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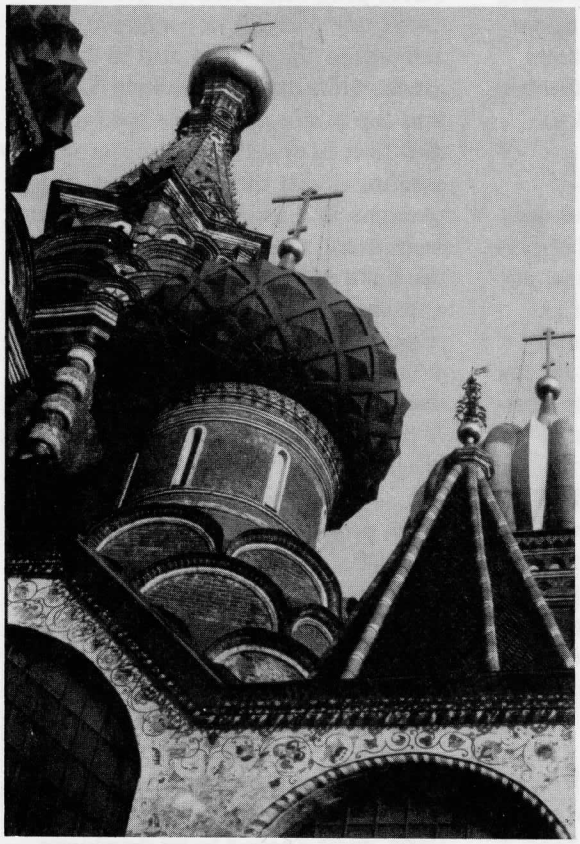
Master Directory Reaches Around the World



St. Basil's Cathedral towers over Red Square in Moscow where scientists met with the Soviet Geophysical Committee regarding the international data directory.

You have perhaps heard about the NASA Master Directory (MD) to Earth and space science data in previous issues of the *NSSDC News*. Did you realize this directory is only one node of an interconnected directory system spanning the world?

The multiple-line diagram on page six illustrates the present directory system and what is planned for the near future. The bold print indicates directory sites already in existence. Most of the other sites shown will be in operation in less than a year.

How did the far corners of the world, such as Japan, the U.S.S.R., and Africa, all become involved in the simple concept of a directory to data? The answer is that useful data are being compiled in many different places, and these data are often useful to other scientists who may be far away. The study of global problems can be greatly facilitated by knowing what data already exist and who has them. The improvement in computer networking capabilities has made it possible to make this information available in a timely and efficient manner.

The directory system is intended as a free service to the worldwide science community. It enables rapid and efficient access to up-to-date information on useful and accessible Earth and space science data sets. In addition, several of the nodes offer automated network links to other data information systems, which in turn provide more detailed information and other data services. A single directory node could provide these services, however. Why should there be more than one?

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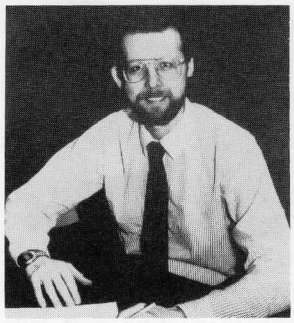

Message from the Director

A Tribute to Stan Shawhan

To many of us, Dr. Stanley Dean Shawhan was far more than the head of our Space Physics Division at NASA Headquarters. He was our colleague, our mentor, and our friend– a role model to follow and emulate. Stan died suddenly of a heart attack at his home on June 21, 1990.

The first time I met Stan was at the University of Iowa where he was teaching a radio astronomy course, which I took in my first graduate school year. Stan was one of the best teachers in the Physics and Astronomy Department and I thoroughly enjoyed all his courses. Dr. Don Gurnett was my thesis advisor, but he was slated to go on a sabbatical for a couple of years and asked me if I would mind switching advisors to Stan. I was delighted and in a very short time Stan became a great friend. Together we worked on ray tracing of Auroral Kilometric Radiation and with Stan's guidance, I began to appreciate the importance of theoretical modeling in addition to data analysis.

I graduated in 1979 at the University of Iowa, and Stan was there when I was thinking of new job opportunities. Dr. Rick Chappell at Marshall Space Flight Center (MSFC) contacted me, as recommended by Stan, and within a few months I had a civil servant position at MSFC. It was in 1980, while I was at MSFC, that the Space Physics Analysis Network or SPAN began. SPAN was a grass roots effort for which funding was very difficult to obtain and an adequate level never possible. Not very many people know that in 1984 SPAN was literally going under. The person who came to the rescue was Stan. He had just gone to NASA Headquarters and through his guidance and negotiating skills, he was able to reach an agreement with the Information Systems Office to contribute a share of funding for SPAN operations from FY84 to FY86.

In 1985, I was still at MSFC and was looking for new challenges and opportunities. I had applied for several positions and received a couple of exceptional job offers all at the same time. Once again I asked Stan for his advice. He urged me to take the position as the Head of the National Space Science Data Center; as always, his logic as to *why* was flawless, and here I am. Not only was he a great source of input to me in establishing my career, but he has laid the foundation for new NASA missions and programs for the whole space physics community in much the same way.

Right after Stan went to NASA Headquarters in 1983, I asked him why he made that decision. Stan said that he knew he would not live past his 50s (he was diabetic) and that he wanted to do something for the whole space physics community. That is what Stan set out to do, and that is exactly what he did! Stan gave his all for the space science community. He did so willingly and unselfishly. His dedication and devotion were unwavering and his energy seemed boundless and his enthusiasm contagious. His loss is felt all across the space physics community.

One NASA program on which he worked especially hard was the International Solar-Terrestrial Physics (ISTP) program. This program was extremely difficult to construct and sell within the agency and to Congress. How do you convince NASA and the public that they need to fly a new fleet of spacecraft simultaneously orbiting about the Earth measuring plasmas and waves, when NASA has been doing this type of science since the birth of the space program? The approach Stan took was to provide opportunities for the community to define the science and mission objectives. With his unique understanding of physics, Stan worked on selling the program on its own scientific merit.

From program definition to new start for ISTP, Stan was faced with hurdles and roadblocks too numerous to mention. With his can-do attitude, Stan would continue to rework the program keeping the scientific objectives in mind but finding new ways of implementation until he had a winning combination. Stan had the unusual ability to see where existing pieces fit, what needed to be developed, and how to put these elements together to make a program. Working on a bilateral basis with the Japanese at the Institute of Space and Astronautical Science (ISAS), Stan successfully added their Geotail spacecraft as an important element of the ISTP program.

Even after the successful new starts for the POLAR, WIND, SOHO/Cluster, CRRES, and Geotail spacecraft mis-

see Director's Message, *p. 8*

CEOS Catalog Subgroup Determines Specifications for Planned PID System

The Fifth Catalog Subgroup (CS) Meeting of the Committee on Earth Observation Satellites Working Group on Data (CEOS WGD) was held at Goddard Space Flight Center on March 21-23. CEOS is an international group composed of members or agencies concerned with satellite remote sensing of the Earth. This includes several U.S. federal agencies as well as a number of international space agencies.

The Catalog Subgroup addresses the technical issues of creating interoperable directories, catalogs, and inventories to international data bases of remote sensing data. The recommendations from this group are passed to the Working Group on Data and from it to the CEOS principals, who have the authority to implement such recommendations. The CS has chosen to establish prototype projects in the areas of directories and inventories to demonstrate and evaluate interoperable data information systems.

At previous CS meetings, it was decided that the group would try to establish an interconnected system of Prototype International Directories (PIDs) that the science community would be requested to use and evaluate as a means of identifying and locating useful data for research.

Three sites were initially proposed as the locations for major PID nodes. These proposed sites are at NASA/GSFC; at the European Space Agency (ESA) offices in Frascati, Italy; and at the National Space Development Agency (NASDA) of Japan's Space Center in Tsukuba, Japan. One additional site at the Canadian Center for Remote Sensing (CCRS) in Ottawa, Canada, may be added if it appears feasible.

CEOS workshop participants sitting at the table include (left to right) Luigi Fusco, Mark Elkington, Jim Thieman, Betty Howard, Bill Callicott (Chairman), Richard Chinman, and George Milkowski; other workshop attendees look on and listen.

The PID nodes would use the NASA Master Directory software, which has been in operation at NSSDC for over a year. Copies of the software have been installed already at ESA offices and installation in Japan will take place very soon. ESA announced that it had received funding for a MicroVAX to hold the PID and for personnel to manage and expand the data base, as well as to maintain the software. This was implemented in May of 1990.

NASDA requested that a copy of the software be installed on a VAXSTATION at Tsukuba Space Center for an evaluation period probably beginning in June. If at the end of the evaluation period the agency wishes to continue with the plan, it will proceed to set up a permanent node similar to the ESA node.

The PID nodes would be interconnected via computer networks. This is already possible since network lines between the nodes now exist. At the CS meeting it was again agreed that the nodes should be identical in software and data base content. Each of the nodes, however, may offer different selections of data systems to which automated network links would be possible from the directory.

The CS group also recommended that the full range of science discipline data now available in the directory data base, including the space as well as the Earth sciences (astronomy/astrophysics, space physics, etc.), be made available at each of the PID nodes. Evaluations of each of the PID nodes by a multi-disciplinary science community should take place soon.

George Milkowski (University of Rhode Island) presented a draft pro-

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MD Reaches Around the World, *from p. 1*

Hase Kannon Temple in Kamakura; CEOS members visited Tokyo to discuss global data information system.

Accessing a single directory from a remote corner of the world is still an expensive process. Often the performance of a long-distance link is not good. Until network costs go down and reliable worldwide performance is assured, it makes sense to have directories located near their users.

To the question of how to bring the directory closer to users, Personal Computer (PC) copies of the directory seem to be the logical answer. Indeed, PC versions of the MD will be available within a year. On the other hand, PC directories will not be as up-to-date as the on-line directories, and they will not provide the immediate links to other data information systems.

One other important factor makes local directories important. Often these directories are used for local data management purposes to keep track of an archive's data sets. Data set descriptions that are placed in this local directory can then be passed to the other nodes, and the whole system benefits as a result. Some of the directories are oriented to serving the particular needs of an organization or user community. The NOAA Earth Sciences Data Directory is an example.

The Directory Interchange Format (DIF) is the standard form used to describe data set information and to pass the information among the interconnected directories. Any directory agreeing to use this standard can thus become a part of the network regardless of the software it uses. For further information on the DIF, request the *Directory Interchange Format Manual* from NSSDC. Version 3 of the manual will be published shortly.

Directories need only agree to have the DIF in common, but, in fact, all of the nodes in the diagram except the one at USGS in Reston use the same software. In most cases the places that needed directories did not already have one and were happy to use the software that NASA provided in exchange for an agreement that their data set information would be made available to all of the directories.

So, for example, a directory to be installed soon at the office of the United Nations Environmental Programme/

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posal for an international AVHRR inventory exchange format. As presented, the exchange format would provide the means for large data center archives to exchange information on their holdings. However, much of the subsequent discussion of the proposal by the Catalog Subgroup revolved around the need to clarify the intended use of the exchange format.

Some group members recommended that the exchange format, in addition to satisfying large data center needs, should also supply information that will support end user needs. As originally designed, the exchange format was to be as simple as possible with a set of required fields that would uniquely identify the record of a satellite pass in a global AVHRR inventory. These fields included the following:

Satellite Identification
(e.g., Nimbus 7)
Sensor (e.g., AVHRR)
Data Mode (e.g., HRPT)
Acquisition Date
Start Time
End Time
Archive Identification
(e.g., NOAA/NESDIS)
Data Level (e.g., level 1b)

Some of the group members recommended that the additional fields of equator crossing longitude and equator crossing time be added to the required fields list. It was felt that the inclusion of these fields was important in enabling an end user (who very likely might not have access to ephemeris data) to calculate the **aeriel** coverage of a satellite pass.

The difference in these prospective uses of the exchange format was felt to be fundamental, and the group discussion did not resolve this issue. As a result, the task of defining an exchange format was transferred to the AVHRR work plan for further development.

Another topic of the meeting was a guidelines document for future plans for interoperability. This is being put together with input from a number of the members. The document will serve as a blueprint for future work by the committee.

The next meeting is planned for September 12-14, 1990, at the USGS EROS Data Center in Sioux Falls, South Dakota.

Acknowledgment – The authors would like to acknowledge the interaction of Sam Skotchdoppel in the preparation of this article.

Richard Chinman
George Milkowski
James Thieman

NSSDC Demonstrates Master Directory at IGARSS and AGU Meetings

Booths were set up for demonstration of the Master Directory at the International Geoscience and Remote Sensing Symposium (IGARSS), held May 20–24 in College Park, Maryland, and at the American Geophysical Union (AGU) meeting, on May 29–June 1 in Baltimore, Maryland.

Directory staff in attendance at both meetings were Dr. Joy Beier (Earth Science Coordinator), Dr. Paul Kuin (Astrophysics Science Coordinator), Dr. David Irvine (Ocean Science Coordinator), John Scialdone (Atmospheric Science Coordinator), and Janis Shipe (Data Management Specialist).

The IGARSS booth was specifically oriented to the Master Directory and NSSDC. Information about the data center and Master Directory was distributed, and a laptop PC was connected for use in live demonstrations.

At AGU the booth was shared with NASA Science Internet (NSI) and included five network-connected terminals available for the use of meeting attendees. Many scientists took advantage of the terminals set up to read their e-mail, and this led to inquiries pertaining to NSSDC and the Master Directory.

Demonstrations were given on the functionality of the Master Directory, resulting in 125 potential users signing up to receive *NSSDC News* and Master Directory information. Technical contacts were made by all the discipline coordinators through participation in many of the technical sessions.

New data sets for the Master Directory have been identified, and more potential data sets are possible. Participation in these two conferences has significantly increased the public awareness and the value of the Master Directory to the scientific user community. Special thanks go to GSFC's Dr. Vincent Salomonson for helping to make the IGARSS booth possible.

John Scialdone and James Thieman

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Global Resource Information Database (UNEP/GRID) in Geneva, Switzerland, would provide information about its data holdings and will also serve as the directory for the coming International Geosphere-Biosphere Program. UNEP/GRID has additional associated sites in Nairobi, Kenya, Bangkok, Thailand, and at the USGS EROS Data Center in Sioux Falls, South Dakota. These sites will probably also have copies of the directory software.

Dr. Jim Thieman of the NSSDC (seated at center) recently met with NASDA members Toshiyuki Fukuda (seated at right) and (standing, left to right) Hidetaka Morita, Shin-Ichi Sobue, Kazuo Yoshida, Tetsuni Iijima.

In the U.S. the federal agencies have been working together to create a directory to data global change under the auspices of the Interagency Working Group on Data Management for Global Change (IWGDMGC). This Global Change Master Directory (GCMD) is managed by the NSSDC. Other federally-related directories such as the NOAA Earth Science Data Directory and the NCAR/NOAA/NASA STORM data management project will pass data information to the GCMD. Other agencies simply create DIF files describing their data holdings and submit them to the GCMD for entry. Staff at the NSSDC are responsible for reviewing the entries for technical content and overall consistency with other entries.

The international Committee on Earth Observation Satellites (CEOS) has promoted the establishment of Prototype International Directory (PID) nodes at the European Space Agency (ESA) offices in Frascati, Italy; at the National Space Development Agency (NASDA) of Japan offices near Tokyo; and at the NSSDC. Another

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node is planned soon at the Canadian Centre for Remote Sensing (CCRS) in Ottawa. Local data management nodes such as the ones at the Earth Observation Data Center (EODC) in the United Kingdom and at the Deutsche Forschungsanstalt fuer Luft und Raumfahrt (DLR) near Munich, Germany, would feed information into the ESA PID node and from there throughout the world.

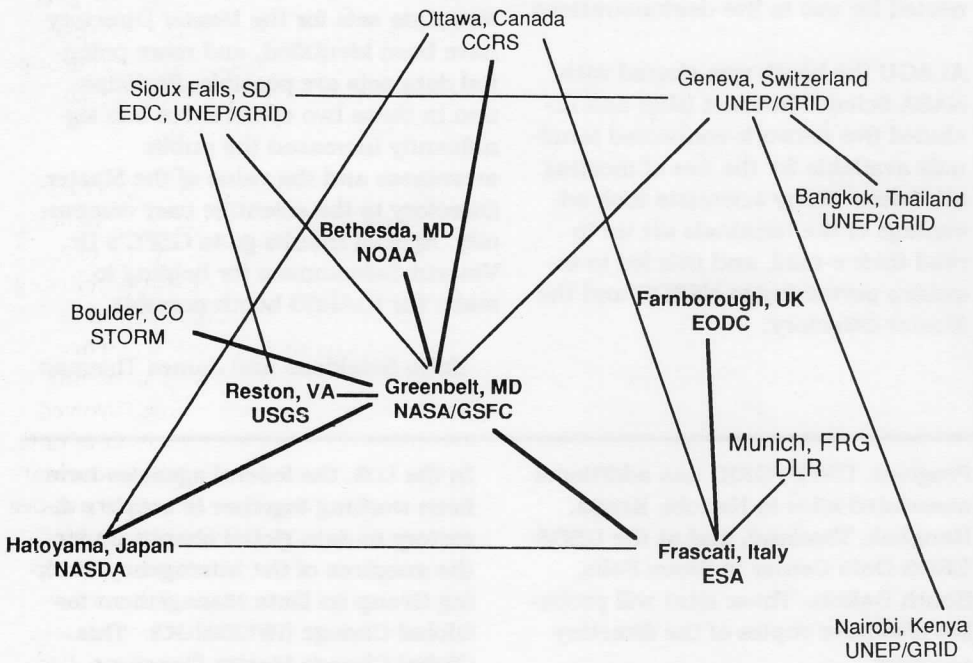
It should be mentioned that, although several groups sponsor directories at NSSDC, at this point the MD, NASA Master Directory (NMD), GCMD, and CEOS PID node all share one and the same data base. It may be that in the future these directories will diverge from each other to meet the needs of their particular user community.

Even those countries not having a directory node are participating by supplying information on their data in the DIF form. The World Data Center system is advocating this approach. Recent discussions with the Soviet Geophysical Committee/World Data Center A in Moscow have resulted in an agreement to do this. Plans are well underway to provide access for the Soviet InterKosmos Institute (IKI) to a separate copy of the directory at NSSDC in exchange for information about IKI data holdings.

Although the system sounds complex, it is already operational and the MD staff believes it will provide an ever more valuable service to the community. The MD staff continues to be amazed at the enthusiasm and cooperation occurring all around the world. Apparently there is widespread recognition that the time for such a directory system is now!

James Thieman

INTERCONNECTED DIRECTORY SYSTEM



Pathfinder EOSDIS Workshop Provides Introduction to Data Resources

As part of a cooperative study with Simpson Weather Associates, the University of Virginia, and Langley Research Center, NSSDC hosted a Pathfinder Earth Observing System Data and Information System (EOSDIS) Workshop on July 9 and 10.

The purpose of the workshop was to introduce the team of investigators to existing data systems supporting Earth science data that they might use in their ongoing research programs. Ten data systems, including NSSDC's Master Directory, NASA Climate Data System (NCDS), and Pilot Land Data System (PLDS), were demonstrated to the 28 participants.

In addition, the NCDS staff trained themselves on a number of external Earth science data systems to provide a more representative view of existing systems for the investigators' review. Following the demonstrations, the participants gave a brief summary of their individual research projects, concentrating on data requirements.

During the remainder of the workshop, investigators were given the opportunity to use the data systems directly. Terminals were set up for individual, hands-on sessions, and the NSSDC Data Systems Support Staff was available to provide assistance.

The ultimate goal of the study is to construct a set of users' data system requirements that can be incorporated into the EOSDIS Phase C/D (final design and implementation) Specification, based on the evaluation of existing systems.

see Pathfinder EOSDIS Workshop, *p. 10*

New Managers Join NSSDC's Science Group and Publications Department

Dr. Richard Tighe manages NSSDC's Science group.

Among the many new faces seen at the data center during the past several months, two individuals have been assigned to particularly significant posts at NSSDC.

Dr. Richard ("Dick") Tighe joined the NSSDC staff this past April as the new SAR Science Group Manager. In this position, he assumes substantial responsibilities including the direction of 20 scientists and 14 computer professionals, reflecting the data center's multiplicity of scientific disciplines. Dr. Tighe's first exposure to NASA and the space program occurred nearly 15 years ago when he worked as a Systems Analyst at the check-out stage in Firing Room One at the Kennedy Space Center in Florida for the first Space Shuttle flight. At that time he was employed by Computer Sciences Corporation, which later transferred him to the Goddard Space Flight Center where he then went to work in the Network Control Center as a Programmer Analyst. Just prior to his coming to NSSDC, Dr. Tighe, whose Ph.D. is in physics specializing in theoretical plasma spectroscopy, served with STX Corporation for five years as the Project Manager on an FAA program to provide an air traffic control system to supervise transoceanic air traffic.

At NSSDC, Dr. Tighe comments that he especially enjoys the challenge of working to meet the rapid expansion of technology occurring in relation to the archiving of space and Earth sciences data. "The growth in technology is very exciting for me to watch," he says. When asked what aspects of the NSSDC project impressed him the most, Tighe replied, "I'm impressed with the way the people here work together as a team, and with the collective knowledge and skill that they display.... The commitment of some individuals that I've observed to NSSDC is overwhelming. When you put together that talent with that commitment," Tighe concluded, "it's got to be a great combination."

Leonard ("Len") Blasso joined SAR Corporation on the NSSDC project last October as the head of Publications. His previous experience encompasses a variety of technical writing and editing assignments spanning several disciplines and numerous science and technology-oriented corporations. Blasso has also spent some time as a scientific trade journal editor and as a part-time newspaper reporter.

Blasso's technical writing career began right after graduation from the City College of New York in 1970, when he accepted a position as Assistant Engineer, writing installation specifications for the New York Telephone Company. From then until now, with an interruption to perform military service in the 1970s and some time out to obtain a certificate in data processing in the early 1980s, Blasso's 14-year career has taken him through positions with organizations including Bell Laboratories and Computer Sciences Corporation; most recently, Blasso served as Senior Writer/Editor with Martin Marietta's Aero and Naval Systems Division in Baltimore, with the independent research and development group where he supported several Department of Defense projects.

Like Dr. Tighe, Blasso has also been enjoying meeting the various challenges presented at NSSDC by the expanding technology of space data archiving. "I like the idea of being involved in publications distributed to science people worldwide, as well as having the chance to become more involved with the on-line dissemination of data. Space technology has always fascinated me and I welcome the opportunities to add to my knowledge of data storage and transfer techniques. On top of all that," Blasso adds, "the atmosphere here at Goddard seems almost academic—similar to that of a college campus, and the people are great to work with."

Len Blasso

Len Blasso has been managing the Publications group since last October.

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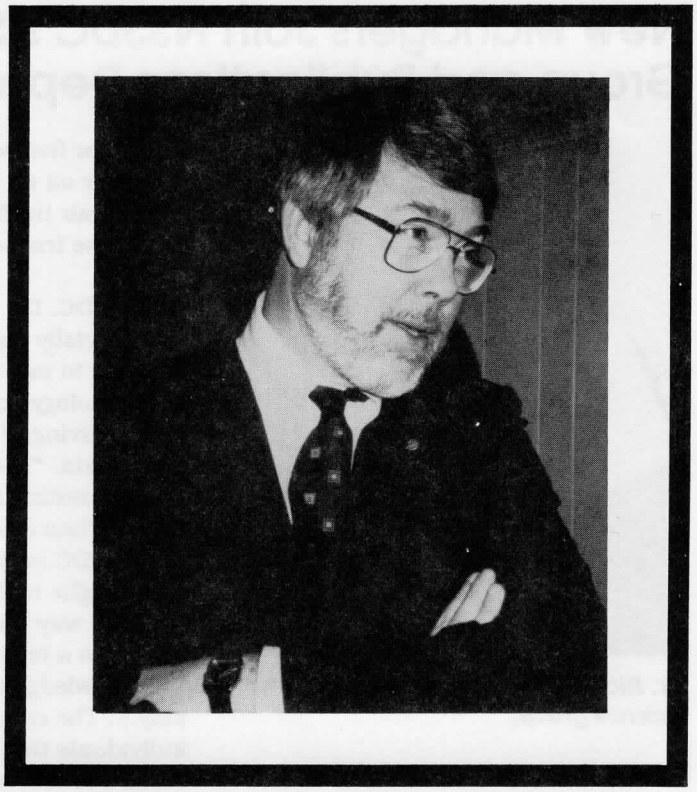
sions, Stan did not rest. He was always working on improving the science opportunities for the space science community. Other international space agency partnerships became an important element to enhance the science return, and in 1985 Stan began to participate in the Inter-Agency Consultative Group or IACG, thus putting another piece of the puzzle together.

The IACG has membership from NASA, ESA (Europe), INTERCOSMOS (U.S.S.R.), and ISAS. It was recognized that over the next five to seven years these agencies will be launching over 30 magnetospheric and heliospheric spacecraft. Stan was instrumental in getting the IACG to focus on promoting data sharing and joint data analysis among scientists involved in these missions, because he knew that would significantly enhance the scientific return. His dream was to provide an opportunity for a quantum leap in the understanding of space plasma and magnetospheric physics. With the new NASA-approved missions and by bringing the IACG's attention to space physics discipline science problems, Stan truly created the International Solar-Terrestrial Physics (ISTP) program.

Working within the IACG organization, Stan established several working groups to facilitate the correlative science activities. As chairman of the Science Working Group, Stan continued to rally the community and focus on defining the new science that can be accomplished from multi-mission science coordination. The Mission Planning Working Group is developing ways to determine and coordinate key spacecraft locations that are necessary to make the right observations at the right place and time. The Data Exchange Working Group, for which I am the deputy chairman, is responsible for implementing mechanisms that promote data sharing and joint data analysis such as pioneering new network connections, defining data format and exchange standards, and creating master directory and catalog systems to be used.

I believe that Stan felt that establishing the ISTP program activities was the near term solution to building up a strong and vital space science community, but he also realized that the long term future still needed direction and definition. Stan began to establish the long term future of his division through an integrated strategic plan of missions and science activities. This year Stan organized two four-day Strategic Implementation Workshops for determining potential future space physics missions. More than 70 scientists from ionospheric, mesospheric, magnetospheric, solar, cosmic, and heliospheric science got together for the first time as a division of NASA to devise a future plan. I was privileged to be asked to be a part of both workshops.



Dr. Stanley Dean Shawhan: Feb. 7, 1941 - June 21, 1990. His unique vision and energy brought lofty future goals into the realm of the achievable.

In the afternoon of the last day of the final workshop, Stan met with all the committee chairmen and the mission integration panel members, and he lead the discussion that blended the science desires with the political realities to complete the Space Physics Division's strategic plan. Stan was in true form. For three hours he lead the discussion masterfully. When we left the meeting, we all felt something special had happened. The Space Physics Division had an ongoing program, a solid mission plan for the future, and a way to accomplish it.

Stan died that evening.

I had the pleasure of working with Stan Shawhan on various aspects of the ISTP program for several years. In just the few program areas that I knew, I observed him working diligently and tirelessly toward coordination of solar-terrestrial science on a multi-agency basis. I believe all the elements that Stan worked so hard to put together are now in place. He has given the solar-terrestrial science community a golden opportunity for today's science and laid the foundation for the future beyond.

Just shortly after his death, the Shawhan flight legacy already began with the launch of the CRRES spacecraft. He accomplished what he set out to do in a way that was uniquely Stan's. His presence made a real difference to the space physics science community and to me personally. It is now up to the space physics community to complete the process and carry out the new missions. Stan would have wanted it that way.

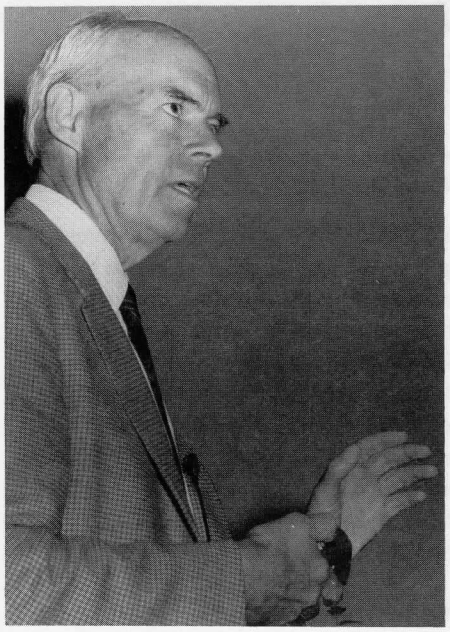
James L. Green

NCDS's Global Climate Data Sets Are a Hot Topic in the Subdiscipline

This is the third in a series of four articles highlighting a subdiscipline of NASA's Climate Data System (NCDS).

Those interested in global climatological and oceanographic data sets will discover that NCDS is rich in this area. Dr. Charles McClain of the Laboratory for Hydrospheric Sciences and Lola Olsen of NSSDC masterminded an agreement between their organizations that enabled several scientists at Goddard Space Flight Center to pool their resources and obtain a dedicated programmer and hardware. These human and physical resources paved the way for flow of ancillary environmental data set collection activities.

This flow of data is expedited by the use of NSSDC's Common Data Format (CDF). Both groups have developed tools designed to analyze and visualize data in this format.



Dr. James Angell discusses his temperature deviation data set and considers the issue of global warming.

Since last fall's NCDS workshop, NCDS has updated and added many data sets in this subdiscipline and plans to add several more. The Fleet Numerical Oceanographic Center (FNOC) Analyses is now current through June 1990. Dr. Richard Reynolds (NMC/CAC), who discussed his sea surface temperature derivation algorithm that blends AVHRR data with in situ observations at the workshop, has recently reanalyzed his product. NCDS holds the most recent version of those data through June 1990. Dr. James Angell, Air Resources Lab of NOAA, who discussed his temperature deviation data set and expressed his cautious concern for possible global warming, continues to send updates of his most recent data to NCDS. Dr. Angell does not use computers in his analyses; therefore, the NCDS staff inputs the handwritten data into the computer when they are received. Data are now current through August 1989. NCDS users and staff are anxiously awaiting the final version of the most recent Comprehensive Ocean-Atmosphere Data Set (COADS) discussed at the workshop by Scott Woodruff of the Climate Research Division, NOAA/ERL.

Several data sets new to NCDS have been implemented from CD-ROM. These include the Genesis of Atlantic Lows Experiment (GALE), an NMC Grid Point Data Set, and the National Oceanographic Data Center's NODC-01. Future data sets include NOAA's Global Precipitation Climatology Project's Tropical Rainfall data set, Goddard's Institute for Space Studies' (GISS) global temperature data set, and others.

Dr. Charles McClain interacts with NCDS project personnel.

The heightened concern by lawmakers and the public awareness of the issues surrounding global change and possible global warming have highlighted the importance of this subdiscipline. The NCDS staff is working diligently to support the intense interest in these topics.

The global climatologies and oceanography data sets available through NCDS are listed in the table below.

For more information about these data or NCDS, contact the NCDS User Support Office, Code 934 at NASA Goddard Space Flight Center, Greenbelt, Maryland 20771 or call (301) 286-3209. Via SPAN, send a message to NSSDC::NCDSUSO, or via Internet to ncdsuso@ndssdc.gsfc.nasa.gov.

John Vanderpool
Lola Olsen

See Global Climatologies and Oceanographic Data Set listing, pages 16 and 17

NSSDC and Solar Maximum Mission Data Analysis Center Prepare a Plan for Cooperation in Solar Data Management

Since the launch of the Solar Maximum Mission (SMM) in 1980, the SMM Data Analysis Center (DAC) at Goddard has served as a world-class center of research on solar activity. SMM provided a wealth of solar and astronomical observations, observing over 12,500 solar flares between its launch in 1980 and reentry in 1989.

In addition to the SMM data, the DAC collected correlative data sets from GOES, ISEE 3, Hinotori, Phobos, and other spacecraft, directed ground-based solar observing campaigns with magnetographic and H-alpha observatories and solar radio observatories worldwide, and compiled data bases that combine the observational results from diverse sources. The DAC continues this activity today, currently working to complete the archiving of all data by the end of 1990. The DAC is equipped with VAX minicomputers and workstations and uses optical disks, Exabyte tape cartridges, and standard magnetic tapes as archive media.

DAC staff members also work with SMM guest investigators and other colleagues who undertake balloon flights to collect solar data and suborbital rocket flights to obtain solar images. The DAC also maintains a program of continuous technology development, upgrading the data processing and scientific analysis hardware and software to keep its image and graphics display capabilities up-to-date.

During the SMM DAC's life, NSSDC has informally delegated some of its data archiving, preservation, and distribution functions to the DAC, because of the DAC's record of excellence in serving the solar research community. Ultimately, a copy of all SMM data will reside at NSSDC. At present, the bulk of SMM data products continues to reside at the SMM DAC, and NSSDC directs the majority of data requests there, as well as points to the SMM DAC as the primary SMM data source in the online NASA Master Directory. The DAC distributes data to investigators worldwide via SPAN and on magnetic tapes. In 1989, for instance, the SMM DAC responded to 25 outside requests for data (in addition to serving the PI teams).

The SMM DAC has been relocated from NASA/GSFC to a site about two miles away, and it continues to be directed by Dr. Joseph B. Gurman. Outgoing NASA Chief of Solar Physics, Dr. J. David Bohlin, has determined that the DAC is likely to be supported for at least the next four years, to continue its current research and development functions and to serve the continuing SMM Guest Investigator program.

Recognizing the SMM DAC's continuing and growing role as a discipline center for solar physics, NSSDC is currently preparing a formal Memorandum of Understanding to make the DAC's status official. This action is warranted because the resources of the SMM DAC make it uniquely qualified to continue housing and providing access to its existing data as well as to provide continuous expertise and analysis tools for upcoming solar space mission data. Data from the U.S. instrument aboard Solar-A, a Japanese spacecraft scheduled to begin solar observations in late 1991, are to be housed at the DAC.

The SMM DAC is also well-positioned to handle data from the solar instruments to be launched aboard SoHO, the Solar and Heliospheric Observatory scheduled for launch in 1995. The SMM DAC has the potential to continue providing an excellent level of access and service to solar researchers for many years to come.

The Memorandum of Understanding will detail the functions that NSSDC delegates to the SMM DAC, and the document will also confirm its status as a Discipline Data Center in the NASA distributed data system. Currently, plans are underway at NASA Headquarters to develop a Space Physics Data System (SPDS); the SMM DAC may become the Solar Discipline Data Center within the SPDS.

NSSDC invites those who need details of the SMM DAC's holdings or require access to some of those data, to communicate with NSSDC (unless they are already in contact with the DAC). NSSDC will forward requests to the SMM DAC. The NASA Master Directory currently describes SMM DAC data sets.

David Batchelor

Pathfinder EOSDIS Workshop, *from p. 6*

Following the workshop, the investigators will continue to use the systems in conducting their research at their home institutions. A team of NSSDC and Simpson Weather Associates personnel will work with the scientists to refine a set of data system scenarios based on their individual needs and to continue to assist them in exercising the scenarios on the existing systems.

They will also prepare a report to the EOSDIS Project in September that captures the results of the investigators' evaluations and summarizes their data system requirements.

Ken McDonald

Pages 11-14 of this issue comprise a special section for SPAN users.

HEP/SPAN DECnet Coordination Group Meets at NSSDC

A meeting of the HEP/SPAN DECnet Coordination Group (HSDCG), more popularly known as "The Big Four," was hosted by the management of NASA's Space Physics Analysis Network (SPAN) at Goddard Space Flight Center on May 30 and 31. The meeting was convened by the management of the U.S. Department of Energy's network ESnet/DECnet.

An "internet" is commonly defined as "a network of networks." The DECnet Internet is composed of DECnet networks worldwide that are used by the space and Earth sciences and energy sciences research communities. The largest of these DECnet networks, "The Big Four," are as follows:

- U.S. Space Physics Analysis Network (US-SPAN), managed by the National Aeronautics and Space Administration.

- European Space Physics Analysis Network (E-SPAN), managed by the European Space Agency.

- Energy Sciences Network/DECnet (ESnet/DECnet), managed by the Department of Energy.

- European High Energy Physics Network (E-HEPNET), managed by the European High Energy Physics Community.

Representatives of all four of these large DECnet networks were present at the conference, including large contingents from both European networks.

The topics of discussion for this meeting included such items as the HSDCG charter, interfaces with other groups and organizations in the global research network community, traffic routing in the DECnet Internet, links that are international (especially between Europe, North America, and Japan) and internetwork (between the major DECnet networks), handling of security problems on the DECnet Internet, and sharing and distribution of documentation.

The transition from the current DECnet technology (DECnet Phase IV) to the new international networking standards of DECnet Phase V/Open Systems Interconnect (OSI) was extensively discussed. Network managers agreed that the limitations associated with DECnet Phase IV are having a severe impact on both the operations and the growth of their DECnet networks. The networks are very keen to move on to DECnet Phase V/OSI.

Each network presented its plans for making the transition to DECnet Phase V/OSI. Topics of DECnet Phase V/OSI discussion centered on technical issues, such as routing domain boundaries, Network Service Access Point addressing, naming standards, name space design, implementation of working name server systems, the impact of third party vendor hardware and software, transition of "hidden" DECnet areas, and field testing.

There was agreement on the importance of extensive cooperation between the network managers in the DECnet Internet to insure that the transition to DECnet Phase V/OSI will not adversely affect users. There will be tools available in DECnet Phase V/OSI to allow for a minimally disruptive transition from DECnet Phase IV to the new OSI standards featured in DECnet Phase V/OSI.

The next HEP/SPAN DECnet Coordination Group meeting is tentatively planned for the spring of 1991, to be hosted by European HEPNET somewhere in Europe.

Dave Peters

Participants of recent Big Four meeting held at Goddard Space Flight Center included, standing from left to right: Warren Van Camp (NASA/ARC), Jim Green (NASA/GSFC), Denise Heagerty (CERN), Dan Kilgore (Digital), Linda Porter (NASA/MSFC), Rene Bilhaut (INZP3), Dave Kelsey (RAL, U.K.), Dave Terrett (RAL, U.K.), Gerbrand Veldman (ESA/ESTEC), Trevor Sanderson (ESA/ESTEC), Nick Van der Heijden (ESA/HQ); and seated left to right: Dave Peters (NASA/GSFC), Phil Demar (FNAL), Brian Carpenter (CERN), Antonia Ghiselli (INFN).

How To Use SPAN's "East" Gateway: A Mini-Guide to Useful Commands

The NASA Science Internet Project has established the "East" Interoperability Gateway to facilitate the exchange of electronic mail, file transfer, and remote login capability between the TCP/IP protocol based NASA Science Network (NSN), and the DECnet protocol based Space Physics Analysis Network (SPAN).

For more background, please read "SPAN to NSN Interoperability," on pages 14-16 of Issue 16 of the *Information Systems Newsletter*, published in April 1989.

The "East" Interoperability Gateway, which is located at Goddard Space Flight Center (GSFC), is based on a Digital Equipment Corporation (DEC) MicroVAX 3300 running Ultrix 3.1. This system runs a DEC layered product, DECnet-Ultrix Gateway, which provides for native mode DECnet and TCP/IP protocol translation. It is attached to both the TCP/IP Internet via NSN, and the DECnet Internet via SPAN.

To use the "East" Interoperability Gateway, you do not need an account or special access on the gateway machine. Remote login, e-mail, and file transfer are translated from one protocol to the other "on-the-fly" in a one-step operation.

This is very different from the normal "staged" gateway where login sessions must "two hop" through the gateway, and files must be moved to the gateway, translated, and then sent off to their end destination.

The "East" Interoperability Gateway is known on the networks as

SPAN (DECnet Internet)
name: EAST
address: 6.769 (6913)
NSN (TCP/IP Internet)
name: east.gsfc.nasa.gov
address: 128.183.104.4

How To Send Electronic Mail from NSN to SPAN

From an NSN machine, mail can be sent to a user on a SPAN host by mailing to

user@host.dnet.nasa.gov

Note: Most implementations support MX records in their mail software. However, if the TCP/IP mail software you are using does not use the name server to get information about hosts, you may have to use the following syntax:

user%host.dnet@east.gsfc.nasa.gov

Host (above) is the name of the SPAN host to which you wish to send mail, and *user* is the login name of the person there to whom you wish to send mail.

To send mail to an NSN site from a SPAN host, mail to this address,

EAST::"user@host.domain"

where, again, *host.domain* is the full name of the NSN host to which you wish to send mail, and *user* is the login name of the person there to whom you are sending mail (you must also type the quotes as shown).

Note: If node EAST is not defined on your system, see your local system manager or substitute the integer address "6913" for "EAST."

How To Invoke File Transfers from a VMS/SPAN Machine

To copy a file from an NSN machine with FTP capability to your local VMS/SPAN machine, type the command

```
$ COPY  East"host.domain!user
password"::"remote-file"  VMS-file
```

Here, *host.domain* is the full name of the NSN host from which you want to get the file; *user* is the login name on the NSN machine; *password* is the log-in password for the designated user account on the NSN machine; and *remote-file* is the name of the file to fetch from the NSN machine (the syntax of remote-file is dependent on the operating system on the remote NSN machine); *VMS-file* is the name of the local file to create on your VMS/SPAN machine (and is in normal VMS syntax).

Again, if node EAST is not defined on your system, see your local system manager or substitute "6913" for "EAST." In the above COPY command, you must type the quotes exactly as shown.

To transfer a file **from your VMS/SPAN machine to an NSN machine**, simply reverse the order of the arguments to the VMS COPY command; for example, put the local VMS-file name first and then East and following parts of the remote file specification last, so that you get

```
$ COPY  VMS-file
East"host.domain!user
password"::"remote-file"
```

If the NSN machine happens to be set up for anonymous FTP and the file you want has been placed in the anonymous FTP directories there, you can use a user name of anonymous and put anything in as the password (although a password must still be present; by convention the last name of the invoking user is often used as the password).

How To Invoke File Transfers from an NSN Machine

To transfer a file from an FTP-capable NSN machine to a remote SPAN machine, type the command

ftp east.gsfc.nasa.gov

see Gateway East, *next page*

Gateway East, *from p. 12*

Note: If you get an "unknown host" error, you can use the IP address 128.183.104.4 to make the FTP connection. Once you have connected and received the login prompt, respond with

host::user

Host is the name of the SPAN host receiving your file, and *user* is the login account in which you wish to place the file. When prompted for the password, give the password for this account. You may then use normal FTP commands (such as *get* and *put)* to transfer files.

It is not possible to invoke a gateway transfer from the TCP/IP side without a password for a SPAN account, because DECnet networking does not provide any kind of non-password access like that of anonymous FTP.

A word of warning about transferring binary files: UNIX systems do not have a record structure format like VMS files do. Therefore, if a binary file is sent from a VMS/SPAN node through the gateway to a TCP/IP machine using the techniques described above, the record structure information is necessarily lost, even if the destination TCP/IP machine is also running VMS. Files sent through the gateway from the TCP/IP side to a VMS/SPAN machine in binary mode creates files on the destination VMS machine that have fixed-length 512-byte records. Also, if the NSN machine is not a DEC machine (or other machine that uses DEC byte ordering), you will probably run into byte ordering problems when the data in the destination file is interpreted.

How To Log into NSN Hosts from SPAN Hosts

To log on to a TCP/IP host with telnet capability from a VMS/SPAN host, execute the command

$ set host east

Again, if node EAST is not defined on your system, see your local system manager or substitute "6913" for "EAST." When you receive the Ultrix login prompt,

Ultrix-32 V3.1 (Rev. 9)
(east.gsfc.nasa.gov)
login:

respond,

host.domain!

where *host.domain* is the full name of the NSN host to which you wish to connect. You should receive a login prompt from the designated TCP/IP machine.

How To Log into SPAN Hosts from NSN Hosts

To log on to a SPAN host from an NSN host, issue the command

telnet east.gsfc.nasa.gov

As with FTP above, if the gateway machine is not known to your local machine, you may telnet to the IP address 128.183.104.4. When you receive the login prompt from the gateway machine as shown, respond

east.gsfc.nasa.gov login:

and respond,

host::

where *host* is the name of the SPAN host to which you wish to log on (followed by the double colon as shown). If the SPAN host is not known to the gateway, you may use its DECnet node number (followed by the double colon), and the gateway will connect you. After entering this line, you should see the usual *Username:* prompt from the SPAN machine.

If You Encounter Problems . . .

If you have trouble using the gateway, please contact Jeffrey Burgan or Todd Butler at the following addresses:

Jeffrey Burgan, NASA/ARC (NSIPO)
- •NSN (TCP/IP): jeff@nsipo.arc.nasa.gov
- •SPAN (DECnet): East::"jeff@nsipo.arc.nasa.gov"
- •415/604-5705 (FTS 464-5705)

Todd Butler, NASA/GSFC (SPAN)
- •NSN (TCP/IP): tbutler@nssdca.gsfc.nasa.gov
- •SPAN (DECnet): nssdca::tbutler
- •301/286-7251 (FTS 888-7251)

Jeffrey Burgan, Todd Butler, and Dave Peters

SPAN Revises Documents

Four documents of the SPAN Documentation Library are now available in newly updated form:

Accessing SPAN from Non-SPAN Nodes, April 24,1990.

Management of the Space Physics Analysis Network (SPAN), Third Edition , NSSDC/WDC-A-R&S 89-23, January 1990.

SPAN Security Policies and Guidelines, NSSDC/WDC-A-R&S 89-21, October 1989.

Space Physics Analysis Network Node Directory (The Yellow Pages) , NSSDC/WDC-A-R&S 89-14, August 1989.

Not updated, but still available:

NASA Science Internet (NSI) Networking Users Working Group Meeting Proceedings, November 1989.

Introduction to the Space Physics Analysis Network (SPAN), NSSDC/WDC-A-R&S 87-04, October 1987.

All documents can be obtained by contacting NSSDC at the appropriate address specified on the back page of this newsletter.

Dave Peters

SPAN Management Staff Changes

During the past several months, some changes in personnel have taken place in SPAN's management.

Pat Sisson has left SPAN Management at GSFC. She served as SPAN Customer Services Manager, a position that will be temporarily vacant. During her nearly three-year involvement with NASA wide area network management, Sisson served as SPAN Information Center Manager, SPAN Security Manager, NSI Security Administrator (at NASA Headquarters), and finally SPAN Customer Services Manager. Sisson has joined U.S. Sprint's Corporate Network Security Group (Telenet) in Northern Virginia.

Ann Beckman is leaving her post as the Marshall Space Flight Center SPAN Routing Center Manager; she has been involved with SPAN Management activities at MSFC since 1986. Beckman plans to head for the northwestern United States, to fulfill some of her personal goals. After Beckman's departure, Linda Porter will receive the title of Acting MSFC SPAN Routing Center Manager and continue as Acting SPAN Manager and SPAN OSI Transition Manager.

Lenore Jackson and Cindy Posinski are new to SPAN's Customer Services and Network Information Group at GSFC, but both have been with NSSDC for several years: Jackson worked as a data technician, and Posinski worked in both the Publications group and in the SPAN office. They can be reached at the main SPAN Management address, nssdca::netmgr.

Dave Stern has come aboard with the SPAN Management group at GSFC as a SPAN Technical Analyst. Dave was previously a VAX/VMS Systems and Network Manager at the Space Telescope Science Institute in Baltimore. Dave can be reached at nssdca::stern. (This is not the David Stern of magnetospheric modeling fame.)

Christopher Pizzano is a recent hire into MSFC SPAN Management. He is now the Assistant MSFC SPAN Routing Center Manager, learning all the ropes of the job from Linda Porter. Christopher can be reached at ssl::pizzano.

Dave Peters

Space Agency Reps Meet, Discuss Ways To Enhance Science Benefits from Upcoming Missions

The Inter-Agency Consultative Group (IACG) for space science is trying to enhance the scientific output from space physics missions to be launched over the next decade by NASA, ESA (Europe), INTERCOSMOS (U.S.S.R.), and ISAS (Japan). It was recognized that over the next five to seven years these agencies will be launching more than 30 magnetospheric and heliospheric spacecraft. The IACG is focusing on promoting data sharing and joint data analysis between scientists involved in these missions since that would significantly enhance the scientific return.

Several working groups to facilitate the correlative science activities have been established under the IACG or-

see IACG, *next page*

IACG Working Group members, from left to right: Chuck Feuschel, Bob McGuire, Kent Hills, Ichiro Nakatani, Don Fairfield, Jack Gaffey, Don Sawyer, Alessandro Ciarello, Hunter Waite, Klaus Blanck, Jim Green, Sardi Parthasarathy.

IACG, *from p. 14*

ganization. The Science Working Group, or WG-1, focuses on defining the new science that can be accomplished from multi-mission science coordination. The Mission Planning Working Group, or WG-3, is developing ways to determine and coordinate key spacecraft locations necessary to make the right observations at the right place and time. The NSSDC's Satellite Situation Center (SSC) is already playing an important role in helping to define science mission opportunity with the current Soviet Active, Japanese/Akebono, and U.S./ Dynamics Explorer missions as part of an IACG effort.

The Data Exchange Working Group (WG-2) is responsible for implementing mechanisms which promote data sharing and joint data analysis such as pioneering new network connections, defining data format and exchange standards, and creating master directory and catalog systems to be used. Although the formal IACG meetings with the space agency science heads meets once a year, it was decided several years ago that progress on data systems activities is moving so rapidly that a meeting twice a year would be needed to keep up with the new developments.

NSSDC was the host for WG-2's most recent meeting. Representatives from all the space agencies except INTERCOSMOS attended the meeting. The major topics of discussion were the status of inter-agency communication links, review of the science models used in the NSSDC Satellite Situation Center (SSC), standard formats for data exchange, and the review of a preliminary version of a space physics data systems handbook.

The NASA members of Working Group-2, Drs. Baker, Halem, Green (all from GSFC), Kurth (University of Iowa), and Mr. Feuschel (Headquarters) have been instrumental in getting approval for a NASA communication link to the Institute of Space Research (IKI) in Moscow. The technical implementation of this link is currently underway with electronic mail capability to be completed by the end of this year. This link will provide electronic mail communications with all approved personnel in the U.S. and the scientists and spacecraft engineers at IKI working on such missions as Active, Interball, Relict 2, Apex, and Coronas.

The SSC contains data and software for plotting spacecraft orbits, both at the NSSDC and remotely via network connections. One of the purposes of the SSC is to enable users to predict advantageous positions of a spacecraft, relative to the position of magnetospheric or interplanetary features, to the position of other spacecraft, or to the position of ground facilities. Dr. Fairfield and other space science modelers reviewed what models the SSC is currently using and identified where improvements can be made to provide better representations of the Earth's magnetosphere.

It is clear that the Standard Formatted Data Unit (SFDU) will be extensively used for space physics data from many missions. Much work needs to be completed to provide more details on the data formats within an SFDU. Current projects that will be using SFDUs for some of their data products include Geotail, Wind, Polar, and the four European Cluster spacecraft.

WG-2 is also overseeing the development of a Space Physics Data Systems handbook, which is being designed to provide key information on capabilities and instructions on accessing data systems and archives that are readily available on wide area computer network. Over 40 entries have been identified and information is currently being sought. The handbook will be available electronically, perhaps through the NASA Master Directory.

The next full meeting of the IACG will be hosted by the European Space Agency in November. The first version of the handbook for Space Physics Data Systems will be distributed at this meeting; presentations are planned on the evaluation of the SSC geophysical model capabilities, standard formats used in the IACG designated missions, and the status of electronic links to all the agencies.

ESA Center SPAN Connection with GSFC Expanded

A new 56 kilobit per second (kbps) SPAN circuit connecting US-SPAN at Goddard Space Flight Center with European SPAN at Darmstat, Germany, was successfully activated on May 17. With this improvement, SPAN now has almost three times the previous bandwidth to connect the US-SPAN and European SPAN backbones. The increased bandwidth will improve scientific data communications between the U.S. and Europe on collaborative NASA and ESA space science missions such as ISTP and Galileo.

The new 56 kbps circuit will be run in parallel for several months with the old 19.2 kbps circuit to verify reliability before the older circuit is released back to the Packet Switch Communications Network (PSCN).

Todd Butler

See Special SPAN Section pages 11-14

GLOBAL CLIMATOLOGIES AND OCEANOGRAPHIC DATA SETS AVAILABLE VIA NCDS AS OF 08/10/90

Data Set	Parameters	Temporal Coverage/ Resolution	Spatial Coverage/ Resolution	Archive Media:Volume	Output Options	NCDS Data Set or CDF* Name
Angell's Global Temperature Deviations	Temperature (Deviations)	01/58 - 08/89, ongoing; seasonal deviations from the mean	Global: surface to stratosphere; Averages over 7 latitude zones (2 polar, 2 temperate, 2 subtropic, equatorial), Tropical Averages, Hemispheric Averages, and Global Averages	Online CDF: 39 Kbytes	CDF	ANGELL *
Climate Analysis Center's in situ Sea Surface Temperatures	Sea Surface Temperature	01/70 - 12/81 discontinued; monthly	40 deg S to 60 deg N; 2 deg x 2 deg	Online CDF: 10 Mbytes; Tape(1)	CDF, Tape	CAC_SST_INSITU*
Climate Analysis Center's in situ Sea Surface Temperatures blended with AVHRR derived data	Sea Surface Temperature	01/82 - 06/90, ongoing; monthly	Global; 2 deg x 2 deg	Online CDF: 28 Mybtes; Tape(1)	CDF, Tape	CAC_SST_BLENDED*
COADS Monthly Summary Trimmed Groups	Wind, Temperature, Clouds, Heat Flux, Humidity, Pressure, SST	1946 - 1979; monthly	Global; 2 deg x 2 deg	Tape (5): 507 Mbytes	CDF, Tape	COADS_MSTG
East Anglia (Jones) Temperature Deviations	Temperature (Deviations)	1851-1988; monthly	Global surface; 5 deg x 10 deg	Online CDFs: 17 Mbytes	CDFs	E_ANGLIA-_TMP-DEV*; E_ANGLIA UNGRIDDED*
FGGE II-B Restructured Data	Clouds, Humidity, Pressure, Salinity, Sea Surface Temperature, Temperature, Winds	12/04/78 - 12/01/79; recorded mainly at 0000, 0600, 1200, 1800 GMT though varies with source	Global; Horizontal: 500 km for soundings, Vertical: 4 tropospheric levels plus 3 stratospheric	Tape (90): 2.63 Gbytes	Tape only	FGGE2B
FGGE III-B Analyses from ECMWF	Height, Humidity, Pressure, Temperature, Vertical Motion, Wind	12/01/78 - 11/30/79; at 0000 and 1200 GMT, plus 0600 and 1800 during special observing periods	Global: 1000 - 10 mb; 1.875 deg grid, 15 levels	Tape (82): 2.96 Gbytes	CDF, Tape	FGGE3B
FGGE III-B Reanalyzed from ECMWF	Height, Humidity, Pressure, Temperature, Vertical Motion, Wind	01/01/79 - 03/05/79 and 05/05/79 - 07/05/79; at 0000, 0600, 1200, 1800 GMT	Global: 10 - 1000 mb; 1.875 deg grid, 19 levels	Tape (21): 2.19 Gbytes	CDF, Tape	FGGE3B-REV
Fleet Numerical Oceanography Center's Analyses	Height, Humidity, Pressure, Sea Surface Temperature, Temperature, Wind, Mixing Depth	01/01/73 - 06/30/90, ongoing; 12 hours	Global; 2.5 deg x 2.5 deg and 63 x 63 and 125 x 125 North Polar Stereographic Grid	Tape (48): 4.6 Gbytes	CDF, Tape	FNOC_ANL

GLOBAL CLIMATOLOGIES AND OCEANOGRAPHIC DATA SETS AVAILABLE VIA NCDS AS OF 08/10/90

Data Set	Parameters	Temporal Coverage/ Resolution	Spatial Coverage/ Resolution	Archive Media:Volume	Output Options	NCDS Data Set CDF* Name
GALE	Sea Surface Temperature, Pressure, Winds, Precipitation	01/02/86 - 04/02/86; Variable	25 deg N - 60 deg N and 40 deg W - 90 deg W; in situ	CD Rom: 7 Mbytes; Online CDF Subset: 4.6 Mbytes	CDF subsets	GALE_SST* GALE_NCSU_ SFC_MARINE*
Hellerman Wind Stress Data Set	Wind Stress	Monthly Climatology (1870 - 1976)	Global; 2 deg x 2 deg	Online CDF: 1.6 Mbytes	CDF only	HEL-WIND*
Levitus Climatologies	Temperature, Salinity, Dissolved Oxygen, Mixing Depth, Specific Volume	Monthly, Seasonal, Annual Climatology (1900's - 1978)	Global; 1 deg x 1 deg and 5 deg x 5 deg	Online CDF: 168 Mbytes, Tape (5): 864 Mbytes	CDF, Tape	LEVITUS
Multichannel Sea Surface Temperatures from AVHRR on NOAA satellites	Sea Surface Temperature	11/01/86 - 06/31/89, weekly	Global; 18 km X 18 km	CDF: 2 Gbytes Tape (20)	CDF, Tape	MIAMI-SST
NCAR Trenberth Wind Stress Climatology	Wind Stress, Wind Stress Curl, Sverdrup transport	01/1980 - 12/1986; Monthly and Monthly Climatology	Global; 2.5 deg x 2.5 deg	Tape (1): 82 Mbytes; Online Climatology Subset	Tape, CDF	TRENB_WIND TRENBERTH_ MON_CLIM*
NCDC TD-3280 Hourly Surface Station Data	Temperature, Wind, Humidity, Pressure, Clouds	01/1978 - 12/1987; hourly	3 U.S. Stations; station data	Tape (1): 50 Mbytes	Tape, CDFs on request	AIRWAYS
NMC Wind Data	Wind	07/01/76 - 06/30/86;	Global; 2.5 deg x 2.5 deg	Tape (4): 906 Mbytes	CDF, Tape	NMC_WIND
NMC Grid Point Data Set	Temperature, Height, Hummidity, Wind, Vertical Motion	01/1946 -12/1985 monthly, daily	N. Hemisphere; 47x51 Octagonal Grid	CD-ROM; Online CDF Subsets: 12 Mbytes 81 Mbytes	CDF Subsets	NMC_MONTHLY_GRID* NMC_DAILY_SFC*
National Oceanographic Data Center's NODC-01	Salinity, Temperature	1900 - 1988; in situ	80 deg S to 80 deg N, 110 W to 70 E; 10 deg x 10 deg	CD-Rom; Online CDF Subsets: 476 Kbytes	CDF Subsets	NODC_SALINITY_STATS* NODC_TEMPERATURE_STATS*
World Monthly Surface Station Climatology	Temperature, Precipitation, Pressure, (Humidity after 1961)	01/1731 - 12/1988, ongoing; monthly	Global; station data	Tape (1): 100 Mbytes; Online CDF	CDF, Tape	SSCLIMATE

Summer Students Learn on the Job

As part of its commitment to encourage high school and college students within the science disciplines, the Space Data and Computing Division (SDCD) attracted some 30 students to work and study with NSSDC scientists and researchers this summer. The students came by way of many recruitment programs:

Visiting Student Enrichment Program (VSEP) - USRA
Summer Intern in Computer Applications (SICA) - Bowie State University
Graduate Intern Program - North Carolina A & T University
Gallaudet University
National Space Club Interns
Summer High School Apprenticeship Research Program (SHARP)

Selection was based on one or more of the following criteria: intended major, career goals, GPA, and relevant experience. Students were here for an average of ten weeks.

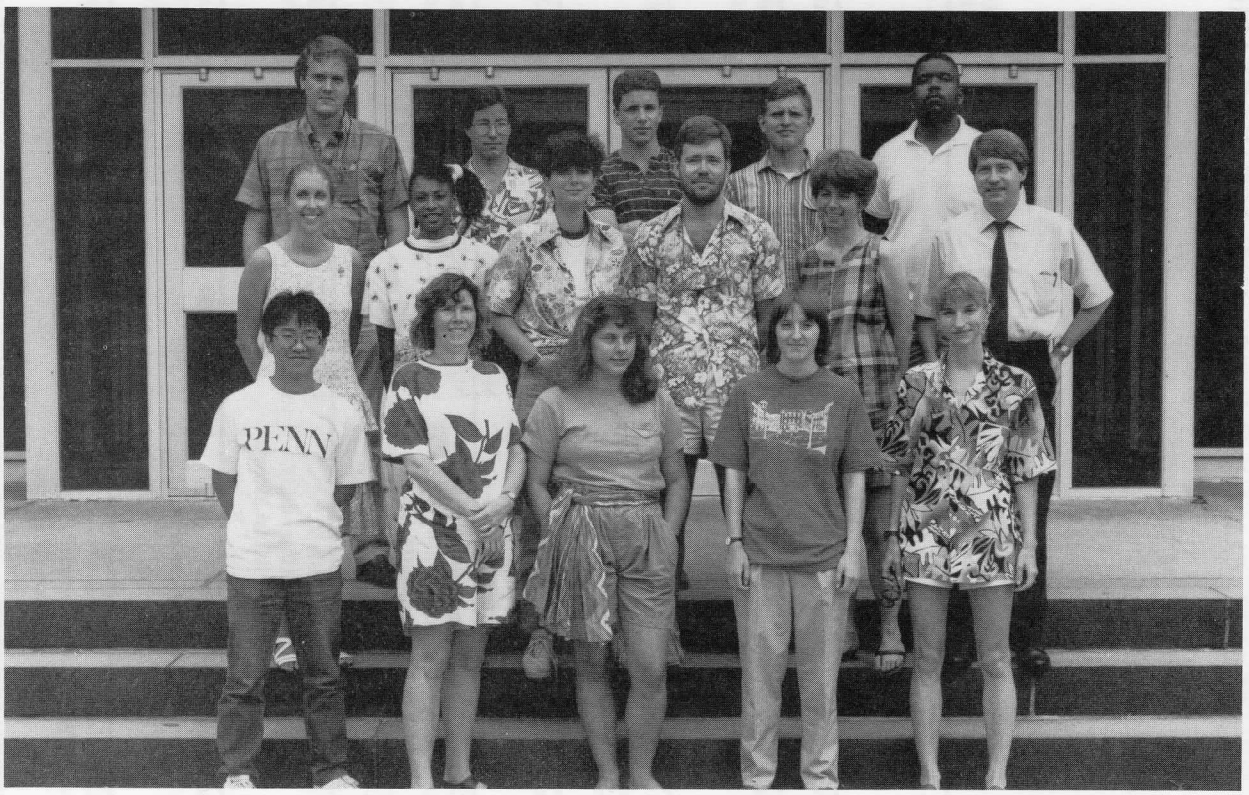
With so many summer students working within Code 930, a committee was established to coordinate summer students, mentors, and activities.

Students were teamed with Code 930 mentors who assigned projects to be completed during Students' summer stay at GSFC. During the week of August 6, 1990, students gave presentations on their summer projects to Division and Associate Division Chiefs. This year's student projects included studying neural networks, artificial intelligence, communications networking, graphics software development as well as applications for large data center programs such as PLDS and NCDS.

To give the students a general overview of all the projects in which the division is involved, a lecture series was established. The lectures, given by division personnel, describe data center projects, such as COBE and SPAN, and areas of research, such as graphics workstations and artificial intelligence.

A picnic was organized at the GSFC Recreation Center in an effort to allow students to meet each other and NSSDC personnel. The Space Data and Computing Division has found that an organized summer student program really provides great benefits and rewards not only for students but also for mentors. The SDCD would like to thank the students, mentors, and other participants involved in the 1990 summer student program.

Jeanne Behnke



NSSDC summer students and mentors—students enjoyed many opportunities to increase their knowledge of technologically advanced data archiving techniques.

Write Once, Read Many

Over the past several years, NSSDC has become heavily involved with Write Once, Read Many (WORM) optical disk technology. WORM technology is ideal for many NSSDC data storage requirements: Each platter may contain from 2 to 6 gigabytes of data (6 full 6250 bpi tapes hold 1 GB), the data are randomly accessible, and the platters are removable.

In 1987-88, two mass buys were coordinated to purchase Optimem 1000 Optical WORM disk drives and associated Emulex host adaptors and to distribute them to various user sites. Forty drives were bought and sent to approximately 30 different locations. (NSSDC also retained a few.)

The goal of the mass buy was to make available to a few researchers a method for easily storing large amounts of data onto a medium that could then be copied and transported for archiving and further distribution. WORM's random accessibility makes it ideal for keeping selected data sets on line for daily access while its removability makes it easy to switch from one data set to another by simply changing platters.

There are a number of differences between optical WORM drives and conventional magnetic disk drives. The major difference is that, as the name indicates, WORMs are write-once devices. Therefore, files and directories must be handled a little differently; otherwise, they can become corrupted. This corruption can lead to loss of data, possible loss of entire platters, and absolute loss of someone's temper. Consequently, there must be a way to manage effectively the files. Although there were a few products on the market, the solution the NSSDC chose was to write its own system. This system has become known as the Software for Optical Archival and Retrieval, or SOAR. SOAR was originally conceived and written by Brian Swafford and then further modified by Neelam Vaidya and then later by Chuck Davis.

WORM disks serve as more compact, wear-resistant medium than conventional 9-track computer tape.

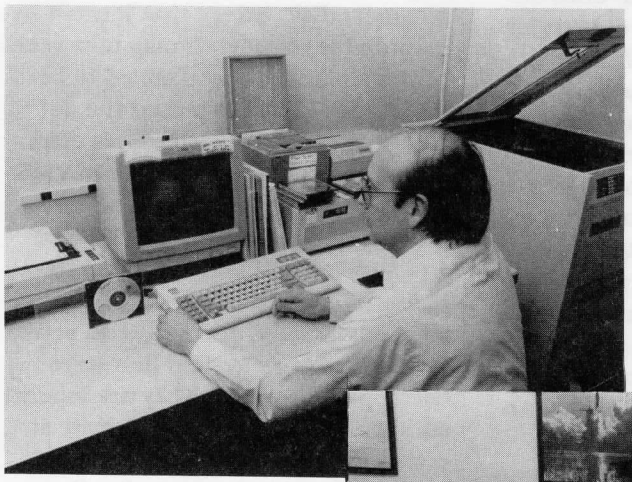
The purpose of SOAR is to manage files and directories on WORM platters so that data can be accessed via standard VAX/VMS Files-11 routines. The software consists of a pseudo-device driver and a group of utility routines. Unlike most products on the market, SOAR is used only until a platter has been filled. Once filled, the platter is closed and is then treated just like a standard VMS Files-11 magnetic disk, except that it **must** be mounted read-only. It may take years before a platter is determined to be full. Using SOAR to mount the device, it is possible to access an open optical disk using any standard VMS command, such as copy, backup, dump, $open, diff, etc. EDIT is **not** recommended! When writing to the platter the SOAR utility OCOPY must be used. NSSDC currently has several platters on its system that have been open for years. They are mounted, via SOAR, for system/nowrite access and are used on a daily basis. Most users do not even realize that they are using optical disks.

NSSDC is now beginning to receive archival data from other users on SOAR generated platters. NSSDC itself has begun to send platters out to users who would like their data on optical disk. For instance, the center recently transferred 218 Helios zodiacal-light data tapes to one platter in response to a customer request. Eager to fulfill future requests for data on optical disk as demands warrant, NSSDC has gained about one new SOAR user every two to three months. If you would like more information about SOAR and the NSSDC's WORM efforts, please contact Chuck Davis at NCF::CDAVIS.

Chuck Davis

CD-ROM Technology Enhances Quality of Services Provided to Scientists

In 1989 NSSDC set up a "premastering facility" to reformat data in preparation for encoding on CD-ROM. The heart of this process is the CD Publisher, which is a collection of hardware that permits the organization of large quantities of data (650 megabytes).



Dr. Ed Grayzeck setting up command file prior to data transfer.

Two initial test discs were produced and then evaluated during a June 1989 workshop dealing with CD-ROM as an archival tool. A set of guidelines for the use of the premastering facility and production of NASA "standard" discs was promulgated. Copies of these guidelines are available from the NSSDC Request Coordination Office. (Please refer to the back page of this newsletter.)

The facility is available on a capacity-available basis to NASA groups interested in creating CD-ROMs for archiving and distribution, and a number of NASA space and Earth science groups have started projects that make use of the CD Publisher.

One such collaborative effort is the work by the International Halley Watch (IHW) to place its entire Comet Halley Archive (20 gigabytes) on this medium. The data from the 1985-86 apparition of this famous comet has been collected from ground-based and spacecraft measurements. Initiated in 1982, the IHW has a Lead Center at JPL and ten discipline nodes (such as the Large-Scale Phenomena [L-SP] group at GSFC) that span the measurement range.

The full IHW archive includes images, tables, and text, and it is intended to be written to about 24 CD-ROMs. The first set of 18 discs are compressed images from the L-SP group which involved wide-field photographs digitized for the archive. The remaining discs will have various data types and be assembled in chronological order for cross-discipline work.

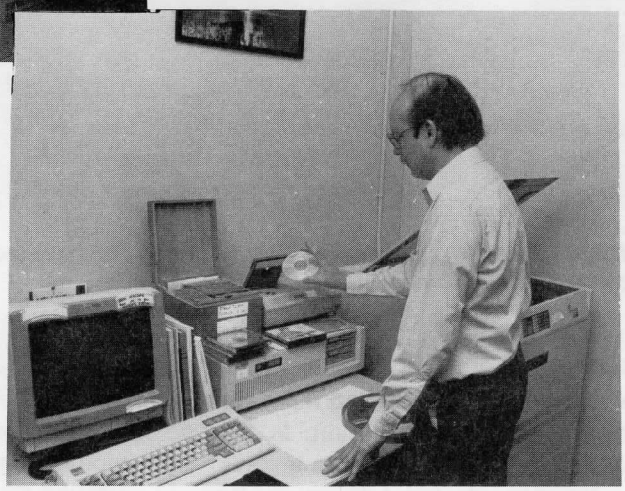
Tape being loaded for ingestion into the CD Publisher.

In deciding on CD-ROM as the archival medium, the IHW considered both longevity and distribution issues. Projected lifetimes for these discs is ten years, with accelerated tests forecasting 100 years of stability. The Comet Halley Archive will also be distributed to the 1000 contributing scientists around the world. To accommodate this need, CD-ROM is an excellent choice since it is inexpensive and has a well accepted international standard (ISO 9660) for logical formatting. As in the case of Comet Halley's archive, even 650 megabytes may not hold many "large" images, so this type of data is also compressed. To evolve display and compression tools, the IHW, NSSDC, and PDS have collaborated on various software techniques.

CD-ROM designs that call for ease of use through metadata labels and index pointers have been pioneered. In planning out such a large multi-volume set, a summary or master "last" disc is a necessity. Valuable experience with metadata (e.g., SFDU) descriptions, delimited index tables, and validation software across multiple platforms has been gained.

NSSDC welcomes the opportunity to share this experience with other NASA groups interested in placing their archive data on CD-ROM.

Ed Grayzeck



Testing (previewing) a disc containing similar data format.

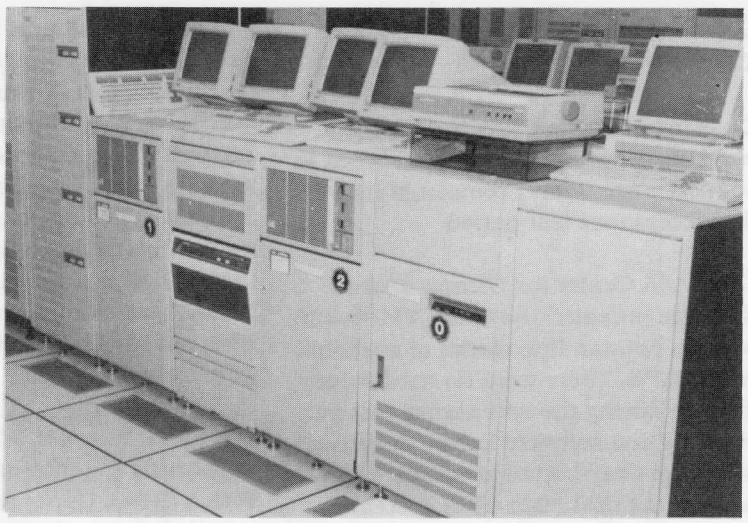
NSSDC's Data Archive and Distribution Service Develops

Many projects have been implemented at NSSDC to research and use on-line mass storage capabilities and the development of large data archive systems. None, however, match the potential and scope of the NSSDC Data Archive and Distribution System (NDADS).

There are four major software components in the system: the archiver subsystem, the catalog subsystem, the data ingest subsystem, and the host/user interface subsystem. The hub of the system is a cluster of two VAX 8250s and one VAX 6410, a VAX cluster configuration with almost 1.2 terabytes of on-line optical disk storage. The mass storage components of two Cygnet optical jukeboxes, models 1802 and 1803, comprise the crucial part of the system.

These jukeboxes are each configured with two SONY 6.5 gigabyte optical disk drives. The Cygnet 1802 holds 51 platters for a total of 330 gigabytes on-line disk space and the 1803 holds 131 platters for a total of 850 gigabytes on-line disk space. An APTEC IO Processor is used as a front end to the SONY drives from the VAX Cluster.

The information about the actual data in the NDADS is managed by the SYBASE data base management system. NDADS will support a data ingest of 300 KB/second into the optical jukebox. The NDADS is based on the prototype system designed for the Space Telescope Data Archive and Distribution Service. NDADS will provide users and NSSDC data managers with many useful features. One basic advantage to the user includes electronic access to data. Presently, users are usually required to place a written request for data to be post-mailed to them on nine-track tape. The NDADS system will provide access to catalogs of the data and some browse capabilities in order to allow users to better determine what data they require. The system will allow over 70 simultaneous users to access the catalogs and data. NDADS is being designed to support users data requests through on-line interactive user interface methods.



NDADS VAX Computing Cluster installed July 1990.

When the system becomes operational (in early 1991), an operations staff will support large volume user requests by moving data in the archive onto optical disks or magnetic tapes for later distribution by postal service. In addition, NDADS will support user requests through a network distribution service that is likely to be the main distribution method of the future.

The NDADS software provides many advantages to NSSDC data managers, including servicing and tracking user requests for data. It also will manage users' work space and system usage as well as provide chargeback capabilities. For administrators, NDADS software also manages the hardware aspect of its system—i.e., files on the platters and the platters within the jukebox.

Following the test of the hardware and software systems, NDADS will become the focal point for a number of future NSSDC active project archives.

Jeanne Behnke

The official transfer of NDADS equipment from Ford Aerospace to NSSDC. A Ford Aerospace representative conducts acceptance testing of NDADS equipment for NSSDC personnel.

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CRAY YMP8-432 Passes Acceptance Test

On August 9, the CRAY Y-MP supercomputing system, recently installed to support Code 930.1, completed its 30-day acceptance test period.

The NASA Center for Computational Sciences accepted the CRAY YMP8-432 with an outstanding record of availability of 99.7%. There were no hardware failures during the acceptance test period. Only one software failure occurred when the Cray-installed software connecting the IBM 3081 MVS system to the CRAY Y-MP caused a Cray software crash. This problem was resolved within two hours.

Conversion from the CYBER 205 to the CRAY Y-MP is well underway with a goal to shut down the CYBER 205 by November 1. As of August 10, the NCCS had authorized 233 users to use the CRAY and Cray had trained almost 200 NCCS users and staff members.

F. Shaffer

New Standards Office Provides Support to a Variety of Users

The NASA Science Data Systems Standards Office (NSDSSO) collects and distributes information about standards relevant to data management, participates in the development of standards, and provides assistance to the users of standards.

Two new user support offices have been organized within the NSDSSO: the Standard Formatted Data Unit (SFDU) Support Office, and the Flexible Image Transport System (FITS) Support Office. These offices, intended to answer user inquiries, help users format their data in conformance to the standard, and assist those who wish to read data formatted using a standard, are responding to a growing number of inquiries. In May and June, the SFDU Support Office responded to 21 inquiries from NASA installations. The FITS Support Office responded to 17 inquiries during the same time period. Of these 17 inquiries, three were from NASA installations, ten were from elsewhere in the United States, and four were from abroad.

The SFDU Support Office is actively supporting the International Halley Watch (IHW), Upper Atmosphere Research Satellite (UARS), DE/EICS, and Pioneer. The most extensive user support has been for the IHW data and metadata, which will comprise about 11 gigabytes of data on 20 CD-ROMs. The SFDU labels for a typical CD-ROM are about 40 kilobytes and identify the contents of each file and its exact location on the disk. The SFDU Support Office developed software that automatically generates these labels by parsing the CD-ROM directory.

D. Sawyer and A. Dwyer

Space Physics Data System Steering Committee Workshop

Planning to define the scope and form of the newest of the NASA discipline data systems began on July 16-17 with the first meeting of the Space Physics Data System (SPDS) Steering Committee at Goddard. This system is expected to be in a study and prototype phase for the next year, but major growth activity is expected as early as FY92.

This newly formed committee is chaired by Prof. Alex Dessler of Rice University and is composed of eight scientists appointed by the Space Physics Division (NASA Headquarters, Code SS) to represent the various fields within the division. The charter of the committee is to examine the operational issues of data acquisition, processing, storage, and distribution. Its specific tasks will include:

- Assessment of the current extent, accessibility, and state of existing distributed space physics data.
- Assessment of current space physics user needs and the space physics program obligations to the larger science community.
- Development of alternative data system concepts and plans for recommendation to the Space Physics Division.
- Oversight of the implementation/operation of the system actually selected.

NSSDC has been tasked to supply the initial technical support to the steering group. That support will encompass preparation of needed requirements studies and archival surveys, detailed development and costing of alternative plans in both archiving and software systems for review by the committee, and, possibly, prototype subsystem implementations if and as directed and feasible within the initial budget.

This first Steering Committee meeting went well, with a mix of activities that included summary presentations on other NASA discipline data system efforts, a tour and demonstrations of NSSDC capabilities relevant to the committee's interests, and working discussions among the committee members. A primary interest during this first meeting was in data-related issues, including the NASA data census effort (and any discipline-specific

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follow-on) and the definition of criteria by which to assess the relative archival value and existing archival state of given data sets. Subcommittees were formed to consider the following issues:

• Archiving, retention, and restoration of existing data sets (community-wide).

• Needs and requirements in the future data system.

• Needs and requirements for future mission data archiving.

• Approaches to encourage a larger and more productive program of archival research within the Space Physics Division.

NSSDC acquired a number of specific action items to support these various subcommittee activities.

The next meeting of the full Steering Committee is tentatively planned for mid-October and will take place in Boulder, Colorado.

R. McGuire

International Ultraviolet Explorer (IUE) Agencies Discuss Final Archive

Charleen Perry (SAR) and Michael E. Van Steenberg represented NSSDC at the IUE three-agency (NASA, the European Space Agency [ESA], and Science and Engineering Research Council [SERC]) meeting at VILSPA (outside Madrid, Spain). The purpose of the meeting was to make decisions concerning the IUE final archive, method of data exchange, proprietary status, formats, media, and time tables.

The meeting was hosted by the ESA tracking station at Villa Franca (VILSPA) on May 22–25. In general, the three IUE agencies hold meetings every six months, alternating between NASA and ESA/SERC as host.

Highlights of the meeting were:

• The IUE final archive processing will produce output products in Flexible Image Transport System (FITS) format.

• The size of the IUE final archive will be about 750 gigabytes.

• It is expected that the archive will be used at near the current rate for five to ten years after the end of the IUE mission (i.e., 3567 spectra accessed from the archives per year).

• The signal-to-noise ratio will be increased by 20%-50% over current data.

• There will be approximately 100,000 observations in the IUE final archive.

• ESA and NASA will each process the observations taken at their respective ground stations.

• The primary copy of the final archive will be at NSSDC; copies for ESA and SERC will be provided (NASA may use NSSDC's working copy).

• Discussions concerning which computer to use for the processing are continuing, including the use of Goddard's CRAY Y-MP.

• Discussions concerning the use of 8 mm tapes for data transport in place of nine-track have begun and will continue over the summer.

NSSDC will archive the IUE data on optical disk platters using its new Data Archive Distribution Service.

M. Van Steenberg

Microgravity Data Management/Archiving Workshop

The NSSDC hosted the first Microgravity Data Management/Archiving Workshop at Goddard on July 18–19. The objective of the workshop was to initiate planning for the archiving of data from upcoming Shuttle and Space-Station-based microgravity investigations. The workshop brought together university as well as other scientists representing various disciplines supported by the NASA Office of Space Science and Applications (OSSA) Microgravity Science and Applications Division (MSAD); Mary Kicza, Roger Crouch, and others of MSAD; Joe Bredekamp of OSSA's Communications and Information Systems Division, managers of microgravity-relevant activities at various NASA field centers, and NSSDC staff.

The microgravity program will generate large data volumes. This was the first group attempt to quantify needs for data storage and access for a community beyond the initial Principal Investigators (PI). Key questions addressed included the following:

• What data need to be archived as having unmined science potential after initial PI analysis?

• What ground truth, calibration, and other data need to be archived to support the archived space data?

• What are the requirements for archiving returned samples, and how are these requirements to be met?

• What information system is needed to

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inform potential users of available data?

• What overall data system functionality is required, and how should this be organized and distributed?

The microgravity group was eager to learn of NSSDC and related data system support developments and implementations. Group members are very interested in using and adapting existing systems and standards where possible.

Over the next few years, the microgravity community expects to continue refining its archiving and data management requirements, in concert with NSSDC technological support and advice relative to data systems options and costs. As examples of near-term outcomes of this meeting, NSSDC will support the creation of Project Data Management Plans for Shuttle-based microgravity missions to fly within the next year or so and will support the creation of descriptions of and pointers to the few major extant microgravity data sets and data bases for inclusion in the NASA Master Directory at NSSDC.

J. King

NSSDC NEWS

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First Magellan Photos Received by NSSDC

During the first week of September, the NASA Regional Planetary Image Facility at JPL made available to the NSSDC three press release photographic images taken by the Magellan satellite of the surface of Venus. Film images in the form of prints, negatives, or positive transparencies are now available on request.

L. Blasso

Campbell Appointed Code 934.0 Branch Head

Effective August 27th, William Campbell was appointed head of Data Management Systems Facility, replacing Paul Smith who transferred to NASA Headquarters over two years ago.

L. Blasso

Calendar

October 1-3, 1990
Sixth Catalog Interoperability (CI) Workshop
Silver Spring Metro Center 2
Second Floor Conference Room
Silver Spring, Maryland

October 4-5, 1990
CCSDS International Master Directory Workshop
Silver Spring Metro Center 2
Second Floor Conference Room
Silver Spring, Maryland

October 16-19, 1990
Operational Satellites: Sentinels for the Monitoring of Climate and Global Change (OPSAT-90)
Hotel Washington
Washington, D.C.

October 23-24, 1990
NASA/NOAA/ERIM Conference
National Press Club
Washington, D.C.

NSSDC Services

Researchers can obtain information about NSSDC's data archive— how to contribute to it or how to request data from it (including cost and availability concerns)— by addressing their questions as follows:

INSIDE UNITED STATES

Data Submissions

Dr. H. K. Hills
NSSDC/Code 933.8
Goddard Space Flight Center
Greenbelt, MD 20771
Telephone: (301) 286-4106
FAX: (301) 286-4952
SPAN: NCF::HILLS

Data Requests

NSSDC/Code 933.4
Goddard Space Flight Center
Greenbelt, MD 20771
Telephone: (301) 286-6695
FAX: (301) 286-4952
Telex: 89675 NASCOM GBLT
TWX: 7108289716
SPAN: NCF::REQUEST

OUTSIDE UNITED STATES

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Goddard Space Flight Center
Greenbelt, MD 20771 U.S.A.
Telephone: (301) 286-7354
FAX: (301) 286-4952
Telex: 89675 NASCOM GBLT
TWX: 7108289716
SPAN: NCF::GREEN

Data Requests

World Data Center A for Rockets and Satellites/Code 930.2
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Telephone: (301) 286-6695
FAX: (301) 286-4952
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TWX: 7108289716
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