requested data sets were the Selected Astronomical Catalogs on CD-ROM, International Ultraviolet Explorer (IUE) data, Voyager imagery of outer planets, Magellan mosaic images of Venus, Nimbus 7 ozone data, and ionospheric and solar-terrestrial models. See Figure 4 on page 11 for details. These and other requests were filled on a variety of media including CD-ROM, tapes, and film. An increasing number of requests were also filled electronically by sending across the NSI/DECnet or by staging the data in the ANONYMOUS account for File Transfer Protocol (FTP) transfer. CRUSO had provided many users with log on instructions to NODIS and the ANONYMOUS account. The output media statistics are summarized in Table 1.

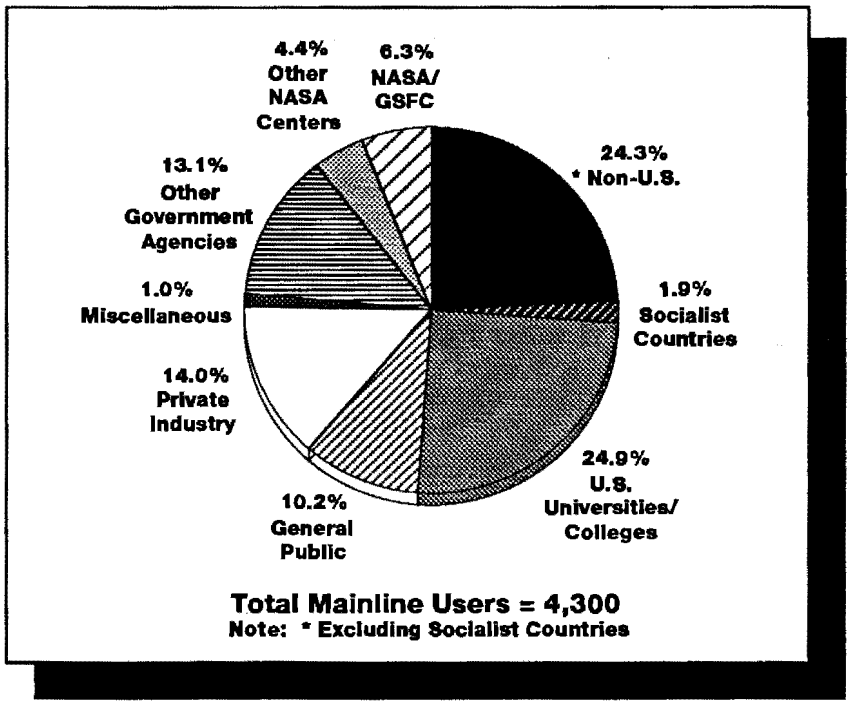

Figure 3. Mainline NSSDC User Community

Table 1. NSSDC Request Off-Line Data Output by Medium (FY91)

Medium	Requests Completed	Quantity	Average Quantity per Request	Output Unit
I. Digital				
CD-ROM	943	4,470	4.740	Each Disc
Computer Tapes	668	2,878	4.308	2,400-Foot Tape
Floppy Disks	1,021	1,519	1.488	Each Disk
Sent Via Network	649	3,036	4.678	Each File
II. Analog				
Aperture Cards	3	5	1.667	Each Card
Books/Bound Vol.	1,573	1,861	1.183	Each Binder
Computer Printout	475	16,918	35.617	Each Page
Hard Copy	585	11,820	20.205	Each Page
Microfiche	201	10,997	54.711	Each Plate
Microfilm	27	348	12.889	100-Foot Reel
Microfilm Copies	3	2	.667	100-Foot Reel
Movie/Kinescope Film	1	5	5.000	Each Roll
Negatives	20	241	12.050	Each Sheet
Negatives (Feet)	8	228	38.000	Each Strip
Photographic Prints	131	7,292	55.664	Each Sheet
Punched Cards	0	0	0	Each Card
Slides	27	542	20.074	Each Slide
Strip/Brush Charts	0	0	0	Each Sheet
Transparencies	15	574	38.267	Each Sheet
Transparencies (Feet)	1	300	300.000	Each Strip
Other	52	168	3.231	Various

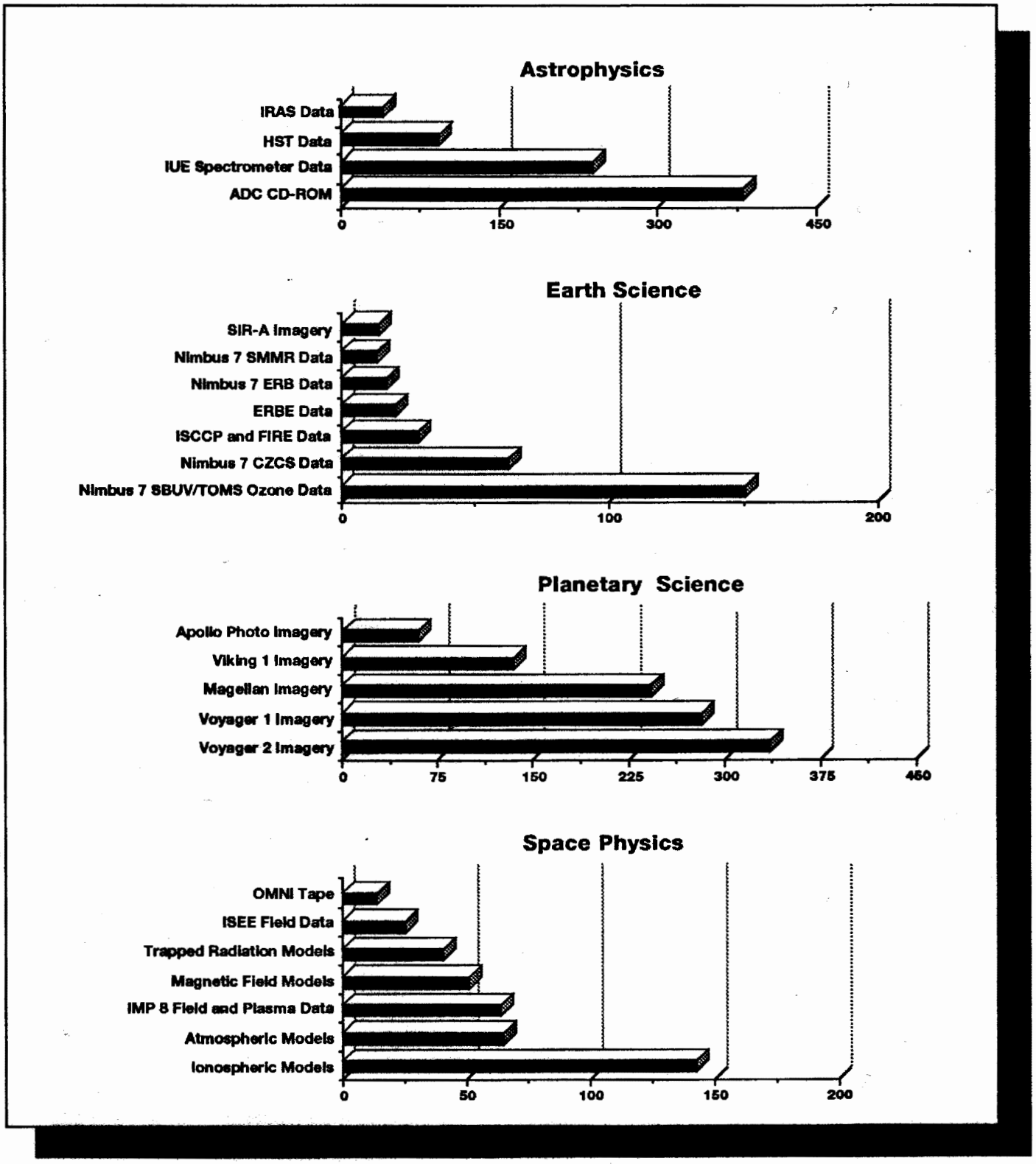

Figure 4. Numbers of 1991 Requests for Most Requested Data

4. NSSDC Data Archive and Distribution Services (NDADS)

The National Space Science Data Center has developed an automated data retrieval request service utilizing our Data Archive and Distribution Service (NDADS) computer system.

NDADS currently has selected project data written to optical disk platters with the disks residing in a robotic "jukebox" near-line environment. This allows for rapid and automated access to the data with no staff intervention required. There are also automated help information and user services available that can be accessed. User access to NDADS is summarized in Figure 1 below.

The request system permits an average-size data request to be completed within minutes of the request's being sent to NSSDC. A mail message, in the format described in this document, retrieves the data and can send it to a remote site.

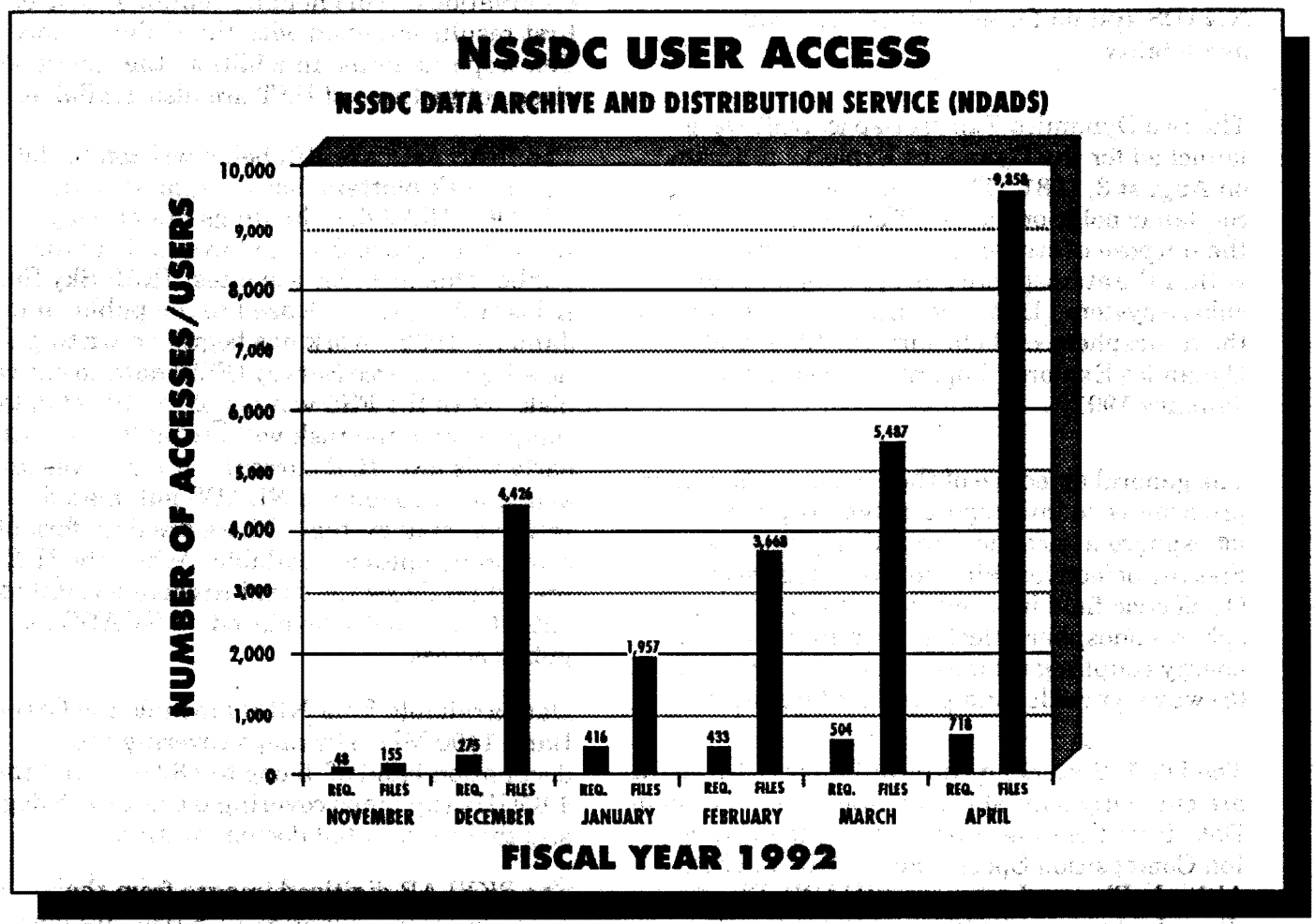

Figure 1. NDADS Statistics

New data are being added on a daily basis. Because of the growing volume of new data products and frequent additions to existing available data sets, the NDADS Automated Retrieval Mail System document will be revised regularly. The current Astrophysics and Space Physics data sets loaded into the NDADS facility are the Astronomical Data Center (ADC) holdings, the Dynamics Explorer (DE), HEAO2, HEAO3, the Hubble Space Telescope (HST), the InfraRed Astronomical Satellite (IRAS), the International Ultraviolet Explorer (IUE), the National Radio Astronomy Observatory's (NRAO) Green Bank sky map data and documentation, SKYLAB, and VELA5B data.

The ADC is placing its astronomical catalogs with NDADS. Catalogs are being added from NSSDC's standard tape media archive to the NDADS system for automated retrieval availability.

The two Dynamics Explorer spacecraft were launched for the Dynamics Explorer program on August 3, 1981. They were launched into co-planar polar o ts at different altitudes for the purpose of st ng interactive processes within the atmos e-ionosphere-magneto-sphere system. Dynamics Explorer 2 re-entered the atmosphere on February 19, 1983, and Dynamics Explorer 1 operations ceased in January 1991.

The general objective of the Dynamics Explorer program is to in tigate gnetosphere-ionosphere-atmo ere co ing processes. Specific objectives fall into e categories: (1) electric-field induced c ection; (2) magneto-sphere-ionosphere electric currents; (3) direct energy coupling; (4) mass coupling; and (5) wave, particle, and plasma interactions.

The DE 1 Spin-Scan Auroral Imager (SAI) data are currently available from the NDADS system. Data from the other instruments, the Energetic Ion Composition Spectrometer (EICS), High Alti it (HAPI), Plasma Wave Ins rument , and Retarding Ion Mass Spectrometer (RIMS) are planned additions in the near future.

The HEAO2 data from the Imaging Proportional Counter (IPC) and the High Resolution Imager (HRI) are currently being loaded into NDADS. These are data sets that have been distributed to the community in eight CD-ROMS that include the catalog of IPC X-ray sources, the IPC Slew survey, the HRI images, and the HRI event lists.

The HEAO3 data are from the anti-coincidence shield surrounding the germanium gamma-ray spectrometer. The shield served as an all-sky monitor for solar flares and cosmic gamma-ray bursts.

The HST data are from the Early Release observations. This holding contains some of the first results obtained with the Hubble Space Telescope cameras. In addition, the spacecraft close out pictures of HST are also available.

The IRAS data are still being written to the optical disk platters; however, most of the NSSDC's IRAS data holdings are already written to optical disk and available to the public. This includes the latest IRAS Sky Survey Atlas (ISSA), just released to the public in mid-January 1992. Work has begun on writing the new Faint Source Survey (FSS) data to optical disk. With the FSS volume of 78 GBs of data, completion of the task will probably take until early this fall. IUE current data archives are available through the NDADS automated retrieval mail system. There are data format conversion options available. When the IUE project produces the Final Archive formatted data, this will also be placed on NDADS for public access.

Data available from NRAO include the Green Bank 1400 MHz sky maps covering the declination band of -5 deg to +82 deg, and the 4.85GHz sky maps covering 0 deg to +75 deg and their associated documentation.

The SKYLAB digit
X-ray telescope, ex

available. The data were collected from May 1973 until February 1974. In total, approximately 35,000 images of the Sun in soft X-rays were made on 70-mm photographic film by the S-054 X-Ray Spectrographic Telescope. Approximately 10% of these images were digitized by scientists at American Science and Engineering (the instrument's builder), using a microdensitometer. There are data files containing full-Sun images (typically 1,243 x 1,244 pixels or 1,400 x 1,401 pixels), and data files containing selected parts of the full-Sun images, having assorted dimensions. Some of the image files contain results of special investigations, such as energy flux values derived from the film densities. The catalog of available types of images is being compiled.

The VELA5B Cosmic X-Ray data are a position-ordered data set from the all-sky survey conducted by the scintillation X-ray detector in 3 keV to 12 keV.

There are user services available, such as SEND INFORMATION, HOLDINGS, and STATUS. To request help/information on how to submit a data request to ARCHIVES, users can send a mail message to NDADSA::ARCHIVES, and on the subject line type "Send Information." No messages should be entered in the body of the mail message since this is an automated service and no staff will read the message sent.

Users may get information automatically returned via electronic mail on the most current available data holdings of the NDADS ARCHIVES. They can simply type on the subject line the word "HOLDING" and the project data in which they are interested. If no project name is entered, then a general listing of the projects that are currently available is sent.

For data requests to be sent via E-mail and then processed automatically, a mail message should be sent to the NDADSA::ARCHIVES account. The body of the mail message is submitted to the NDADS batch queue with the project and data type taken from part of the subject line.

5. Visual Reproduction Facility

The NSSDC's Visual Reproduction Facility (VRF) continued to upgrade its capabilities in 1991 to provide quality support of photographic and audio-visual needs to the scientific research community. The current hardware inventory has been enhanced with the addition of several new items of equipment. The purchase of a SANDERS Color Enlarger has resulted in the start of a small amount of in-house color enlargement work and allows the duplication and shipment of material within hours. This color equipment and the JOBO color processor have enabled the NSSDC to provide another service to requesters. The Coordinated Data Analysis Workshops (CDAW), NASA Climate Data System (NCDS), Pilot Land Data System (PLDS), Catalog Interoperability Workshop, and Minority University Space Interdisciplinary Network (MU-SPIN) seminars and conferences have required the lab to add a Super-VHS tape recorder. These VHS and U-Matic tapes can be sent to users unable to attend these functions. One of these many tapes of interest is the MAGELLAN VENUS RADAR mapping, developed by the Solar System Visualization Project and Magellan Science team at the Jet Propulsion Laboratory (JPL).

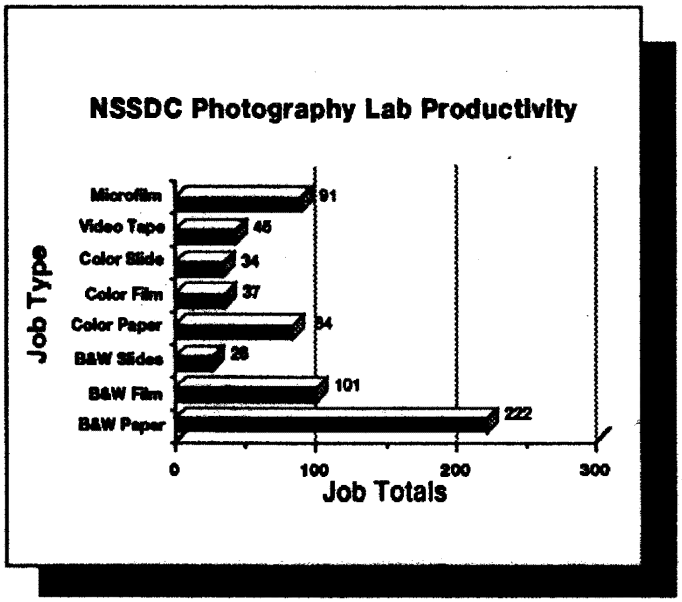

Figure 1. NSSDC Photo Lab Productivity

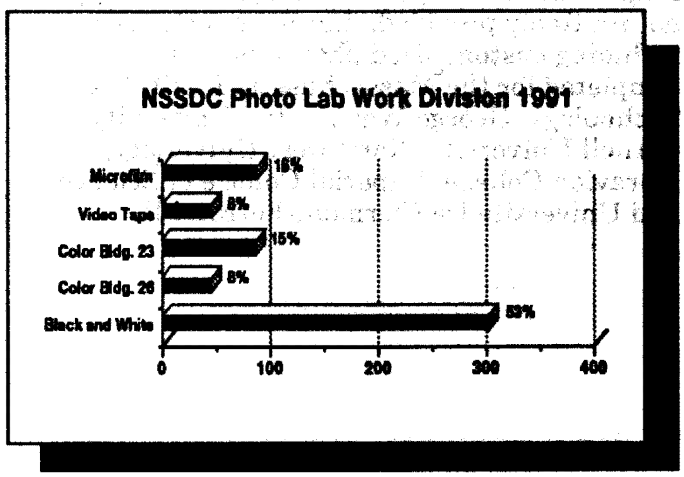

Figure 2. NSSDC Photo Lab Work Division

In maintaining conformance with its mission, the facility has continued to provide a variety of visual formats to the science community. The Apollo, Viking Orbiter and Lander, Voyager I and II, and Magellan data continue to be the most requested missions. In the past year the science community has had a new look at the moon, and this has had the lab working on more LUNAR ORBITER requests. The VRF has been conscientiously striving to sustain its efforts to improve the accessibility of visual data from NASA missions.

The laboratory has handled some very substantial jobs this past year. Some of these were completed for Dr. Brian R. Dennis, head of the Solar Activity Section at Goddard Space Flight Center (GSFC); Ms. Rosemary E. Steinat of the Regional Planetary Image Facility, Center for Earth and Planetary Studies, National Air and Space Museum; Dr. Jouko T. Raitala

of the University of OULU, Department of d; Mr. Kent D. Tergo of the P h Institute, Palo Alto; and . nes of the Los Alamos National Laboratory, Los Alamos. These jobs consisted of large numbers of special-sized prints of a type not routinely provided. Large projects (also luding custom-sized photos) were also pleted for the Massachusetts Institute of hnology, George Washington University, ell University, Northw University, ravion College, Imperial llege of Science, Universite De Clermont-Ferrand II.

The past year has also reflected con nued support for the VRF's school i ms. One student from the Academ Career Experiences (ACE) program and two from the Summer High School Apprenticeship Research Program (SHARP) have been working in the laboratory performing routine tasks assigned by their supervisors. These internships have helped students gain insight into the internal operations of NASA and the laboratory, while the facility simultaneously has benefited from the enthusiastic help of students who some day might be data requesters themselves.

SPACE SCIENCE DATA SYSTEMS

1. Coordinated Data Analysis Workshop (CDAW) Program

The CDAW program is an effort by NSSDC to further the conduct and development of tools and techniques for the conduct of large-scale collaborative scientific research, using simultaneous data from many investigators to attack significant physical problems of global scale that may not be otherwise addressable. The concept originated in the solar-terrestrial community with a need within the International Magnetospheric Study (IMS) program to analyze simultaneous data from a variety of sources to understand better the structure and dynamics of systems like the Earth's magnetosphere.

The CDAW program is distinguished by its combination of a traditional workshop format with assembly of a digital data base where the data and relevant models have been cast into a common format, with supporting software and graphics devices during the workshops to allow participants direct interactive graphic display and data analysis. NSSDC serves as a focus for the organization and logistics of the workshops. The selection of scientific problems and overall planning is the responsibility of the interested science community. Access to the data base between workshop meetings is supported over electronic networks such as NSI/DECnet and NSI/TCP-IP. The CDAW program is one model for how some aspects of the collaborative work to be included in the Inter-Agency Consultative Group (IACG) 1990s initiative in solar-terrestrial science and significant parts of the global science objectives of the Global Geospace Science/International Solar-Terrestrial Physics (GGS/ISTP) program might be carried out.

The current CDAW workshop series (CDAW 9) was initiated with a major meeting at NSSDC in May 1989. The focus of the CDAW 9 analysis is five specific events during the March-June 1986 Polar Regions and Outer Magnetosphere International Study (PROMIS) campaign period. During the PROMIS period, an international effort was made to gather simultaneous solar-terrestrial observations toward the goal of an improved understanding of the relation between polar phenomena and physical processes in the magnetosphere as a whole. The campaign included concurrent imaging of Northern and Southern Hemisphere aurora by the Viking and Dynamics Explorer spacecraft, respectively.

The overall CDAW 9 effort involves over 100 participating scientists from around the world and a data base including 14 spacecraft and numerous ground-station observations. Some 80 distinct data sets (for each of the five CDAW 9 events, in most cases) plus satellite ephemeris data constitute the basic data base. CDAW 9 meetings have been held at Goddard (May 1989, June 1990, June 1991), Stanford University (December 1989), and the Solar-Terrestrial Environment Laboratory (STELAB) of Nagoya University (August 1990). The workshop in Japan was supported by porting and reinstalling the data base on local facilities; the other workshops have been supported by either direct or network access to the data base and software at NSSDC. Access and use of the data base for the primary CDAW 9 analysis period is governed by a set of "Rules of the Road" that establish the requirements to be considered a CDAW 9 participant and for use of the CDAW 9 data in publications.

During the workshops themselves, literally a thousand or more plots have been produced for

either interactive graphics terminal or hard copy display. On-going access to the data continues between workshops. In a number of cases, data have also been interactively extracted from the data base for local manipulation and display by participants. As a recent example at what is now a relatively mature phase of the CDAW 9 analysis, a total of 44 participant sessions to access and use the data base were logged in the three months from November 1990 through January 1991.

A special session on initial results from CDAW 9 was held at the 1990 spring American Geophysical Union (AGU) meeting in Baltimore, Maryland. CDAW 9 results are more comprehensively summarized in papers presented at the International Association of Geomagnetism and Aeronomy (IAGA) meeting held in Vienna, Austria, in August 1991. Some of the still unfolding research deriving from the CDAW 9 effort include

- The relation between ultraviolet auroral images and the ground magnetometer signatures that have been used in the past to imply auroral structure and motions.
- Cross-tail current development, field-line mapping, and substorm onset mechanisms.
- Modeling of the instantaneous distribution of electric fields, horizontal currents, field-aligned currents, and magnetospheric heating.
- Substorm development as seen in dual auroral imaging.

Work also continues on the underlying software system to improve both its functionality and its performance to meet future analysis needs.

2. Satellite Situation Center (SSC) and SPACEWARN (SW)

During 1991, the Satellite Situation Center (SSC) and SPACEWARN (SW) office carried out the following tasks:

- Support the Inter-Agency Consultative Group (IACG) program.
- Support the Solar-Terrestrial Energy Program (STEP).
- Support the International Heliospheric Study (IHS) and the SOLar connection of Transient Interplanetary Processes (SOLTIP) programs.
- Support the International Solar-Terrestrial Physics/Global Geospace Science (ISTP/GGS) program.
- Populate on-line files of orbital elements.
- Carry out commitments to the Committee on Space Research/International Ursigram and World Days Service (COSPAR/IUWDS), and the Consultative Committee for Space Data Systems (CCSDS).
- Miscellaneous.

IACG, STEP, SOLTIP SUPPORT

Operationally, support to IACG was extended through its WG-3 center called the Spacecraft Position Information Network (SPIN), which is creating distributable graphics software that requires ephemeris files from NSSDC/SSC for input. Because SPIN's software is at an evolutionary stage, as a start, planned ephemeris vectors were supplied for the WIND spacecraft at 24-hour and 30-minute resolutions. Special codes were written to reprocess and reformat the GTDS prediction files as needed by SPIN. This on-going effort will address all other IACG spacecraft, at appropriate time resolutions. SPIN was also supplied with the algorithms for plotting modeled magnetospheric boundaries such as bowshock and magnetopause. SSC interacted with the SOHO and CLUSTER center at Rutherford-Appleton Laboratories (U.K.) to assist their effort to initiate a mission-capable center and to assure them of all available information/data related to other spacecraft. Many computed coordinate files and orbital elements pertinent to several IACG spacecraft were loaded in a new DECnet subdirectory, NCF::ANON_DIR:[ACTIVE.IACG]. Many of the files in [ACTIVE.HELIO] are also of interest to IACG. As was requested by the IACG, the models of magnetospheric plasma and the magnetic field in the SSC software were updated and augmented.

All support extended to further IACG activities are, ipso facto, support to the STEP project also. In a series of four articles written for the *U.S. STEP Newsletter* and *STEP International*, the SSC provided tabulations, graphics, and brief descriptive texts pertinent to about 50 spacecraft of interest to STEP. The U.S. STEP Coordination Office was also provided numerous times with ad-hoc information it needed. SSC agreed to present a poster session paper at the STEP symposium (scheduled for August 1992) outlining its resources and services to further the STEP project.

The IHS and SOLTIP programs address heliospheric processes and phenomena. An extensive collection of files providing computed coordinates of all heliospheric spacecraft and time intervals when two or more of them are in radial alignment with the Sun were loaded on line in [ACTIVE.HELIO]. Additionally, two executable codes were written and put on line to enable outputs at desired coordinate systems and time intervals, for the period 1989-2000. Total data in this subdirectory was 40 MBytes, all of which were of direct interest to heliospheric research and some of interest to

IACG and STEP; dozens of special purpose codes were written (in VMS) to create the files and associated graphics. At the request of SOLTIP, several list/graphics outputs w provided for planning and furthering the SOLARMAX campaigns during the year. A condensed version of the on-line data in the HELIO subdirectory was published as NSSDC Report 91-08, containing list and graphics output. An article was published in the *IHS Newsletter* describing NSSDC/SSC's resources for the IHS program.

ISTP/GGS SUPPORT

The ISTP office at Goddard Space Flight Center (GSFC) is evolving a planning center, the Science Planning and Operations Facility (SPOF), to address the operational planning of all dedicated ISTP spacecraft. SSC was intimately involved in the evolution of SPOF. Most of the codes available at the SSC were ported to VMS and UNIX environments and updated by the efforts of a team of programmers at the NSSDC and tested and validated by the SSC before supplying copies to SPOF. These codes enable the SPOF to access SSC's extensive ephemeris data base in SUN 330, totaling 390 MBytes.

USSPACECOM 2-LINE ORBITAL ELEMENTS

Three times a week, SSC has been processing and networking six tapes of USSPACECOM elements (for thousands of orbiting objects) to Johnson Space Center and three of them to two European institutions. The total volume of data in all the tapes for 1991 was over 525 MBytes. In addition, the SSC had been extracting from each tape the orbital elements for a score science spacecraft and putting them on line in the file [ACTIVE]NEW2LINE.ELEM and periodically moving them to OLD2LINE.ELEM. Together these extracted data added up to 0.5 MBytes.

COSPAR/IUWDS AND CCSDS SUPPORT

As a unit of the WDC-A-R&S, which is the designated agency for assigning the International IDs for newly launched spacec raft on behalf of COSPAR/IUWDS, the SPACEW. coARN offi assigned a total of 137 IDs for all the launched payloads. (This assi nt essentially confirmed the IDs designated b the USSPACECOM.) All the assigned IDs were communicated to the COSPAR/IUWDS community via prompt telexes. In addition, each month the SPACEWARN office published a *SPACEWARN Bulletin* containing new launches, brief descriptions of their payload/ orbital parameters, a list of spacecraft with continuous beacons (typically 40), a list of Global Positioning System (GPS) spacecraft (about 15), a list of visually bright spacecraft and rocket bodies (about 100), a list of objects (about 40) that re-entered during the month, and a larger list of spacecraft that were predicted to re-enter during the next 60 days. Information for these were obtained by browsing each month about 400 telexes (not counting duplicative ones) from USSPACECOM and the Foriegn Broadcast Information Service (FBIS) and supplementing the information from other hard copy sources such as NASA/GSFC and Radio Astronomy Explorer (RAE) (U.K.) publications. Each issue was also put on line in [ACTIVE] .SPX and stored cumulatively. The mailing list for the *SPACEWARN Bulletin* had contained 600 names; mainly in view of the availability of on-line electronic files, about 350 of them consented to drop out of the list.

The WDC-A-R&S is the designated agency for assigning packet telemetry IDs for all international agencies that are members of the CCSDS. The assignment is being carried by the SSC/SW office, which assigned a total of 13 IDs.

MISCELLANEOUS

In all there were over 3,327 accesses of files in [ACTIVE] and its subdirectories. Individual requests, totaling over 50, for special computations and graphics were also satisfied; major ones of these were for one-hourly geocentric solar ecliptic/geocentric solar magnetospheric (GSE/GSM) coordinates of IMP 8 from 1973 to 1994 and of IMP 7 from 1972 to 1978, totaling over 40 MBytes.

3. The Astronomical Data Center (ADC)

The Astronomical Data Center (ADC) is part of the National Space Science Data Center/World Data Center A for Rockets and Satellites at NASA Goddard Space Flight Center. The ADC acquires, verifies, formats, documents, and distributes catalogs containing astronomical data in computer-readable form. It also develops and maintains software tools to access these data. The ADC archives currently contain more than 600 catalogs of astrometry, photometry, spectroscopy, radio, and other miscellaneous data for stellar and non-stellar objects. These catalogs were acquired as direct contributions from the international astronomical community, exchanges with the Centre de Donnees Astronomiques de Strasbourg (CDS), and exchanges with other astronomical data centers worldwide.

To date the ADC has distributed more than 8,000 data sets via computer networks, tape, CD-ROM, microfiche, and microfilm to more than 1,500 individual requesters worldwide. The ADC has provided data and/or software to various space astronomy projects, such as the InfraRed Astronomical Satellite (IRAS), the

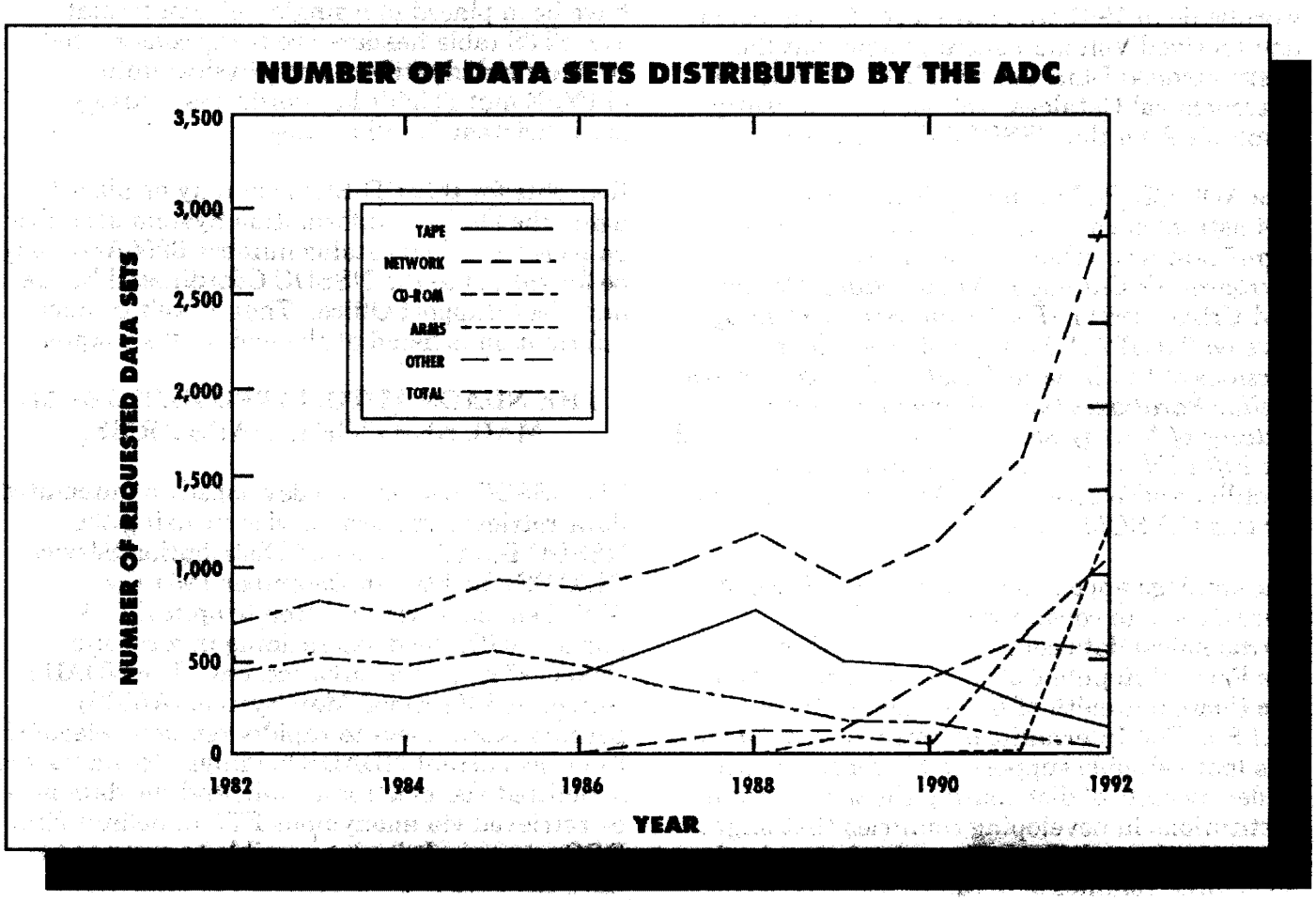

Figure 1. Requests and Number of Data Sets Distributed by the ADC

International Ultraviolet Explorer (IUE), the Hubble Space Telescope (HST), the Cosmic Background Explorer (COBE), the ASTRO 1 Ultraviolet and X-Ray Astronomy Space Shuttle Mission, and the High Energy Astrophysics Science Archive Research Center (HEA-SARC).

During 1991 the dedicated ADC staff handled requests for 597 catalog data sets with an average response time of only 1.5 days for network distribution and six days for tape distribution. This is the result of hard work and dedication to providing the best service possible. Figure 1 (see page 25) shows the number of requested ADC data sets per year broken down by distribution method.

THE ADC CD-ROM, SELECTED ASTRONOMICAL CATALOGS, VOLUME I

Those who aren't among the over 800 astronomers worldwide in 1991 who have already requested and received Volume I should know that the "Astronomical Data Center CD-ROM, Selected Astronomical Catalogs, Volume I" is currently available from the NSSDC/WDC-A-R&S.

The ADC CD-ROM is a two-disk set containing 114 astronomical catalogs, including several significant new releases, such as the *Astrographic Catalog Reference Stars* (Corbin and Urban, 1991); *IRAS Faint Source Catalog, Version 2.0* (IPAC, 1990); and preliminary versions of the *General Catalog of Trigonometric Stellar Parallaxes* (van Altena et al., 1991), the *Catalog of Nearby Stars* (Gliese et al., 1991), and the *Fifth Edition of the Bright Star Catalog* (Hoffliet and Warren, 1991), prepared especially for this CD-ROM release.

The catalogs appearing on the ADC CD-ROM were chosen in consultation with the astronomical data centers in China, France, the Federal Republic of Germany, Japan, and the Commonwealth of Independent States (C.I.S.). The International Astronomical Union has lent valuable support in the form of a grant to defray costs of distributing the data to small institutions in developing countries that might otherwise have difficulty in acquiring and using such large volumes of data.

One disk in the two-disk set contains flat ASCII text file versions of the catalogs, while the other contains most of the same catalogs in the Flexible Image Transport System (FITS) table format. Software is available from the ADC for browsing through the FITS-formatted data sets. The FITS Table Browser can read standard FITS tables and data stored as flat files with separate FITS table extension headers, select fields to display by name, filter records by boolean comparisons of field values, and extract selected fields into text files.

Computer-readable documentation is included with each catalog in the form of printable ASCII text files and, for some catalogs, as LaTeX input files. In preparation for the CD-ROM, all catalogs were inspected and certain fields, such as object names and coordinates, have been reformatted for more homogeneity among data sets. For instance, all Durchmusterung catalog identifiers have been placed in a single uniform format. The FITS table headers are being constructed so that field identifiers and physical units (TTYPE and TUNIT keywords, respectively) are consistent for all catalogs.

Requests for this CD-ROM set may be placed using the On-Line Information System described on page 27 (select catalog number 6906A) or may be forwarded to the NSSDC Coordinated Request and User Support Office. That office's contact information is listed at the end of this chapter.

THE NDADS AUTOMATED RETRIEVAL MAIL SERVICE (NDADS ARMS)

The NSSDC has recently developed an automated data retrieval request service utilizing the NSSDC Data Archive and Distribution Service (NDADS) facility. In December 1991 the ADC-held data were written to optical disk platters with the disks residing in a robotic "jukebox" near-line environment. The NDADS Automated Retrieval Mail System (ARMS) permits researchers to rapidly retrieve selections from the current NDADS holdings. Requests are submitted via electronic mail, and the data may be retrieved via anonymous FTP or default NSI/DECnet copy. It is also possible to arrange to have the data sent directly to the requester's

computer. For more information on ARMS, users can send an electronic mail message as follows:

via NSI/DECnet – Send to

NDADSA::ARCHIVES
Subject: SEND INFORMATION

or via Internet – Send to

ARCHIVES@NDADSA.GSFC.NASA.GOV
Subject: SEND INFORMATION

No information is required in the body of the mail message in order to receive a reply. Please note that this is an automated service. Although the mail is monitored, staff do not normally reply to E-mail sent to ARCHIVES.

THE ADC ON-LINE INFORMATION SYSTEM

The ADC On-Line Information System provides information on all catalogs held at the ADC and

GENERAL INQUIRIES DEALING WITH CATALOG REQUESTS CONTACT:

Requesters WITHIN the United States:

NSSDC Coordinated Request and User Support Office
NASA/Goddard Space Flight Center
Code 633
Greenbelt, MD 20771, U.S.A.

Requesters OUTSIDE the United States:

World Data Center A for Rockets and Satellites
NASA/Goddard Space Flight Center
Code 630.2
Greenbelt, MD 20771, U.S.A.

For all requesters:

Internet: REQUEST@NSSDCA.GSFC.NASA.GOV
NSI/DECnet: NSSDCA::REQUEST
Telephone: (301) 282-6695; FAX: (301) 286-4952

GENERAL INQUIRIES ON ASTRONOMICAL CATALOGS, DATA SUBMISSION, AVAILABILITY, AND THE ADC ON-LINE INFORMATION SYSTEM:

Gail L. Schneider
National Space Science Data Center
Hughes STX
Code 631
NASA Goddard Space Flight Center
Greenbelt, Maryland 20771, U.S.A.
Internet: GAIL@NDADSA.GSFC.NASA.GOV
NSI/DECnet: NDADSA::GAIL
Telephone: (301) 286-8310; FAX: (301) 286-5152

QUESTIONS ABOUT SCIENTIFIC CONTENT OF CATALOGS:

Nancy G. Roman
National Space Science Data Center
Hughes STX
Code 631
NASA Goddard Space Flight Center
Greenbelt, Maryland 20771, U.S.A.
Internet: ROMAN@NSSDCA.GSFC.NASA.GOV
NSI/DECnet: NSSDCA::ROMAN
Telephone: (301) 286-4770; FAX: (301) 286-5152

SUBSCRIPTIONS, QUESTIONS ON CD-ROM DEVELOPMENT, NETWORKING, AND PROBLEM REPORTS FOR THE ADC ON-LINE INFORMATION SYSTEM:

Lee E. Brotzman
National Space Science Data Center
Hughes STX
Code 631
NASA Goddard Space Flight Center
Greenbelt, Maryland 20771, U.S.A.
Internet: BROTZMAN@NDADSA.GSFC.NASA.GOV
NSI/DECnet: NDADSA::BROTZMAN
Telephone: (301) 286-6953; FAX: (301) 286-5152

QUESTIONS CONCERNING NDADS ARMS:

Charleen M. Perry
National Space Science Data Center
Hughes STX
Code 633
NASA Goddard Space Flight Center
Greenbelt, Maryland 20771, U.S.A.
Internet: PERRY@NDADSA.GSFC.NASA.GOV
NSI/DECnet: NDADSA::PERRY
Telephone: (301) 286-2899; FAX: (301) 286-4952

GENERAL QUESTIONS ON CURRENT AND FUTURE ADC SERVICES AND SUPPORT:

Michael E. Van Steenberg
National Space Science Data Center
Code 631
NASA Goddard Space Flight Center
Greenbelt, Maryland 20771, U.S.A.
Internet: MEV@NDADSA.GSFC.NASA.GOV
NSI/DECnet: NDADSA::MEV
Telephone: (301) 286-7876; FAX: (301) 286-5152

Figure 2. ADC Contact and Subscription Information

allows interactive submission of requests. It is built around the *Status Report on Machine-Readable Astronomical Catalogs* and supplemental brief descriptions of the catalogs. The system is maintained under a "captive" account on the NSSDC VAX cluster called the NSSDC On-Line Data and Information Service (NODIS). One may connect to the NODIS account over NSI/DECnet or Internet. To connect through NSI/DECnet, users can execute

SET HOST NSSDCA

To connect through Internet, execute

telnet nssdca.gsfc.nasa.gov or
telnet 128.183.36.23

Once connected, enter "NODIS" in response to the "Username:" prompt; no password is required. NODIS is integrated with the NSSDC Request Activity and Name Directory (RAND). The system will ask for the user's name and check the NSSDC requester data base for a match. If users have never requested data from NSSDC before, they should enter complete information so that any catalog requests registered later will be filled promptly and correctly.

On the NODIS main menu, the Astronomical Data Center is option 10. Once connected to the ADC option, there will be some system messages followed by the opening menu of search options. The on-line system assumes that the user is using a VT100-compatible terminal and emits ANSI escape sequences to clear the screen.

The system has three search options: by ADC (CDS) number, by text search of abbreviated titles, and by text search of keywords. Each of these options is designed to create a list of catalogs meeting the given criteria. Catalogs are then selected from the list and information such as the full title and reference, file format description, comments, and the current distribution status is displayed. Requests can be entered interactively; the system will guide you through giving the information necessary for the ADC staff to fulfill the request.

4. ROSAT Mission Information and Planning System (MIPS)

The ROSAT (Roentgen Satellite, a German X-ray research satellite) project is a cooperative program between the Federal Republic of Germany, the United States, and the United Kingdom. The mission of ROSAT is to advance the science of astrophysics through the study of X-ray emissions from non-solar celestial objects. The study will be performed with an X-ray observatory that initially will survey the sky for X-ray sources and then will point at specific sources for extended periods of time.

The main instrumentation of ROSAT consists of a Wolter type I X-ray telescope with a carousel plane assembly carrying a Position Sensitive Proportional Counter (PSPC) instrument designed and built by the Federal Republic of Germany and a High Resolution Imager (HRI) instrument designed and built by the United States. The X-ray telescope will be supplemented by an extreme ultraviolet (EUV) telescope with a Wide Field Camera (WFC) instrument designed and built by the United Kingdom. The United States launched the

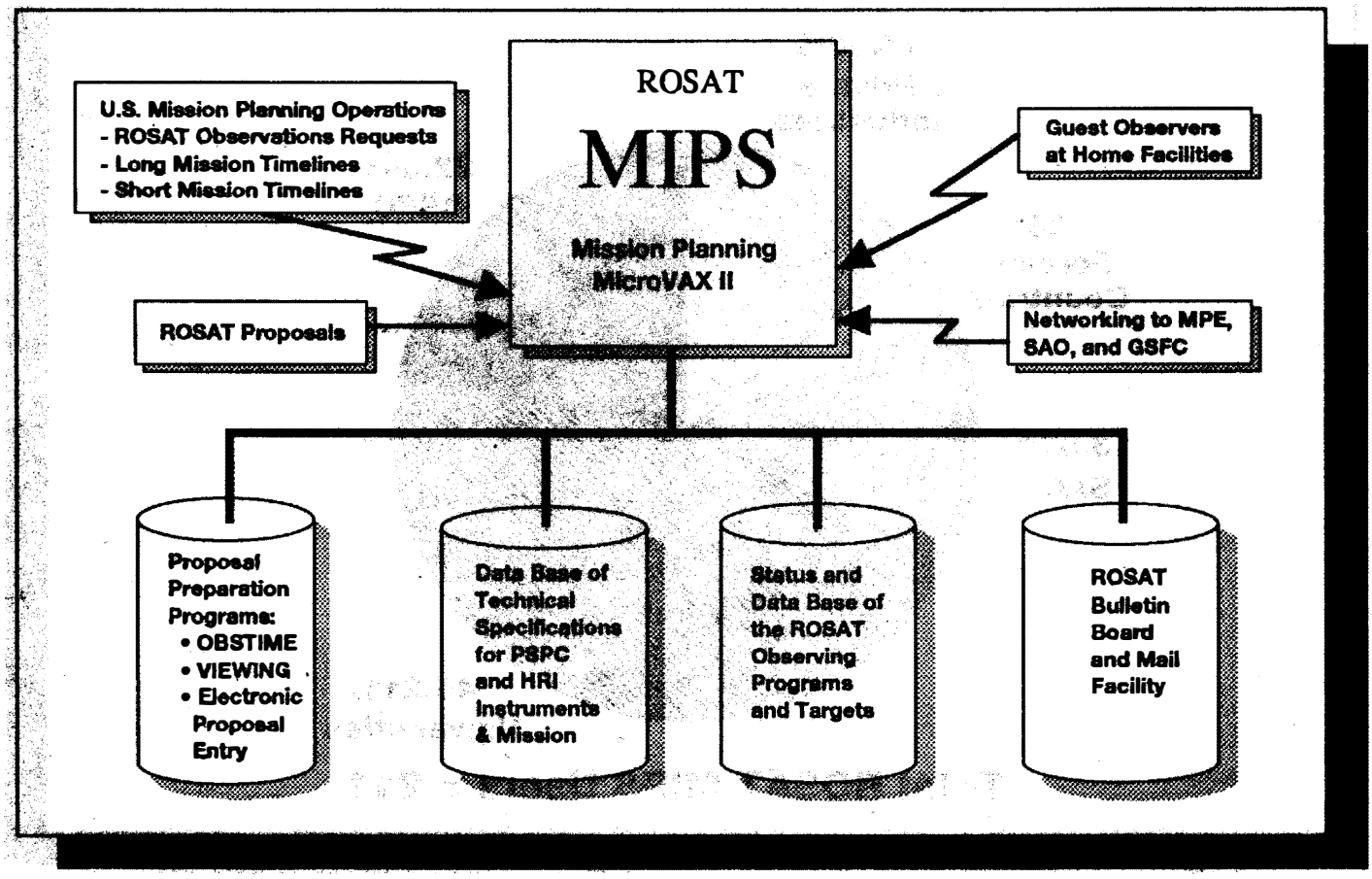

Figure 1. Conceptual View of ROSAT MIPS

ROSAT observatory on a Delta 2 rocket on June 1, 1990. The satellite is in a near-perfect orbit of 584.6 km x 577.8 km and 53.004° inclination.

MISSION PLANNING AND MISSION INFORMATION SUPPORT

The U.S. ROSAT Science Data Center (USRSDC) has been developed to support the U.S. portion of the ROSAT program. One function of the USRSDC is to provide mission information and proposal support to the U.S. investigators, the primary task of which is to assist guest observers in the development of pointed observation proposals for ROSAT. As part of this function, target lists for approved pointed observations by U.S. guest observers are provided to the International Users Committee at the Max Planck Institute (MPE). To effectively carry out this task, there have been many activities performed together by the USRSDC and MPE, such as the creation and maintenance of several data bases and software packages that will support the mission planning tasks and also provide assistance to the guest observer. The mission planning software coordinates and manages incoming requests from NASA-selected guest observers for observing time on ROSAT instruments. It provides all necessary information and reports to NASA Headquarters, to the National User Committee, to MPE, and to guest observers. It directly interfaces with the German mission planning software at MPE. In addition, the mission planning support staff extracts technical information from proposals at the request of U.S. ROSAT proposal review committees and provides other support including evaluating

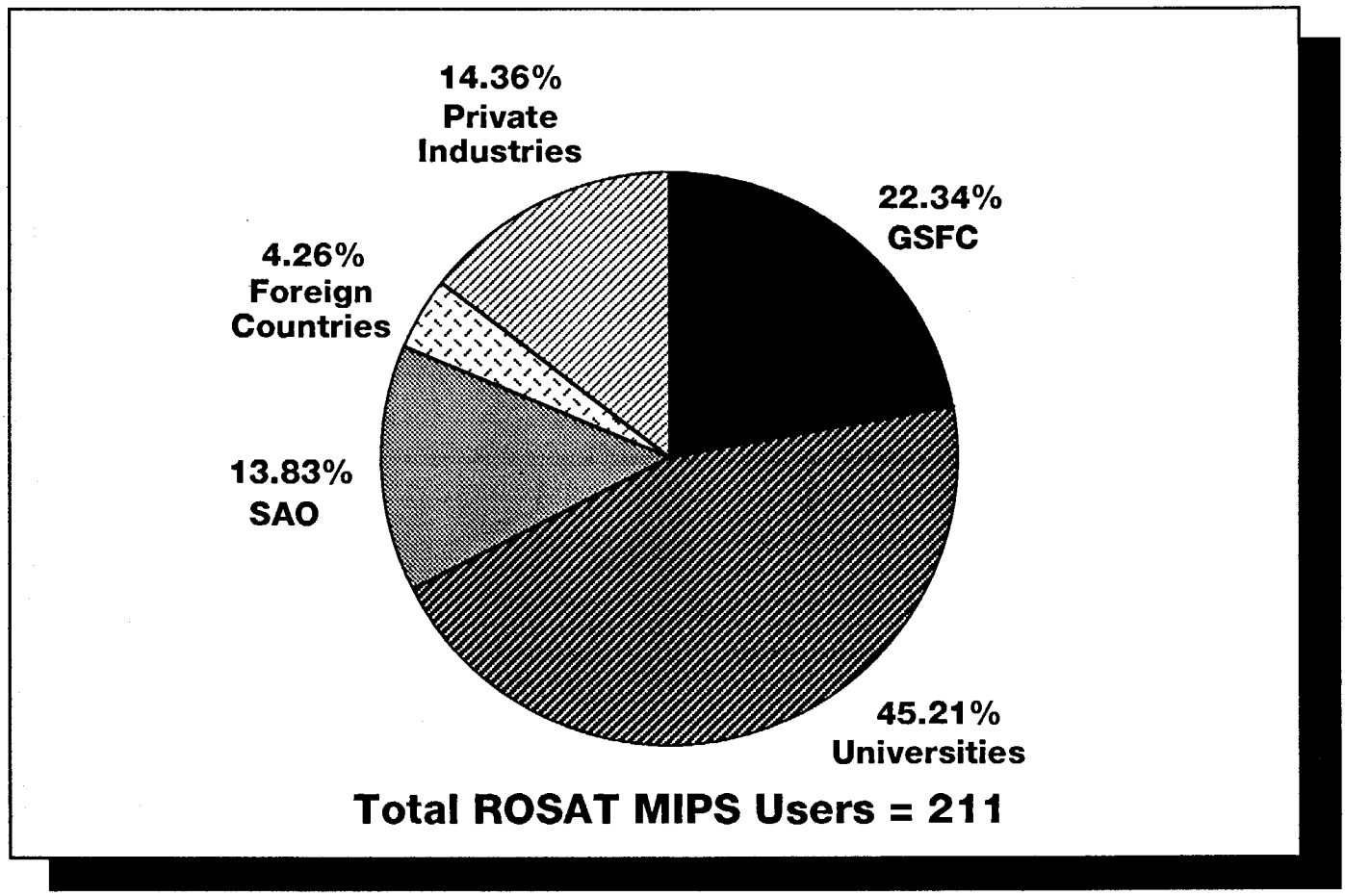

Figure 2. ROSAT MIPS Version Operational at GSFC Profile

targets based on possible observing times and viewing windows. The information and reports are available in an on-line information system for mission planners. Guest observers may interact with the on-line information system in order to acquire data concerning the ROSAT instrumentation and approved ROSAT proposals. The mission planning and mission information support function is provided to the community by the ROSAT Mission Information and Planning System (MIPS).

MIPS is an on-line information retrieval system devised for the USRSDC and its users. MIPS was designed and implemented by the ROSAT Mission Planning Team at the NSSDC. It is a menu-driven system built using the INGRES data base management system (DBMS) and its utilities.

The requirements for MIPS were assessed after collaboration with investigators at the Smithsonian Astrophysical Observatory (SAO) at the onset of the GSFC involvement in the ROSAT project in November 1986. The first version of MIPS went on line in September 1988. The major components of MIPS are seen in Figure 1 (see page 29). MIPS is arranged primarily in a menu-driven system providing the user maximum flexibility despite the disparity of user knowledge and equipment. MIPS resides on a Digital Equipment Corporation (DEC) VAX 4000 running the VMS operating system. It is available to users 24 hours per day, seven days per week. This computer is accessible through the NASA Science Internet networks and is known as the ROSAT node. Access to the MIPS VAX 4000 is also available through the GTE SprintNET system and through direct dial-in telephone lines.

ROSAT Mission Planning covers many aspects of the ROSAT mission including MIPS. Most activity on MIPS centers around the ROSAT proposal cycle. The first NASA Research Announcement (NRA) for ROSAT was distributed in March 1989. Access to MIPS is usually heaviest during the proposal period. Figure 2 (see page 30) shows the relative access to the MIPS system during the three-month proposal periods. Initial access to the MIPS was extremely high, while subsequent access to the system shows a steady usage. Changes requested by users have been incorporated into all subsequent new versions. Copies of the MIPS have also been distributed to and installed at the MPE.

STANDARDS AND TECHNOLOGIES

1. NASA/OSSA Office of Standards and Technology (NOST)

The NASA/OSSA Office of Standards and Technology (NOST) at NSSDC has been established by the Office of Space Science and Applications (OSSA) at NASA Headquarters to serve the space and Earth science communities in evolving cost-effective, interoperable data systems. It has been recognized that research organizations that promote the use of cost-effective standards for their operations will have relatively more resources available to devote to the generation of truly unique and significant advances in science and technology. To this end, NOST performs a number of functions designed to facilitate the recognition, development, adoption, and use of standards by the space and Earth science communities.

NOST is organized into four distinct functional areas, all operating under the guidance of its Executive Board. These areas are known as NOST Administration, the Standards Library, Standards Development, and Standards Conformance and Support. (See Figure 1 below.) The administration operation is concerned with managing the activities of the other three NOST areas, administering the office's policies and procedures, and providing an active interface to other standards organizations within and outside NASA to foster both the exchange of standards information and the development of new standards. The library is concerned with collecting, updating, and disseminating information about existing and emerging

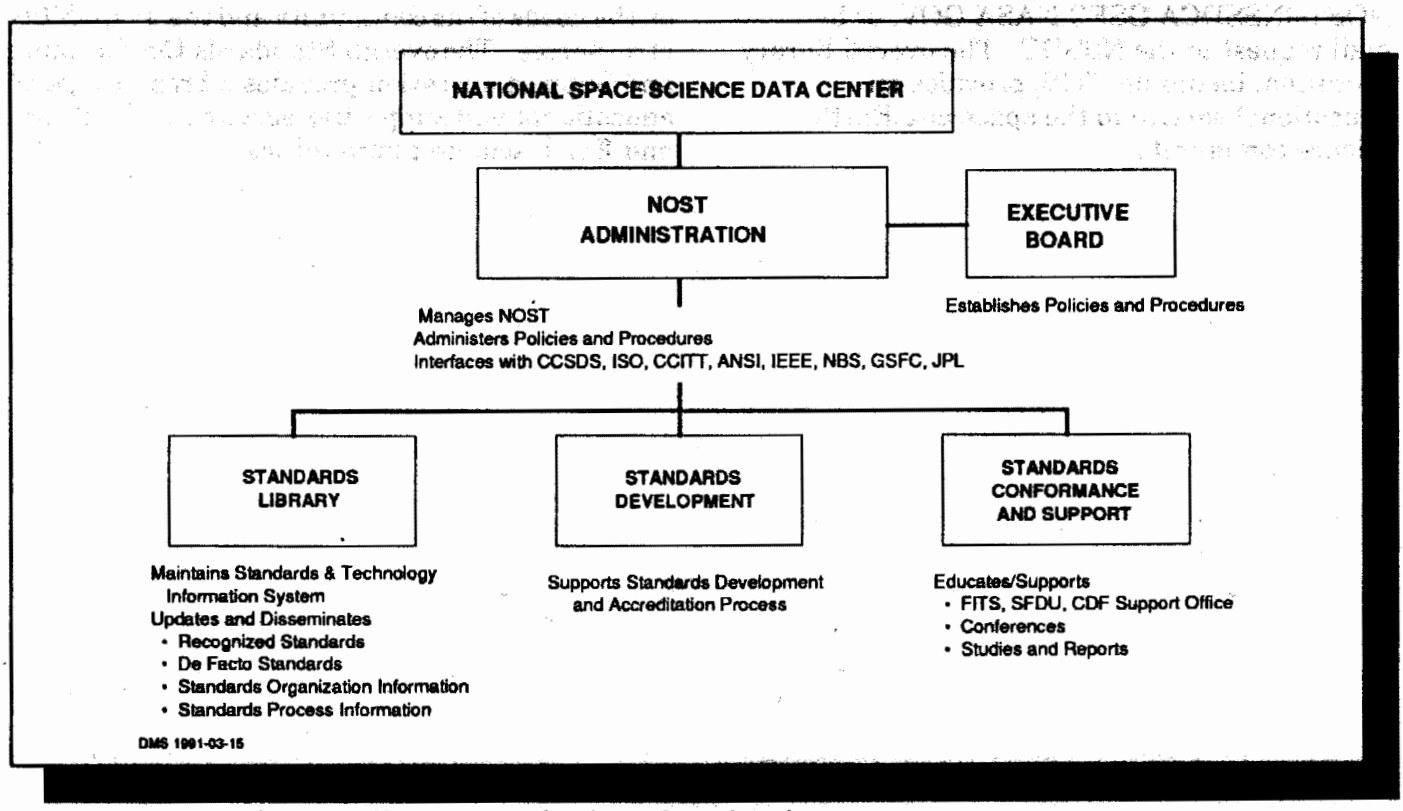

Figure 1. NASA/OSSA Office of Standards and Technology

s. Information on recognized standards (i.e., standards documented by recognized standards organizations such as the International Standards Organization [ISO], American National Standards Institute [ANSI], and the Consultative Committee for Space Data Systems [CCSDS]), and de facto standards (i.e., specifications/systems in wide and stable use) are the primary categories maintained in the library, with each broken into a number of subcategories to facilitate searching and understanding. Other categories include information on the various standards organizations and on the standards creation process. Some standards specifications are available on request, while othe must be obtained from commercial org tions. Requests for standards information may be satisfied through the r and Technology Information System) – an easily used NOST on-line data base and so stem for accessing information on s d technology – electronic mail to the NSSDC account known as NCF::NOST or NOST@NSSDCA.GSFC.NASA.GOV, or by mail request to the NSSDC. The overall library operation, including STIS, provides an educational service to the space and Earth science community.

The Standards Development operation is concerned with the establishment, m aintenance, and use of policies and p rocedures for the development of new standards, the adoption of technical panels to develop standards, the review process through which draft standards must pass, and the logistical ent from NOST. The overall S ds Development operation provides a mechanism for the development and of standards by the space and E communities.

The Standards accreditat operation is conc and emerging standar from providing inform on experience with full support for the standard. available testing and the standa The actual on the needs of the community and the availability of resources. The overall Standards Conformance and Support operation provides a broad range of educational and supportive services to the space and Earth science communities.

2. The Standards and Technology Information System (STIS)

Using standards is an effective and efficient method for controlling time and dollar costs incurred while performing many functions. Data systems developed using standards are often less expensive to develop and maintain. They are easier to understand and more adaptable to changing requirements. The use of widely acknowledged standards results in users' not being dependent on a single vendor and allows users to produce their data systems with less risk. Often the use of standards is mandated by higher authorities or required by contractual agreements.

The Standards and Technology Information System (STIS) is a centralized electronic library that lets users know about available standards. The STIS is supported by the NASA/OSSA Office of Standards and Technology (NOST) and is a tool to help NOST accomplish its mission to facilitate the recognition, development, adoption, and use of standards by the space and Earth science communities. Besides the information on the actual standards and related documents, this library also contains information about emerging technologies where standards may not yet have been developed. This referenced material may have originated from a variety of sources such as books, technical or popular press articles, government or industry reports, and reports created by the NOST staff or NOST technical contributors. NOST encourages individuals within the community who have an interest in a particular standard or new technology area to register as NOST technical contributors. By doing so they agree to provide reports, as new information comes to them, for incorporation into the STIS under their authorship.

The information displayed for these documents includes standards identifiers (e.g., International Standards Organization [ISO] 9660), title, source, publication and copyright data, the names of any identified authors or editors, and the organization responsible for the document. The staff also classifies the documents with topic and content codes, assigns a number of keywords to aid the user in searching for the document and often prepares an abstract or comments on the document. If copyright provisions can be accommodated, the full text of many of the shorter documents is provided. Future implementations of the STIS are planned to include the display of information needed to order copies of documents directly from the source. At all times the NOST may be contacted for ordering information.

The STIS also contains information on the policies and procedures of the NOST. This provides the user with on-line information regarding NOST functions and services.

The STIS is also able to display information on a number of organizations that are active in the standards development field, including information on the areas in which these organizations are working. Contact points within those organizations are provided for users who need further information.

All the information in the STIS is presented through a series of user-friendly menus. Most users find they can use the system without any help or training. Comments and requests to NOST/STIS may be directly entered by users at virtually any point.

The STIS may be accessed through the NSSDC On-Line Data and Information System (NODIS), which is described elsewhere in this document.

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NSSDC ACRONYMS AND ABBREVIATIONS LIST

ADC	Astronomical Data Center
ADS	Astrophysics Data System
AGU	American Geophysical Union
AEM	Atmospheric Explorer Mission
AIAA	American Institute for Aeronautics and Astronautics
ANSI	American National Standards Institute
ARC	Ames Research Center (NASA)
ARPAnet	Advanced Research Projects Agency Network
BITnet	Because It's Time (or There) Network
BMFT	Bundes Ministerium Forschung and Technologie
CCRS	Canadian Centre for Remote Sensing
CCSDS	Consultative Committee for Space Data Systems
CDAW	Coordinated Data Analysis Workshop
CDF	Common Data Format
CD-ROM	Compact Disc-Read Only Memory
CDS	Centre de Donnees de Strasbourg
CEOS_PID	Committee on Earth Observations Satellites Prototype International Directory
CFA	Harvard Smithsonian Center for Astrophysics
CFC	Chlorofluorocarbons
CI	Catalog Interoperability
CIRA	COSPAR International Reference Atmosphere
COADS	Comprehensive Ocean Atmosphere Data Set
CODD	Central On-Line Data Directory
COSPAR	Committee on Space Research
CRRES	Combined Release and Radiation Effects Satellite (joint NASA/USAF mission)
CRUSO	Coordinated Request and User Support Office
CTIO	Cerro Tololo Inter-American Observatory
CZCS	Coastal Zone Color Scanner
DAB	Data Announcement Bulletin
DADS	Data Archive and Distribution System
DADS	Document Availability and Distribution Services
DAN	Data Analysis Network (Canada)
DAVID	Distributed Access View Integrated Data Base
DBMS	Data Base Management System
DEC	Digital Equipment Corporation
DECnet	DEC Networking Products (generic family name)
DIF	Directory Interchange Format
DLR	Deutsches Forschungs Anstaltfuer Luft und Raumfahrt
DSUWG	Data Systems Users Working Group
ECMWF	European Center for Midrange Weather Forecasting
EDC	EOS Data Center
E-HEPnet	European High Energy Physics Network
ELSET	Element Set
EOS	Earth Observing System
EOSDIS	EOS Project Data and Information System
ERB	Nimbus 7 Earth Radiation Budget Instrument
ERBE	Nimbus 7 Earth Radiation Budget Satellite

ERBF	Earth Resources Browse Facility
ERBS	Nimbus 7 Earth Radiation Budget Instrument
EROS	Earth Resources Observation System
ESA	European Space Agency
ESDD	USGS Earth Science Data Directory
ESO	European Southern Observatory
ESOC	European Space Observation Centre
E-SPAN	SPAN in Europe
EUROHEPnet	European High Energy Physics Network
EUV	Extreme Ultraviolet
EXOSAT	European X-Ray Observations Satellite (ESA)
FBIS	Foreign Broadcast Information Service
FGGE	First GARP Global Experiment
FIFE	First ISLSCP Field Experiment
FIRE	First ISCCP Regional Experiment
FNOC	U.S. Navy's First Numerical Oceanography Center
FRG	Federal Republic of Germany
FTP	ANONYMOUS File Transfer Protocol
GARP	Global Atmospheric Research Program
GCMD	Global Change Master Directory
GGS	Global Geospace Science
GIS	Geographic Information System
GOES	Geostationary Operational Environmental Satellite (NASA-NOAA)
GPS	Global Positioning System
GSFC	Goddard Space Flight Center
HEPnet	High Energy Physics Network (also known as PHYSnet)
HRI	High Resolution Interferometer
IACG	Inter-Agency Consultative Group
IAGA	International Association of Geomagnetism and Aeronomy
ICE	International Cometary Explorer
ICSU	International Council of Scientific Unions
IDL	Interactive Data Language
IDM	Intelligent Data Management
IGRF	International Geomagnetic Reference Field
IIFS	Intelligent Information Fusion System
IMP	Interplanetary Monitoring Platform
IMS	International Magnetospheric Study; Ion Mass Spectrometer
IRAP	ISLSCP Retrospective Analysis Project
IRAS	Infrared Astronomical Satellite (The Netherlands-NASA-U.K.)
IRI	International Reference Ionosphere
ISCCP	International Satellite Cloud Climatology Project
ISLSCP	International Satellite Land Surface Climatology Program
ISO	Information Systems Office
ISO	International Standards Organization
ISTP	International Solar-Terrestrial Physics
IUE	International Ultraviolet Explorer (satellite, NASA-U.K.-ESA)
IUI	Intelligent User Interface

IUWDS	International URSIGRAM and World Days Service
JIMS	CYGNET's Jukebox Interface Management System
JPL	Jet Propulsion Laboratory (NASA)
JSC	Johnson Space Center (NASA)
KSC	Kennedy Space Center (NASA)
LAS	Land Analysis Software
LAS	Land Analysis System
LAS 4	Level of Archive Services 4
LLR	Lunar Laser Ranging
Magsat	Magnetic Field Satellite
MD	Master Directory NASA
MIDAS	Munich Image Data Analysis System
MIPS	Mission and Information Planning System
MIT	Massachusetts Institute of Technology
MPE	Max Planck Institute (FRG)
MPP	Massively Parallel Processor
MSFC	Marshall Space Flight Center (NASA)
MSIS	Mass Spectrometer Incoherent Scatter (atmosphere model)
NACS	Network Assisted Coordinated Science
NASA	National Aeronautics and Space Administration
NCDS	NASA's Climate Data System (formerly PCDS)
NCF	NSSDC Computer Facility
NCS	Network Computing System
NDADS	NSSDC Data Archive and Distribution System
NESDD	NOAA Earth System Data Directory
NGS	NSSDC Graphics System
NIC	Network Information Center
NLQP	Natural Language Query Processor
NOAA	National Oceanographic and Atmospheric Administration
NODIS	NSSDC On-Line Data and Information Services
NODS	NASA Ocean Data Systems
NORAD	North American Air Defense Command
NOST	NASA/OSSA Office of Standards and Technology
NPSS	NASA Packet Switched System
NRAO	National Radio Astronomy Observatory
NSDSSO	NASA Science Data Systems Standards Office
NSF	National Science Foundation
NSI	NASA Science Internet
NSN	NASA Science Network
NSSDC	National Space Science Data Center (NASA)
ORACLE	Relational Data Base Management System
OSSA	Office of Space Science and Applications
PCDS	Pilot Climate Data System
PDS	Planetary Data Systems

PHYSnet	High Energy Physics Network (also known as HEPnet)
PI	Principal Investigator
PIMS	Personnel Information Management System
PRA	Planetary Radio Astronomy
PROMIS	Polar Regions Outer Magnetosphere International Study
PSCN	Program Support Communications Network
PSN	Packet Switched Network
PSPC	Position Sensitive Proportional Counter
RAND	Request Activity and Name Directory
RAPSE	Report on Active and Planned Spacecraft and Experiments
RINEX	Receiver INdependent EXchange
ROR	ROSAT Observation Request
ROSAT	Roentgen Satellite (German X-ray research satellite)
SAO	Smithsonian Astrophysical Observatory (Smithsonian Institute)
SBP	Sedimentary Basins Project
SDSD	NOAA's Satellite Data Services Division
SEASAT	Sea Satellite (NASA)
SERC	Science and Engineering Research Council
SIMBAD	Set of Identifications, Measurements, and Bibliography for Astronomical Data
SLR	Satellite Laser Ranging
SMM	Solar Maximum Mission
SOAR	Software for Optical Archival and Retrieval
SPACEWARN	World Warning Agency for Satellites
SPAN	Space Physics Analysis Network
SPAN_NIC	SPAN Network Information Center
SQL	Standard Query Language
SSC	Satellite Situation Center
SSL	Space Science Laboratory
STARCAT	Space Telescope Archive and Catalog
STE LAB	Solar-Terrestrial Environment Laboratory
ST-DADS	Space Telescope Data Archive and Distribution Services
ST/ECF	Space Telescope/European Coordinating Facility
STIS	Standards and Technology Information System
STP	Solar-Terrestrial Physics
TAE	Transportable Applications Executive
TCP/IP	Transmission Control Protocol/Internet Protocol
Telenet	Public packet switched network owned by General Telephone and Electric
THEnet	Texas Higher Education Network
TMO	Table Mountain Observatory
TOMS	Total Ozone Mapping Spectrometer
UARS	Upper Atmosphere Research Satellite (NASA)
U.K.	United Kingdom
UNEP/GRID	United Nations Environmental Programme/Global Resources Information Data Base
ULDA	Uniform Low Dispersion Archive
URSI	International Union of Radio Science
USAF	United States Air Force
USGS	United States Geological Survey

US-HEPnet	U.S. High Energy Physics Network
USRSDC	U.S. ROSAT Science Data Center
US-SPAN	SPAN in the U.S.
VAX	Virtual Address Extension (DEC minicomputer)
VICAR	Video Image Communication and Retrieval
VLBI	Very Long Baseline Interferometry
VOD	Virtual Optical Disk
VRF	Visual Reproduction Facility
WAN	Wide Area Network
WDC-A-R&S	World Data Center A for Rockets and Satellites
WFC	Wide Field Camera
WORM	Write-Once, Read-Many
WWAS	World Warning Agency for Satellites