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EARTH SYSTEM MONITOR

World Ocean Atlas 1994 presents new ocean climatologies

NODC's Ocean Climate Laboratory issues new atlas and CD-ROMs

A guide to NOAA's data and information services

INSIDE

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The Ocean Climate Laboratory of NOAA's National Oceanographic Data Center (NODC) has completed the first major phase of a project to produce improved climatologies of principal ocean parameters. The new ocean climatologies are based on oceanographic data holdings of the NODC as of the first quarter of 1993. The results of this project are published in the multivolume *World Ocean Atlas 1994* and technical reports describing the data quality control and processing procedures. The atlas data sets are also now available on CD-ROM or Exabyte tape.

The international oceanographic and climate scientific communities need research quality data sets in order to describe the temporal and spatial variability of physical, chemical and biological parameters in the ocean. A research quality database requires development of procedures that provide an evaluation of the data. The Ocean Climate Laboratory (OCL) at the NODC is supported by the NOAA Climate and Global Change program to produce such scientifically quality-controlled oceanographic databases.

Work to date has concentrated on quality control of historical *in situ* temperature, salinity, oxygen, phosphate, nitrate, and silicate data, and the preparation of global, objectively analyzed fields of these parameters on a one-degree latitude-longitude grid for selected standard depth levels from the sea surface to 5500 m depth. The atlas volumes include global distributions of these measured parameters as well as the derived quantities of oxygen saturation and Apparent Oxygen Utilization (AOU). An example of one of the objectively analyzed fields presented in the *World Ocean Atlas 1994* is shown in Figure 1.

To date this project has produced:

- four ocean atlas volumes describing the objectively analyzed fields of ocean parameters,
- two technical reports describing the quality

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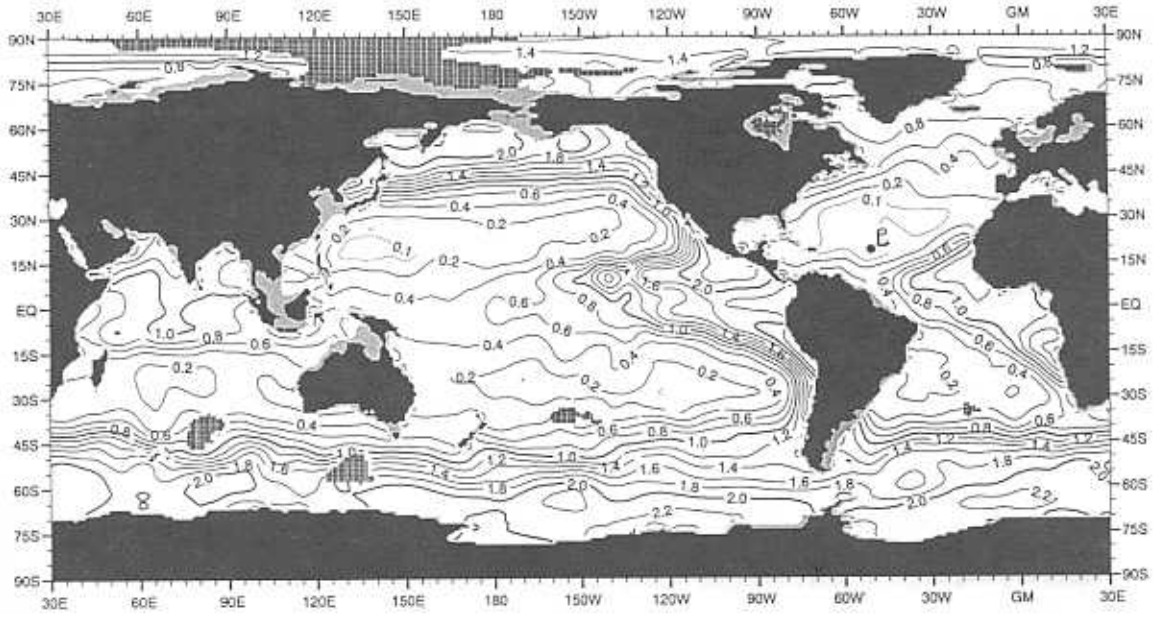

▲ **Figure 1.** Annual mean phosphate (μM) for the world ocean at 100 m depth. This objectively analyzed field is based on all phosphate data in the NODC data archives, regardless of year or season of observation.

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control and processing procedures, and
• a set of nine CD-ROMs containing the gridded data sets and the ocean profile data sets from which they were derived.
Table 1 lists the atlas volumes and related publications produced as a result of this work.

The *World Ocean Atlas 1994* (referred to as WOA94 in the rest of the text) data sets are available on CD-ROM and on Exabyte tape. The tape version is primarily for research scientists using workstations having sufficient computing power to handle large files. The WOA94 data sets include:
• global, objectively analyzed one-degree latitude-longitude mean fields for each of the atlas parameters,
• observed and standard level ocean profile data used to produce these atlases, along with quality control flags, and,
• five-degree square statistics of standard level values for each of the atlas parameters.
The ocean profile data are organized geographically on CD-ROM and by instrument type on Exabyte tape.

Background

The WOA94 series represents an extension and continuation of the *Climatological Atlas of the World Ocean* which was published 12 years ago (Levitus, 1982). This atlas (one printed volume and magnetic tapes) described the results of a project to quality control and objectively analyze the historical data sets of temperature, salinity, and oxygen that were on file at the National Oceanographic Data Center as of the late 1970s. The quality controlled versions of these NODC data sets were used as input to an objective analysis scheme that produced global, smoothed clima-

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Table 1. *World Ocean Atlas 1994* and related publications

Atlas series

- Conkright, M.E., S. Levitus and T.P. Boyer, 1994. *World Ocean Atlas 1994, Volume 1: Nutrients.* NOAA Atlas NESDIS 1. U.S. Department of Commerce, NOAA, NESDIS.

- Levitus, S. and T.P. Boyer, 1994. *World Ocean Atlas 1994, Volume 2: Oxygen.* NOAA Atlas NESDIS 2. U.S. Department of Commerce, NOAA, NESDIS.

- Levitus, S., R. Burgett, and T.P. Boyer, 1994. *World Ocean Atlas 1994, Volume 3: Salinity.* NOAA Atlas NESDIS 3. U.S. Department of Commerce, NOAA, NESDIS.

- Levitus, S. and T. P. Boyer, 1994. *World Ocean Atlas 1994, Volume 4: Temperature.* NOAA Atlas NESDIS 4. U.S. Department of Commerce, NOAA, NESDIS.

Quality control documentation

- Boyer, T.P. and S. Levitus, 1994. *Quality Control and Processing of Historical Oceanographic Temperature, Salinity, and Oxygen Data.* NOAA Technical Report NESDIS 81. U.S. Department of Commerce, NOAA, NESDIS.

- Conkright, M.E., S. Levitus and T.P. Boyer, 1994. *Quality Control and Processing of Historical Nutrient Data.* NOAA Technical Report NESDIS 79. U.S. Department of Commerce, NOAA, NESDIS.

Documentation for non-archived data

- Levitus, S., R. Gelfeld, T.P. Boyer, and D. Johnson, 1994. *Results of the NODC and IOC Oceanographic Data Archaeology and Rescue Projects.* Key to Oceanographic Records Documentation No. 19, NODC, Washington, D.C.

Documentation for archived data

- Levitus, S. and R. Gelfeld, 1992. *NODC Inventory of Physical Oceanographic Profiles.* Key to Oceanographic Records Documentation No. 18, NODC, Washington, D.C.

EARTH SYSTEM MONITOR

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News briefs

NGDC's Global Inventory of Biomass Burning project funded

The National Geophysical Data Center received funding from the Strategic Environmental Research and Development Program for the Global Inventory of Biomass Burning project. Operational Linescan System imagery from the Defense Meteorological Program (DMSP) will be utilized to locate fires each night. NGDC will also attempt to identify the temperature and subpixel area of each fire. From the fire area, vegetation type and density, the emission fluxes of greenhouse gases (including CO_2, CO, CH_4, O_3, and NO_2) will be computed.

This proposal was rated first among 300 new submissions to the Global Environmental Change Thrust Area. Cooperating agencies include the Environmental Protection Agency, the U. S. Geological Survey, and the U. S. Forest Service. Dr. Herbert Kroehl of NGDC is the principal investigator and Eric Kihn, also of NGDC, will be conducting most of the research.

NGDC's online data access systems development team awarded Silver Medal

The National Geophysical Data Center's online data access systems development team has been awarded the Department of Commerce Silver Medal for pioneering work in providing customers with easy online access to environmental data. Members of the team who represent each of the divisions in NGDC are: Susan J. McLean, Carla J. Moore, David M. Anderson, Eric A. Kihn, and Marcus O. Ertle. The team was presented with the award by Commerce Secretary Ronald H. Brown. The presentation ceremony was held in Washington, D.C., on October 13, 1994.

GODAR Regional Meeting for the Indian Ocean

The Third Regional IOC/IODE GODAR (Global Oceanographic Data Archaeology and Rescue project) meeting was held at the National Institute of Oceanography in Dona Paula, Goa, India during December 6-9. Countries that sent representatives included: India, Australia, Saudi Arabia, Iran, Kenya, Tanzania, France, and England.

The purpose of the GODAR project is to locate and digitize oceanographic data that exist only in manuscript or analogue form, and insure that these data and all digital oceanographic data sets, are submitted to one or more international data centers. All data gathered as a result of the GODAR project are being made available internationally without restriction.

The meeting was opened by Sydney Levitus of the U.S. National Oceanographic Data Center who serves as GODAR project director. Dr. S.K Joshi,Director General of the Indian Council of Scientific and Industrial Research presented opening remarks to the participants. Dr. B.N. Krishnamurthi, Director of the Department of Ocean Development, described Indian participation in international ocean programs and the structure of ocean related research and development in India.

National reports describing data holdings from each country were presented. Scientific reports on the circulation and biogeochemical processes in the Indian Ocean were presented as well. A presentation describing data management experiences associated with the Southern Ocean BIOMASS project was also given.

A meeting report will be available from the IOC in April, 1995. The report of the first GODAR meeting (held in Obninsk, Russia) is available as IOC Workshop Report 88. The report from the second GODAR regional meeting (Tianjin, China) is in press.

Soil Conservation Service funds serially complete summary-of-the-day data set

The National Climatic Data Center's Climate Applications Branch provided detailed cooperative station inventories for daily precipitation and maximum/minimum temperature for New Mexico and Colorado to the Cooperative Institute for Research in Environmental Sciences (CIRES) in Boulder, Colorado. The inventories are phase two of an ongoing project to build a serially complete database of daily precipitation/temperature data for the United States for the 1961-1990 period. This effort was recently completed for the state of Kansas, and produced encouraging results.

The inventory identifies those stations which meet minimum criteria for available data. The cooperative data for New Mexico, Colorado, and nearby states were also sent to CIRES to be used in building the dataset. The Soil Conservation Service is funding this project in an effort to build a serially complete database for conservation modeling applications.

PRC-U.S. meeting on data and information exchange

The fourth meeting of the People's Republic of China and U.S. Joint Coordination Panel for Data and Information Cooperation was held in Tianjin, China, from September 12-15, 1994. National Oceanic and Atmospheric Administration representatives attending included Ronald Fauquet, Ron Moffat, and Bobby Gill of the National Oceanographic Data Center; Dr. Michael S. Loughridge of the National Geophysical Data Center; and Joe Elms of the National Climatic Data Center.

The Joint PRC/U.S. Implementation Plan to digitize the Maury Collection (a collection of ship reports primarily from 1820-1860) was successfully coordinated during conferences between U.S. representatives and Chinese oceanographers. Detailed discussions between the Chinese National Oceanographic Data Center and NCDC at the working-level were also held.

Joe Elms also visited the Chinese National Meteorological Center (NMC) in Beijing, to present an invited lecture on the Comprehensive Ocean-Atmosphere Data Set and ocean climate research. In addition, Ronald Fauquet and Dr. Loughridge visited the Japan Hydrographic Office, the Japan Oceanographic Data Center of the Maritime Safety Agency, and the Ocean Research Institution of the University of Tokyo. Dr. Loughridge returned to the U.S. with bathymetric data from Chinese cruises for inclusion in NGDC's global marine geophysical database.

Bobby Gill presented a technical workshop on NODC modernization, QC software, and Mosaic. Ronald Fauquet toured CNODC facilities in Tianjin and coordinated with Chinese oceanographers on equipment modernization and improving data exchange. CNODC has committed to sending more data to NODC and to the Global Oceanographic Data and Archaeology and Rescue (GODAR) project, to continue with cooperative efforts and information exchange in technical areas including hardware, software, and networking, and forwarding World Ocean Circulation Experiment (WOCE) bathymetry data to the WOCE Data Assembly Center (DAC) at NGDC.

NOAA's National Environmental Watch

New interactive system provides earth system information to a broad spectrum of users

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The National Oceanic and Atmospheric Administration (NOAA) is deeply involved in the scientific investigation of the causes and effects of phenomena observed in the oceans and atmosphere. Too often, scientific information relevant to many environmental problems remains accessible only to those willing and able to read through highly technical research articles (Carnegie Commission, 1993). Nonetheless, the results and conclusions derived from these reports are often of interest to a broad segment of society.

Dissemination of the research results to nonspecialists such as planners, policy makers, and the general public is a primary responsibility of NOAA. Improving NOAA's capability to assimilate and disseminate reliable, clearly expressed, problem-specific Earth system information to a wide spectrum of users is a focus of the NOAA strategic plan. As a result of workshops and internal discussion, a prototype information delivery system called the National Environmental Watch has been built to convey the results from recent NOAA and NOAA-sponsored scientific studies to nonspecialists.

This delivery system is an electronic publication that allows multiview browsing by topic, author and keyword; interactive, graphic access and browsing; text and picture printing; and copying of text and graphics into other documents. The system was built in a cooperative effort between NOAA's National Climatic Data Center and Washington University's Center for Air Pollution Impact and Trend Analysis (CAPITA). This article discusses the philosophy behind this, as well as the evolutionary process of assembling the contents and of building an easy-to-use product that is designed to meet scientific information needs of generalists.

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Philosophy

Scientific investigations often produce information that furthers the understanding of observed phenomena. It is imperative, however, that this information be transferred into a form that specialists in areas not directly connected to the scientific inquiry can use in solving problems related to the welfare of society. These specialists could be, for example, policy analysts concerned with providing adequate water resources for human and agricultural use, engineers who design structures that must withstand variable environmental conditions, energy suppliers who must provide the power necessary to sustain economic development, and decision makers who regulate coastline activities.

It is imperative that information be transferred into a form that can be used by specialists in areas not directly connected to the scientific inquiry.

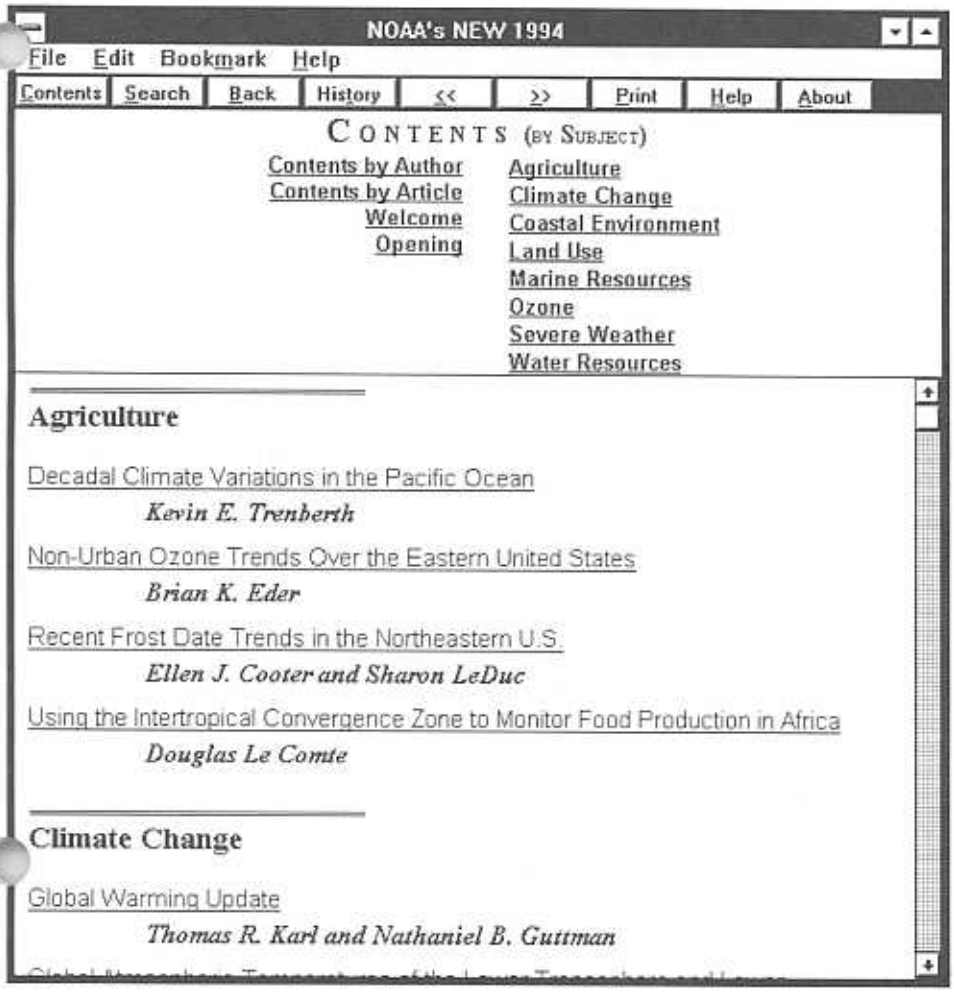
Since these specialists are not experts in the subject area of the scientific inquiry, one of the goals of the information delivery system was to provide research results in language that could be easily understood by a lay audience. A concomitant goal was to explicitly relate a research result to a specific environmental issue or problem so that the reader could immediately make the connection between his or her area of concern and the research. Relevance of the research to societal issues, clearly expressed, was of primary concern.

A third goal of the system was to provide information in a user-friendly environment. No matter how good the information may be, if it cannot be retrieved and accessed easily, it would have limited utility. Personal computers are now commonplace, so it was decided to produce an electronic information delivery system. Because Internet and UNIX environments are not as widespread as Microsoft Windows, the platform for development was chosen to be Windows version 3.1.

Platform Development

The electronic document delivery system utilizes the Microsoft Windows graphical operating environment for IBM compatible personal computers. MS Windows provides an effective, icon and menu-driven user interface that has become a standard and ubiquitous front end for many office software applications. The contents of the National Environmental Watch publication is delivered as a hypertext document. Hypertext documents are dynamic in that the viewing sequence is determined by the user by following detectable threads, jumps and instant pop-up windows (Shneiderman, 1992). Visually, hypertext documents contain color-enhanced words or pictures that are "hot." Clicking on a hot item may result in a jump to another part of the document, in a display of a linked figure or reference, in playing an animation sequence or in other dynamic responses.

The National Environmental Watch hypertext document facilitates a variety of display, browsing, and navigational avenues characteristic of intelligent documents (Parsaye and Chignell, 1992). The text is augmented with color graphic images and animations. Multiple views are provided for the contents (by subject and by author, see Figure 1), and hyper-links facilitate jumping between related topics. A keyword search engine lists the available keywords as well as the sections of their occurrence in the document. User annotations and



▲ **Figure 1.** Screen image showing contents options (subject contents displayed). Clicking on an underlined topic results in the display of the requested topic.

bookmarks allow for a limited extendibility by the user. Copying text from the hypertext document into other Windows applications such as word processors, as well as hard copy printing, fosters the further dissemination and re-use of information. The usability of the hypertext document is enhanced by context-sensitive online help support.

The implementation of the hypertext document uses the Help hypertext display engine provided with MS Windows for online Help display. After evaluating several alternative display tools, the Help engine was selected because: (1) Windows users are familiar with its features, (2) it is a free and robust software, (3) it is well suited for the contents and form of National Environmental Watch information, (4) it is strongly supported by text and graphic data preparation and compilation tools, and (5) its functionality can be extended by dynamically linked libraries (DLLs). In fact, the standard display software was extended with DLLs for the display of 256 color images and for the display of image sequences and animations.

The document preparation for hypertext was done primarily using the Microsoft Word for Windows word processor. The individual articles (38) were formatted uniformly with a consistent set of titles, headings, references, and other headings (Figure 2, for example). Throughout text files, special codes were inserted to embed the hypertext-related information. These included codes for hyper-links to literature references, to figures, and to the keyword search engine entries. These codes were added by a special macro command in the word processor. The resulting word processing document is exported in rich text format (RTF) and submitted for the Help compiler for assembly into a binary hypertext file. The resulting file contains the text and figures and is ready for display and dissemination on diskettes, CD-ROM, or through Internet.

Contents development

Since the intent of the electronic publication was to disseminate information about NOAA conducted or sponsored research, contributions were solicited from all NOAA line offices as well as from NOAA-supported Climate and Global Change researchers. The solicitation involved letters and personal phone calls. The effort was coordinated by the National Climatic Data Center under the guidance of an executive committee composed of NOAA research scientists. The guidelines for contributors were as follows:

- The publication is a survey of the type of information NOAA can provide to policy or decision makers and the general public. It is not meant to be an in-depth treatment of a specific topic. Contact points should be given so the reader can obtain more detailed information.
- Contributions must be related to a specific environmental issue or problem.
- Information must be of high quality. Contributions will be peer reviewed.
- Graphics are desired.
- Peer reviewed references should be included.

Since this was a prototype publication involving many segments within NOAA, it was not known what to expect from contributors. What was eventually collected was a set of contributions covering many diverse subject areas in a myriad of styles and formats. Topics ranged from marine life to stratospheric processes to weather forecasting to operational program descriptions. Formats ranged from hard copy to electronic word processing files. Graphics were received in many forms: various electronic formats, color prints, black and white copies, journal reprints, and hand-drawn figures.

It was obvious that meeting the goals of the publication required some standardization. A format was developed that included an abstract to introduce the subject, a relevance section to specifically relate the research to societal issues, a descriptive section(s) to explain the research results, illustrations, and a

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section with names, addresses and communications information of authors and/or contacts for obtaining additional information.

Most of the articles were rewritten in the editorial process to conform to the standard format. Graphics were also prepared anew from data submitted by the authors. The edited articles were then sent to the authors for approval. Often there were several iterations (mostly cooperative but sometimes contentious) in the transformation of an article from the original submission to the final version.

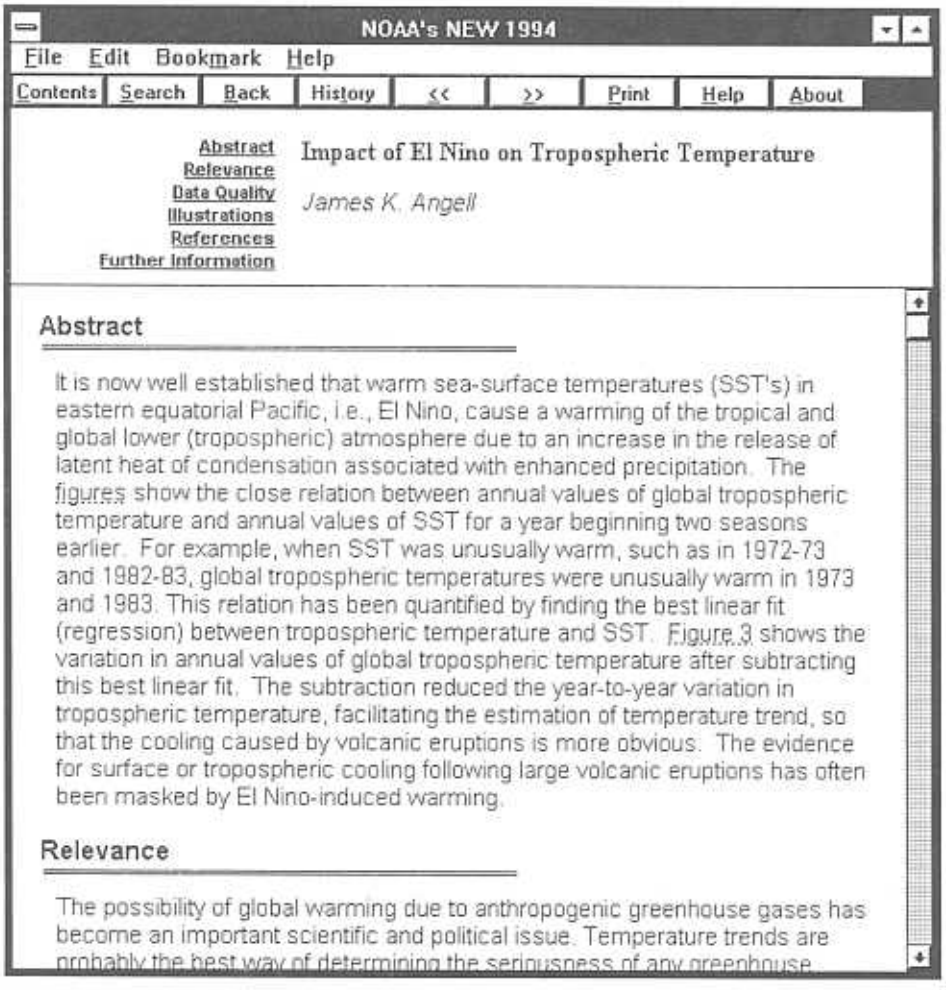
After the edited articles were approved by the authors, a committee composed of both NOAA and non-NOAA scientists reviewed the articles. This committee examined not only the content of the articles, but also the language and graphics, to insure that the articles were of high scientific quality as well as easily understood by an informed nontechnical reader.

Questions raised and comments made by this committee necessitated further editing of most articles. The revised, edited versions were again sent to the authors for approval. Several iterations were once again necessary to arrive at the final, published article.

Dissemination

The National Environmental Watch has been published on a CD-ROM and also on a set of six 3.5-inch diskettes. Both versions contain a setup routine for easy installation. Copies may be obtained by writing or calling:

Customer Services
National Climatic Data Center
37 Battery Park Avenue
Asheville, NC 28801
Phone: 704-271-4800



▲ **Figure 2.** Screen image showing consistent format and subject headings. Underlined figure references allow jumps to the figure display.

The electronic publication may also be downloaded in two forms via anonymous binary file transfer protocol (FTP) or via the NCDC Home Page on Mosaic (*http://www.ncdc.noaa.gov*). Both forms have been compressed with pk204g software.

First, the entire file (new94.zip) is available. This file is 5.5 megabytes in size. After downloading, the file should be uncompressed into a separate subdirectory on the computer's hard drive. Running "setup" from this subdirectory creates an icon from which the program can be started.

Second, a diskette (3.5-inch) version is available. There are six files (new_dsk1.zip through new_disk6.zip) to download. Once downloaded, each file should be uncompressed onto a separate diskette, and each diskette should be labeled (Disk 1 through Disk 6). Running "setup" on the first diskette installs the program on the computer's hard drive and creates an icon from which the program can be started. An ASCII "readme" file can also be downloaded.

To FTP the files, access the FTP software and open the NCDC computer (*ftp.ncdc.noaa.gov*). The following sequence of instructions will allow you to download the files:

user name: *anonymous*
password: *<your e-mail address>*
change directory: *cd pub/noaanews*
set binary mode: *binary*
download file: *get <file name>*

Lessons learned

Preparation and publication of National Environmental Watch as a prototype information delivery system was a learning experience. Several lessons were learned which will facilitate building similar systems. When soliciting contributions, it is expedient to specify a format for text and graphics. Specifications should include not only text arrangement, but also word processing programs and graphics formats that can be easily transformed into one common format. For example, conversion of text prepared in Microsoft Word to Word Perfect is not always straightforward. Scanning of hard copy figures into bitmaps is tedious and error-prone, and reduces image quality. Electronic graphic formats are much more preferable for an electronic publication. How-

ever, many different graphics software packages are in use, and they cannot all be translated into a common format. Standardizing the input information for National Environmental Watch would have removed many of the problems of editing.

When preparing a publication in a cooperative manner between two or more physically separated institutions, it is important that each party fully understands the capabilities and needs of the other parties. This lesson was learned when some illustrations were prepared by the National Climatic Data Center in a form that was not totally compatible with the capabilities at Washington University. It was also learned when editing text concurrently at both locations.

One of the disadvantages to creating hyper-media applications is that "developers" tend to be the gate-keepers of changes in information. Authors typically change information in their articles by writing a new version. Hypertext, however, requires additional formatting and organization that must be completed by a "hypertext developer." Once a section of text is formatted, it is rather difficult for the author to change the text; the developer must make the change. A new factor is therefore introduced into the writing process that must be understood by the author. While small changes can be made, larger changes slow the process and add to the cost by involving the developer in tasks that are secondary to the hypertext software development. Hence, we have learned that for future electronic publications, editing of content and form has to be completed before "typesetting" into hypertext. Also, "galley proofs" or drafts of the hypertext document, could be distributed to all authors for proofreading and verification.

Communications during the initial stages of the preparation of the publication were generally by telephone and mail. It quickly became apparent that this mode of communication was inefficient, so electronic mail and FTP file transfer through Internet mailboxes became the primary modes of data and message exchange between institutions. This combination yielded an efficient and effective communication process. There were only a few physical mailing exchanges and we anticipate even less need for "snail mail" in the future.

Conclusion

The electronic hypertext delivery of the information contained in the National Environmental Watch allows for contextual understanding and browsing that would have otherwise been difficult using standard delivery methods such as hard copy. Linking related articles within themselves and to other articles increases the context of the information by easily placing an article's contents in relation to the contents of itself and other articles. This expansion of the context of the information increases the understanding of the article itself and helps the reader relate the information to other articles. The reader can therefore gain a greater understanding of the whole publication.

The future for this form of electronic publication will depend on the acceptance by the user community of the National Environmental Watch. This prototype could be updated periodically, or other kinds of information could be published. Under consideration are hypertext linking of a collection of extended abstracts that describe ongoing NOAA Climate and Global Change research efforts, and publication of background articles that are being used for the Intergovernmental Panel on Climate Change (IPCC) reports.

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Parsaye, K. and M. Chignell, 1992: *Intelligent Database Tools and Applications.* Wiley.

Shneiderman, B., 1993: *Designing the User Interface: Strategies for Effective Human-Computer Interaction.* Addison-Wesley. ■

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NCAAS also provides online access to AVHRR products following their near real-time release from collection and processing sites at NOAA, the National Environmental, Satellite Data, and Information Service (NESDIS), and the National Marine Fisheries Service (NMFS). The NCAAS page on the NODC Mosaic server is located at URL address: *http://www.nodc.noaa.gov/NCAAS/ncaas-home.*

Future developments

NODC is currently working to provide access to its relational databases using Mosaic. During the development phase, access will be restricted to NODC employees for security and other technical reasons. If this concept works, however, access to the NODC's archive databases could be made available to all Internet users. The security problem will be solved by acquisition of a replication server or "firewall" computer that will enable outside users to access NODC data without gaining access to other areas of NODC's computer system.

The mechanism being tested to implement this concept is SQL Gateway, in particular, the Web Data Base (WDB) package based on syperl (a collection of scripts that allow interaction with Sybase databases). The package produces a HyperText Markup Language (html) form that allows users to enter search criteria in order to search the database. The results are then formatted as a temporary html document that Mosaic displays to the user. Results of the tests performed to date have been encouraging, and development is continuing.

Data sets are received in NODC from all over the world to manage, store, and distribute. Online communication is the data delivery system of the future. Look for more online data distribution as NODC streamlines its service capabilities to accommodate the growing demands of the world's scientific community and online users at large. ■

The Global Inventory of Biomass Burning (GIBB) project

NGDC develops first systematic global inventory of fires and resulting gas emissions

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NOAA/NESDIS

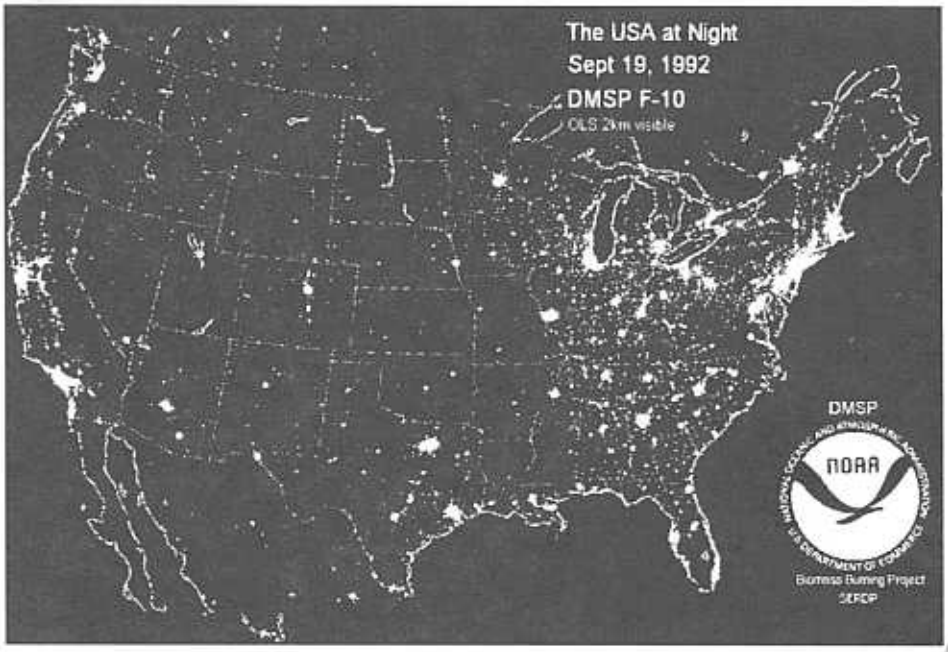
The National Geophysical Data Center (NGDC) has undertaken the Global Inventory of Biomass Burning (GIBB) project to produce the first systematic, global inventory of fires and to compute the resulting greenhouse gas emissions, including CO, CO_2, CH_4, O_3, NO_2, hydrogen, methylchloride, and particulates. Biomass burning on a global basis is a serious environmental concern, accounting for about 40% of the greenhouse gases in the atmosphere. This problem is directly related to population in "Third World" countries, and therefore of increasing concern with rapid population growth.

The GIBB project will construct daily maps of fire locations and estimate the quantity of greenhouse gases emitted by these fires. Assessment of greenhouse gas fluxes is a primary objective of the International Geosphere-Biosphere Program, the U.S. Global Change Research Program, and the Intergovernmental Panel on Climate Change (IPCC).

Global fires are clearly seen in nighttime images recorded by Defense Meteorological Satellite Program (DMSP) instruments at visible and near infrared wavelengths during each orbit. Forest fires during this summer's tragic fire season in the western United States provided an opportunity for us to develop, test, and evaluate our fire detection algorithms.

Project methodology

GIBB uses imagery recorded on Defense Meteorological Satellite Program (DMSP) satellites. The DMSP mission is to record meteorological, oceanographic, and solar-geophysical data in support of DOD operational requirements. The DMSP program currently operates three satellites in sun-synchronous, low altitude, polar orbits. The orbital period is 101 minutes and the inclination is 99°. DMSP program management has been moved to the Integrated Program Office in NOAA/NESDIS.



▲ **Figure 1.** DMSP nighttime imagery of the United States.

The complement of instruments on DMSP satellites include the Operational Linescan System (OLS) imager and other meteorological and solar-geophysical instruments, notably microwave imagers and sounders. OLS instruments measure visible/near- infrared emissions at 0.4-1.1 μm and thermal infrared emissions at 10-13 μm across a 3,000 km swath at 0.5 km or 10 acre resolution.

For global coverage, data are typically reduced to 2.7 km resolution or 310 acres per pixel by on-board averaging. At night the visible data are amplified by on-board instrumentation, making it possible to detect faint sources of light. In fact, visible detection of high-temperature subpixel sources (i. e., fires) is easily accomplished, because the OLS has a lower range of 10^{-9}W/m²*sr (watts per square meter times steradians) in the visible band. OLS visible imagery can be therefore be used to identify fires active at

Table 1. Summary of active fires greater than 200 acres in Colorado during the period of July 1-10, 1994.

Fire name	Dates active	Date detected	Total acres
Hourglass	July 1-8	July 1	1,275
Elk	July 4-7	July 4	950
Pyramid Rock	July 4-8	July 5	1,050
Spud Patch	July 4-9	July 4	1,087
Wake	July 4-8	July 4	3,460
Burn Canyon	July 5-9	July 5	200
Mitchell Lake	July 5-9		270
South Canyon	July 5-9	July 6	2,430
Rabbit Mount	July 6-9	July 6	630

National Geophysical Data Center
NOAA/NESDIS E/GC2
325 Broadway
Boulder, CO 80303
E-Mail: ekihn@ngdc.noaa.gov

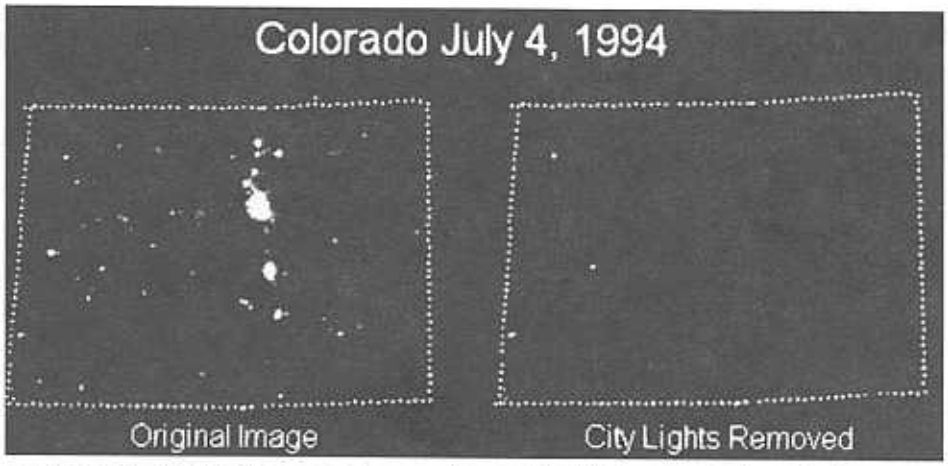
night. In addition, the thermal imagery can be used to produce more accurate estimates of the area of each fire.

DMSP nighttime imagery record all sources of visible and near infrared emissions including city lights, aurora, fires, oil gas flaring, moonlit clouds, lightning, and squid fishermen. Because city lights and industrial facilities such as gas flares also put out light and heat at night, the fire detection algorithm distinguishes between stationary lights (like the U.S. city lights as seen in Figure 1) and ephemeral lights from active fires. In Figure 1, you will note urban areas of the United States; in fact, DMSP nighttime imagery may be used to define urban areas and make estimates of population density.

A running box filter is used to select light pixels and background radiances at visible and thermal infrared wavelengths. Non-fire pixels are discarded. Thermal infrared temperatures are used to estimate the subpixel area of the fire. Using the fire model developed by the U.S. Forest Service, we are able to estimate the flux of greenhouse gas emissions.

Forest fires in the Western United States

The summer of 1994 proved to be a very active forest fire season in the Western United States. Numerous fires ravaged large areas of the West, notably, in Colorado, Washington and Idaho. Smaller fires raced across high prairie grasslands. Intense fires burned large areas of pine forests in U.S. National Forests, some as large as 100,000 acres near Rabbit Creek in Idaho. The powerful spectacle of these natural or anthropogenic phenomena attracted national media attention as lives, property, and areas of natural beauty and biodiversity were threatened. These fires were recorded in DMSP nighttime images.



▲ **Figure 2.** DMSP OLS smooth imagery for the Elk, Wake, and Spud patch fires (from north to south).

Initial ground truth efforts focused on the following questions:

- What is the smallest fire that DMSP imagery can see?
- How does the fire pixel area compare with the USFS estimate of acreage burned?
- Can short-lived, grass fires as well as long-lived, intense forest fires be seen?

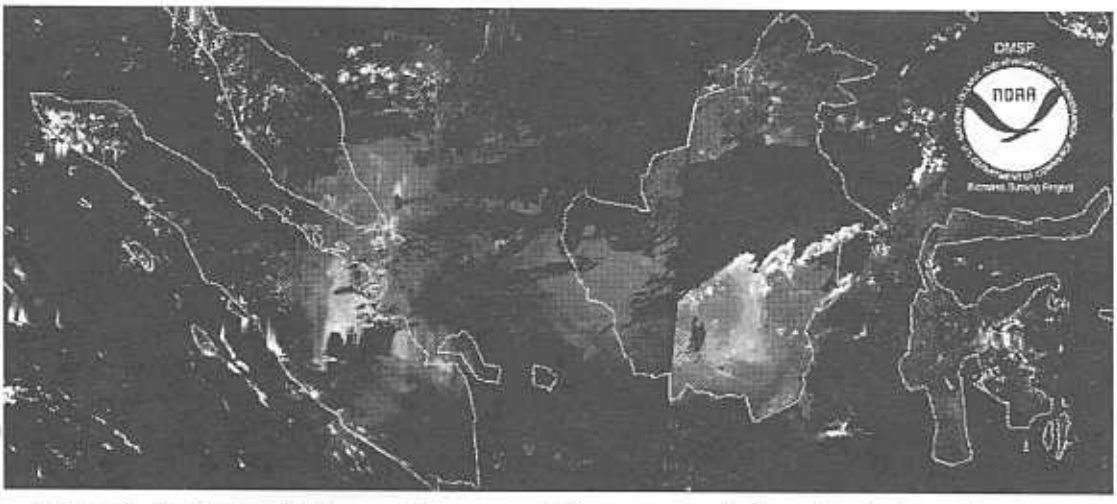
We used the OLS smoothed imagery for the Colorado fires of July 1-10, 1994 and the Idaho fires of August 22-Sept 5, 1994 in our tests. Early results indicate a high success rate for the fire detection algorithm. Forest fires as small as 200 acres total area burning in Burn Canyon, Colorado were captured in the imagery. Table 1 summarizes the active fires of total area greater than 200 acres for the period in Colorado.

Fires that occurred during Colorado's very intense fire season were reported by the USFS and all were recorded in the smooth OLS imagery, except the Mitchell Lake fire which was obscured by cloud cover during its early active period. Fires are generally most apparent during the intense initial phase of the burn. Figure 2 shows the DMSP OLS smooth imagery for the Elk, Wake and Spud patch fires from north to south.

In addition, most fires resulted in enhanced thermal infrared temperatures over the neighboring background temperature. From the temperature increase, one can infer the subpixel area as well as possibly detect daytime fires (Figure 3). Simple area estimates produced from the OLS data were in reasonably good agreement with actual area burned for the period (11,082 acres burned versus 9,400 acres initial estimate.)

We also investigated the Idaho fires of August 20-Sept 5, 1994 (Figure 4). The interesting aspect of these fires was their evolution with time from smaller isolated fires into a very large burn area. For

– *continued on page 10*



▲ **Figure 3.** Daytime visible image of Borneo and Singapore. Smoke from fires in Borneo hangs over Singapore (clouds were removed using IR sensor information applied to the visible image).

GIBB project, from page 9

example, the largest cluster of fire pixels in Figure 3 is estimated to represent a fire area of over 5,000 acres. The Rabbit Creek fire was observed by DMSP to last for two weeks, and evolved in time and changed direction during that period until it consumed 100,000 acres. These fires were quite easily visible in nighttime OLS data and again the area estimation proved to be within 20% for the total burn.

Global inventory of fires project

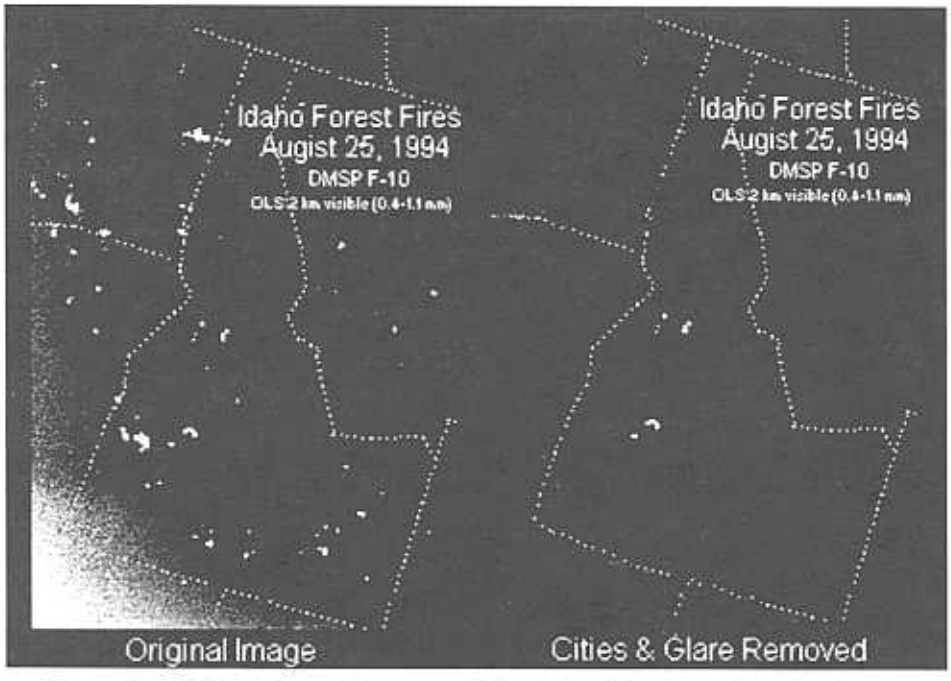
Colorado's forest fires fueled local concern and interest over fire suppression as fires threatened local property, natural resources and lives, however, the fires were of little climate and global change interest. Biomass burning is an accepted agricultural and hunting practice in many parts of our world, especially in remote areas. Figure 5 shows a nighttime visible image of India without fires on the left and with fires on the right. In the left image you see cities and oil flares. Note the region near northeastern India where numerous fires are burning. Similar agricultural fires burn in many other parts of the world.

On a global scale, accounts for 30-40% of the greenhouse gases released into the atmosphere each year, of which only 10% come from forest fires. As population pressures for agricultural land increase, the number of fires increases and the resulting greenhouse gas emissions also increase. From a policy position, the Intergovernmental Panel on Climate Change is responsible for assessing all greenhouse gas emissions from all sources including biomass burning. For global change issues, the International Geosphere-Biosphere Program stimulates scientific interest in this area of environmental concern.

▲ Figure 5. Nighttime visible image of India without fires (left) and with fires (right).

The GIBB project is creating a global database of permanent nighttime lights. This database will be used primarily to remove city and industrial lights from the nightly OLS data. The remaining light sources can then be classified as fires by using appropriate filters on the data, as was done in Figures 1 and 2. Once this database and filtering system has been established on a global scale, estimates of the burn area will be used to estimate greenhouse gas emissions. The data generated will be presented on regional and global bases. In addition to this primary product, other databases including population density, observed lightning, and gas flaring will be prepared.

These data will address several key scientific and policy questions: What is the relative contribution of biomass burning to the Greenhouse Effect? How does biomass burning affect tropospheric chemistry and the cloud nucleation processes? How do climate variations and changes in human populations affect the spatial and temporal patterns of biomass burning? Are countries adequately meeting their emission target through changes in agricultural and forestry practices? What are the scenarios for future trace gas emissions resulting from climate change and population growth predictions? These and other "greenhouse" questions will be answered by the GIBB's look at global biomass burning. ■



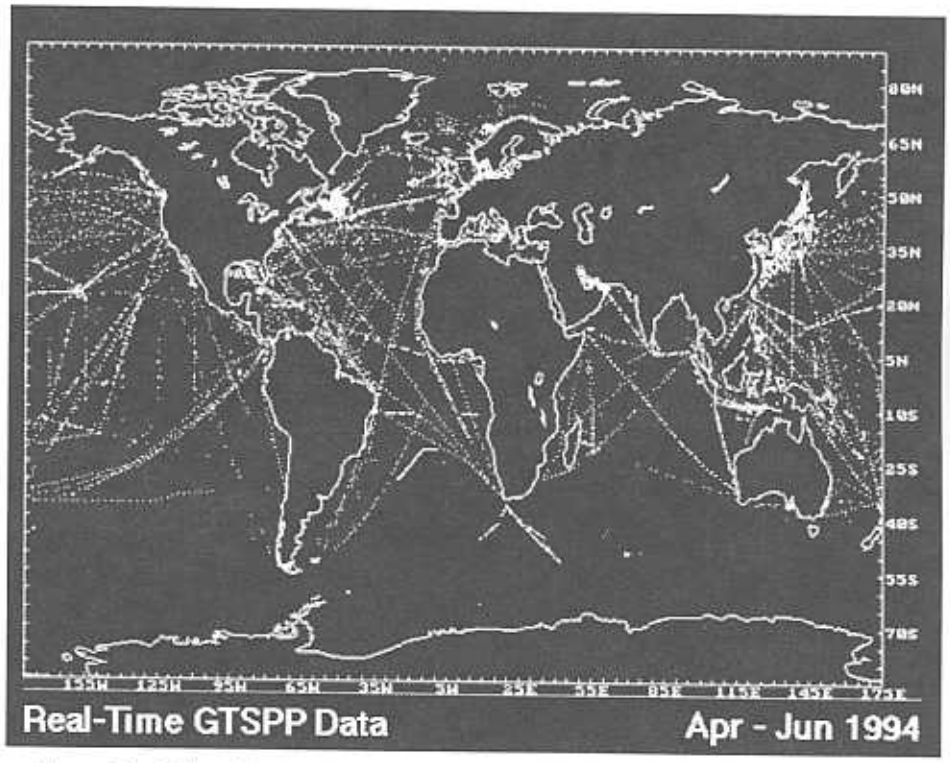
▲ Figure 4. DMSP OLS smooth imagery of the 1994 Idaho forest fires. The largest cluster of fire pixels is estimated to represent a fire area of over 5,000 acres.

NODC Online eases access to ocean data

National Oceanographic Data Center building Internet access

Judith Snider
Information Services Division
National Oceanographic Data Center
NOAA/NESDIS

Early in 1994, the National Oceanographic Data Center (NODC) began a project to make its data and information resources available to users around the world over the Internet. The NODC established both Gopher and Mosaic servers using these two popular Internet browse tools. Initially, the NODC installed information files that describe its data holdings, products, and services. The NODC Gopher, for example, provides what is essentially an online version of the *NODC Users' Guide*. The ultimate goal, however, is to make NODC data easily accessible to users via the Internet. This developing service is called NODC Online, and is now available through the NODC Mosaic home page on the World Wide Web.



▲ Figure 1. Major shipping lanes are evident in GTSPP data location plots available from NODC via the Internet. Quarterly GTSPP upper ocean temperature and salinity data sets and corresponding station locations plots can be automatically downloaded from the NODC Mosaic server.

NODC oceanographic data resources

As one of the national environmental data centers operated by the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce, the NODC maintains the world's largest archive of historical oceanographic data. The NODC holds physical, chemical, and biological marine and estuarine data. These data are used by customers around the world to support a wide variety of applications in research, ocean engineering, resource management, and other fields.

NODC's data resources are especially valuable to scientists studying global change. Because they provide the historical context for making comparisons with observations taken today, these data provide the key for predicting the future. Ocean modelers often use NODC to make hindcasts to test whether climate models can correctly predict past events and changes in ocean climatology. As NODC's data become more valuable and useful for such studies, it becomes increasingly important to make NODC's data resources more easily available.

A limited amount of NODC oceanographic data and information has been available online for project-specific users for some time. Now, however, NODC's Mosaic home page offers these resources to the global ocean community through the Internet. Currently three major data sets are available online:

- the Global Temperature-Salinity Pilot Project (GTSPP),
- the NOAA Marine Environmental Buoy Information Database, and
- the NOAA CoastWatch Archive and Access System (NCAAS).

GTSPP data

GTSPP is a cooperative international project seeking to develop and maintain a global ocean temperature and salinity resource, with data that are both up-to-date and of the highest quality possible. Both real-time data (transmitted over the Global Telecommunications System) and delayed-mode data are received at NODC. In addition, delayed-mode data with Science Center quality flags are acquired and incorporated into the GTSPP database.

– continued on page 12

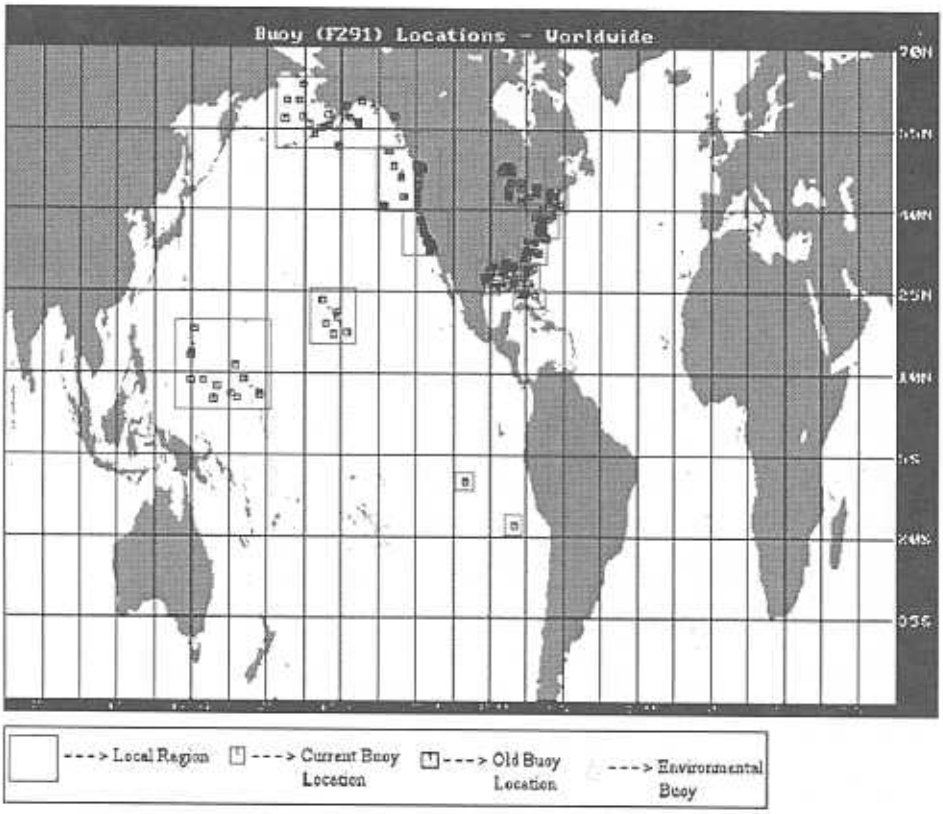
NODC on the Internet

NODC's oceanographic data and information resources on the Internet can be accessed via the:

NODC Mosaic Home Page
http://www.nodc.noaa.gov/

NODC Gopher
gopher.nodc.noaa.gov

National Oceanographic Data Center
NOAA/NESDIS E/OC2
1825 Connecticut Avenue, NW
Washington, DC 20235
E-mail: jsnider@nodc.noaa.gov



▲ **Figure 2.** Worldwide map of NOAA marine environmental data buoys and Coastal-Marine Automated Network (C-MAN) stations. This interactive map provides users with a point-and-click interface for detailed information about these data.

stations located on piers, offshore towers, lighthouses, and beaches (Figure 2).

Because of the very large volume of these data (currently about 10 gigabytes), the NODC is releasing these data on a continuing series of CD-ROMs. Buoy data is also available to users through NODC's Mosaic home page (at URL address *http://www.nodc.noaa.gov/BUOY/buoy.html*).

NOAA CoastWatch data

The NOAA CoastWatch program is designed to provide Federal and state decision-makers and researchers with rapid access to satellite data and imagery of U.S. coastal and offshore regions. NOAA CoastWatch focuses on specific environmental events (e.g., red tides), accumulating algal biomass, volcanic eruptions, and mapping tidal wetland change. NOAA's CoastWatch Active Access System (NCAAS) is utilized for the archival and distribution tasks of CoastWatch Advanced Very High Resolution Radiometer (AVHRR) data products (Figure 3) and NOAA fixed coastal buoy data.

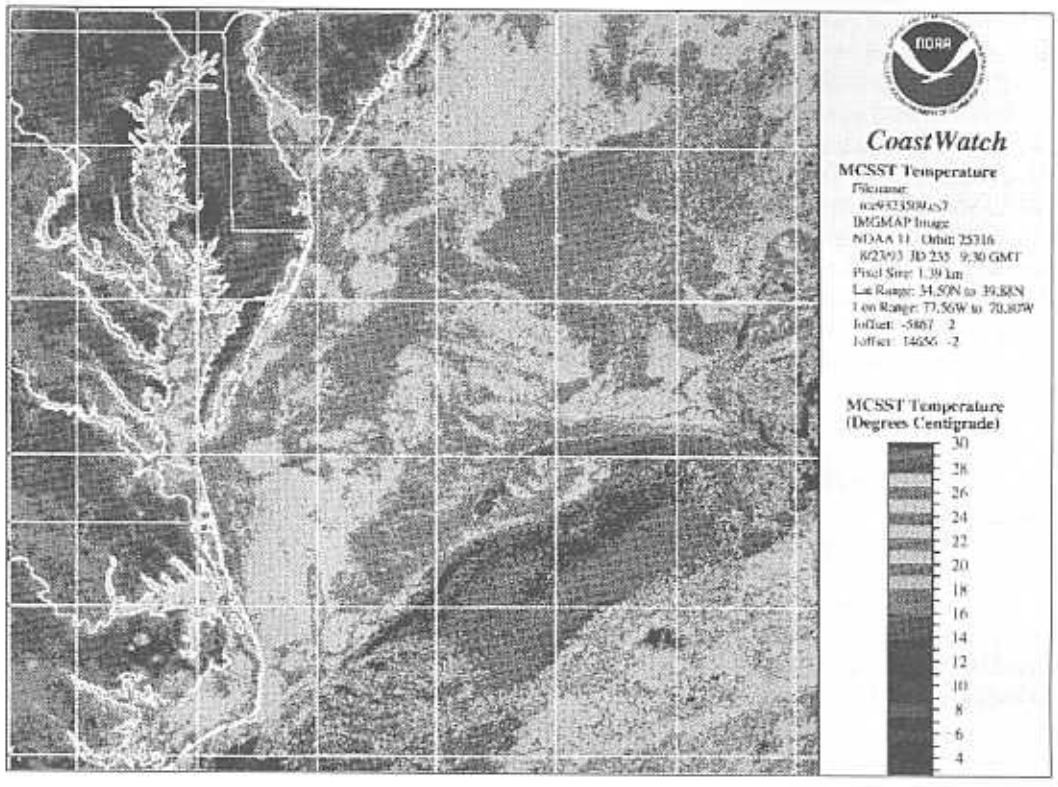
– continued on page 7

NODC online, from page 11

The GTSPP module is available to Internet users under the NODC Online section of the NODC Mosaic home page (at URL address *http://www.nodc.noaa.gov/GTSPP/gtspp-home*). The GTSPP page on NODC's Mosaic server enables users to download GTSPP data location plots and data sets via FTP by simply clicking on the appropriate items listed (Figure 1).

NOAA buoy data

The NOAA Marine Environmental Buoy Database (NODC File 291) is one of the largest and most frequently used data archives maintained by NODC. This database holds wind, wave, and other marine data collected by the NOAA National Data Buoy Center (NDBC). Data are collected from NDBC moored buoys and from Coastal-Marine Automated Network (C-MAN)



▲ **Figure 3.** Gray-scale rendering of NOAA CoastWatch sea surface temperature analysis for Chesapeake Bay and the mid-Atlantic region off the U.S. east coast. In the original image, colors depicting sea surface temperatures are keyed to the temperature scale at the lower right.

World Ocean Atlas 1994, from page 2

tological fields of various parameters on a one-degree latitude-longitude grid at standard depth levels from the sea surface through 5500 meters depth. The analyses were published and made available in digital form to the international research community.

In the 12 years since being released, these analyses have been used in numerous ways by the oceanographic and climate research community. For example, the analyses have been used to provide both initial and boundary conditions in numerical models of the Earth's climate system and to perform diagnostic studies of the ocean's role in this system. In particular, the satellite altimeter community has used fields of steric sea level computed from these objective analyses as sea-truth for studies evaluating altimetric measurements of sea level.

Five-degree square statistics of the quality controlled data sets were also made available and have been used in a variety of ways for climate studies and operational purposes such as quality control of synoptic ocean data. For example, these five-degree statistics are being used to quality control new or existing data being processed by the National Ocean Service at their Ocean Products Center in Camp Springs, Md. and by the Marine Environmental Data Service of Canada (as part of the Global Temperature-Salinity Pilot Project). The older analyses have also been used to plan expeditions.

Another result of this project is an atlas of the northern Indian Ocean, prepared to support the Joint Global Ocean Flux Study (JGOFS) program in the Indian Ocean (Conkright *et al.*, 1994).

Data sources

Since 1982 a great number of additional oceanographic profiles have accumulated in the archives. In particular, substantial numbers of older historical data (e.g., 450,000 mechanical bathythermograph profiles) have been submitted to the NODC. The data used in this project are all the data found in the NODC archives as of the first quarter of 1993. Levitus and Gelfeld (1992) show global distribution maps of the data held in these files for all years (1900-1992).

In addition, data gathered as a result of the NODC's National Oceanographic Data Archaeology and Rescue (NODAR) and the IOC/IODE Global Oceanographic Data Archaeology and Rescue (GODAR) projects, not yet incorporated into the NODC master archives, were included in this study. GODAR seeks to: (1) catalog and digitize data available only in manuscript or analog form, as well as digital data not currently available at one of the oceanographic data centers; (2) ensure that all oceanographic data are available for international exchange and are archived in digital form at two or more data centers; (3) perform quality control on all data. Data targeted for rescue include physical parameters (i.e., temperature, salinity), chemical parameters (i.e., oxygen, nutrients), biological parameters (i.e., chlorophyll, biomass), and surface marine meteorological observations. A description of the NODAR and GODAR projects can be found in Levitus *et al.* (1994e). In brief, more than one million temperature profiles and 300,000 salinity profiles have become available to the international oceanographic community as a result of this project.

Table 2. Objectively analyzed fields of ocean parameters available in the *World Ocean Atlas 1994* and atlas data sets.

Parameter	Annual*	Season**	Month***
Temperature	X	X	X
Salinity	X	X	X
Dissolved oxygen	X	X	
Apparent Oxygen Utilization	X	X	
Oxygen saturation	X	X	
Phosphate	X		
Nitrate	X		
Silicate	X		

* Annual - composite of all data regardless of season or year.

** Season - data composite based on seasons following the Northern Hemisphere convention. Seasons are defined as:
- Winter (January - March)
- Spring (April - June)
- Summer (July - September)
- Fall (October - December)

*** Month - data composite for each month. Monthly analyses are for 19 standard depth levels only (0-1000 m).

Quality control procedures

The quality control procedures applied to the historical data sets have been documented in two NOAA Technical Reports (Boyer and Levitus, 1994; Conkright *et al.*, 1994). Procedures include flagging individual observation or pairs of observations for failing range checks, exceeding standard deviation criteria, being hydrostatically unstable, or exceeding vertical gradient criteria among other problems. Profiles marked for one or more possible problems are flagged with a special "whole profile" indicator.

Data products

The philosophy of this project is to produce a hierarchy of documented, value-added data sets and products so that investigators can use these data sets and products with an understanding of how the data have been analyzed and processed, and process the data using different methods if desired.

For example, the most basic data sets produced by this project are the observed level profiles with quality control flags. The quality control procedures used are well documented, so individual investigators can choose for themselves whether to accept the results of the quality control criteria we have developed. Scientists who want to use different criteria for quality control can do so.

Profiles of the data interpolated to standard depth levels are provided in digital form as well as profiles of the observed level data. Products such as seasonal five-degree square statistics of the data values at standard levels, and the objective analyses of various parameters at standard levels for different compositing periods are also provided (Table 2).

To maximize the utility of these data sets and analyses, we are distributing them digitally in two different ways. We have prepared a set of CD-ROMs, in which all digital products are available as ASCII files, with the largest

– *continued on page 14*

World Ocean Atlas 1994, from page 13

file being about 20 megabytes in size (Table 3). Profiles are organized by 10-degree squares (WMO system) so that investigators can select data by relatively small geographic regions if desired. Availability of inexpensive CD-ROM readers with recording formats governed by international standards makes this technology the medium of choice for distribution.

For investigators with more powerful computer systems, the *World Ocean Atlas 1994* data sets are also being made available on Exabyte (8mm helical scan) tape. On tape, the data sets are compressed and the ocean profiles are in separate files by instrument type (e.g., all Nansen cast profiles). Substantial hard disk resources are necessary to decompress these files. Suggestions from users will help determine other schemes for distributing the data. For example, we could produce a set of CD-ROMs or Exabyte tapes that contained the profile data stored in individual yearly files for each instrument type.

Future work

Future work will focus on producing data sets and products for additional parameters such as chlorophyll, primary productivity, and nitrite among others. In particular, we hope to acquire enough data so we can produce seasonal analyses of nutrients. Seasonal analyses of nutrients, chlorophyll, and other biochemical parameters could enhance understanding of biogeochemical cycles, as well as the interannual variability of these parameters. We have begun efforts to archive biological data such as phytoplankton and zooplankton measurements. This effort is hampered by the lack of metadata with which to document such measurements and the lack of digital data.

Quality control and processing procedures will be improved in response to what the Ocean Climate Laboratory has learned in producing this work, and in response to suggestions from investigators using the WOA94 data sets and products. In addition, substantial amounts of previously unavailable historical oceanographic data are becoming available which justify repeating the WOA94 series or a similar series, within one or two years. A global high-resolution spatial analyses of temperature and perhaps salinity will be produced.

For comment or suggestions on any of these products please contact: e-mail: *atlas94@nodc. noaa.gov*

To order *World Ocean Atlas 1994* data products

Prices and ordering information for *World Ocean Atlas 1994* data products are available via the Internet on the NODC Mosaic Home Page (at URL http://www.nodc.noaa.gov/) or from:

National Oceanographic Data Center
NOAA/NESDIS E/OC21
1825 Connecticut Ave., NW
Washington, D.C. 20235
Phone: 202-606-4549
Fax: 202-606-4586
E-mail: services@nodc.noaa.gov

Table 3. *World Ocean Atlas 1994* CD-ROMs

- **Disc 1**
  - Objectively analyzed temperature fields
- **Disc 2**
  - Objectively analyzed salinity fields
  - Five-degree square statistics
- **Disc 3**
  - Objectively analyzed oxygen, apparent oxygen utilization, oxygen saturation, phosphate, silicate, and nitrate fields
- **Disc 4**
  - Observed level profile data for the North Atlantic (0°-40°N), North Indian and South Indian oceans
- **Disc 5**
  - Observed level profile data for the North Atlantic (40° N-90°N) and South Atlantic oceans
- **Disc 6**
  - Observed level profile data for the North Pacific (0°-30°N) and South Pacific oceans
- **Disc 7**
  - Observed level profile data for the North Pacific (30°N-90°N)
- **Disc 8**
  - Standard level profile data for the Atlantic and Indian oceans
- **Disc 9**
  - Standard level profile data for the Pacific ocean
- **Future Disc 10**
  - Upper ocean thermal structure

Acknowledgments

Substantial amounts of historical oceanographic data used in this study were located and digitized with support from several agencies. Data Archaeology and Rescue projects were funded by the NOAA Climate and Global Change (CGC) Program, the NOAA Environmental Science Data and Information Management Program, the National Science Foundation, and the Office of Naval Research. Analysis of these data has been supported in part by the Atlantic Climate Change and Data and Information Management elements of the NOAA CGC program.

The IOC/IODE Global Oceanographic Data Archaeology and Rescue project has been responsible for the location and "rescue" (digitization) of substantial amounts of historical oceanographic data. We would like to acknowledge both the international community of scientists who have submitted their data to national and regional data centers and the data managers at the various data centers.

References

Conkright, M.E., and S. Levitus, T. P. Boyer, D.M. Bartolacci, and M.E. Luther, 1994. *Atlas of the Northern Indian Ocean.* Unpublished report, Univ. of South Florida, St. Petersburg, Fl.

Levitus, S., 1982. *Climatological Atlas of the World Ocean.* NOAA Professional Paper 13. U.S. Department of Commerce, NOAA, NESDIS.

Levitus, S. and R. Gelfeld, 1992. *NODC Inventory of Physical Oceanographic Profiles.* Key to Oceanographic Records Documentation No. 18, NODC, Washington, D.C.

Levitus, S., R. Gelfeld, T.P. Boyer, and D. Johnson, 1994. *Results of the NODC and IOC Oceanographic Data Archaeology and Rescue Projects.* Key to Oceanographic Records Documentation No. 19, NODC, Washington, D.C. ■

Global View CD-ROMs and user's guide

The National Geophysical Data Center has released the Global View CD-ROMs, a four volume collection that includes a user's manual. These CDs are expected to be widely used by climate and change researchers. Featured data include: Advanced Very High Resolution Radiometer (AVHRR) derived vegetation indices, global ecosystem data, global and regional land cover classification data, global and regional land cover classification data sets, and digital terrain models. NGDC's Geovu access software accompanies the CD-ROMs..
Contact: NGDC

New climate visualization tool now available on Internet

The National Climatic Data Center has placed a new climate visualization tool (CLIMVIS) on the Internet's World Wide Web. CLIMVIS allows for interactive visualization of climate data by accessing the NCDC Mosaic Home Page. Users select the type of data or index, time period, and location that they want to view. The initial dataset available is drought data from 1895 to the present.

After viewing, the data are available for immediate downloading via the NCDC Online Access and Service Information System, or via FTP over Internet. CLIMVIS complements NCDC's other interactive visualization tool, called Interactive Climatological Products, which displays gridded data. These systems are considered among the best visualization tools available on the World Wide Web.
Contact: NCDC

Chesapeake Bay region land cover data set on CD-ROM

A CD-ROM data product that shows changes in land cover for the Chesapeake Bay region over the 5-year interval from 1984 to 1988-89 is now available. The CD-ROM was produced cooperatively by the National Geophysical Data Center, the National Oceanographic Data Center, and the National Marine Fisheries Service, and was completed in support of the Coastal Change Analysis Project of NOAA's Coastal Ocean Program. The Chesapeake Bay data set constitutes one of the largest detection efforts ever attempted, covering an area of about 30,000 square miles with a source data resolution of 30 m by 30 m.

Data products and services

The Chesapeake Bay region land classification data set is based on an analysis of Landsat Thematic Mapper (TM) scenes. The CD-ROM product consists of three data sets:

- analysis of land cover based on four Landsat TM scenes from 1984,
- analysis of land cover based on four Landsat TM scenes from 1988-89 for the same area, and
- analysis of the resulting change between 1984 and 1988-89.

The CD-ROM includes GeoVu data browse and retrieval software developed by NGDC. This CD-ROM may be ordered from either NGDC or NODC.
Contact: NODC, NGDC

Hydrographic Survey Data Management System goes online

The National Geophysical Data Center's Hydrographic Survey Data Management System (HYDDAS) is now online via the Internet. HYDDAS is a data system for managing marine hydrographic sounding data held at NGDC. This system inventories data for managing marine hydrographic soundings as survey polygons of soundings and hydrographic features. Together with the Tracking Geophysical Data System, HYDDAS is a subset of the GEODAS Marine Geophysical Data System. Searches and other functions are now available as an interactive system using Mosaic Forms over the Internet.
Contact: NGDC

CONTACT POINTS

National Climatic Data Center (NCDC)
Climate Services:
704-271-4682
Fax: 704-271-4876
Internet: orders@ncdc.noaa.gov

Satellite Services:
301-763-8399
Fax: 301-763-8443
Internet: sdsdreq@ncdc.noaa.gov

National Geophysical Data Center (NGDC)
303-497-6958
Fax: 303-497-6513
Internet: info@ngdc.noaa.gov

National Oceanographic Data Center (NODC)
202-606-4549
Fax: 202-606-4586
Internet: services@nodc.noaa.gov

NOAA Environmental Services Data Directory
202-606-5012
(Anne O'Donnell)
Fax: 202-606-0512
Internet: aodonnell@esdim.noaa.gov

NOAA Central Library
Reference Services:
301-713-2600
Fax: 301-713-4599

Wind stratified conditional climatology product to aid NWS

The National Climatic Data Center completed programming and testing of a Wind Stratified Conditional Climatology product, which was obtained from the U.S. Air Force Environmental Technical Applications Center/Operating Location A. OL-A has been routinely providing this product to Air Force customers for many years, and last spring the National Weather Service requested that NCDC bring this product capability online.

The summary provides bivariate distributions of ceiling and visibility classes versus wind direction as a function of time, out to 48 hours. In other words, for a given set of conditions at hour '00', the WSDD shows the climatic probabilities for various conditions during the next 48 hours. The climatic probabilities are calculated from surface observational data for the station. NWS found that USAF forecasts for ceiling/visibility conditions were on average more accurate than NWS forecasts, and plans to use these summaries to improve NWS forecasts.
Contact: NCDC

Global Historical Fields CD-ROM

The Global Historical Fields (Version 1.0) CD-ROM is now available from the National Climatic Data Center. The CD-ROM allows users to view daily surface charts for the Northern Hemisphere for the period from 1899 through April 1994. Daily upper air charts (700 mb, 500 mb, and 300 mb) are available from the late 1940s through April 1994.

Surface charts contour sea level (pressure only; not station plots); upper air charts contour geopotential heights and temperatures. Charts can be contoured, looped, and exported to a file or printer. This CD-ROM is a joint U. S. Navy/NCDC product.
Contact: NCDC

NCDC provides online access to global surface summary-of-day data

The National Climatic Data Center (NCDC) announces the availability of global surface summary-of-day data (over 8000 stations) online via anonymous FTP (Internet). These summary-of-day data files include the latest month's data, normally available about 1 month after the end of the data month. A worldwide map of station locations is also included (in GIF and Postscript formats).

The data are accessible through NCDC's Mosaic/WWW server (at URL address *http://www.ncdc.noaa.gov/*) or through direct FTP connection as follows:

open *ftp.ncdc.noaa.gov*
login: *anonymous*
password: *your e-mail address*
directory for global summary of day: */pub/data/globalsod*

The directory has a "readme.txt" file with information about the contents and individual file names. The latest month's data are available as seven regional files or as one file containing all of the data (in ASCII or compressed mode). Previous months' data are also included as individual ASCII files. The daily elements included in the dataset (as available from each station) are:

- Mean temperature (0.1 degrees Fahrenheit)
- Mean dew point (0.1 degrees Fahrenheit)
- Mean sea level pressure (0.1 millibar)
- Mean station pressure (0.1 millibar)
- Mean visibility (0.1 miles)
- Mean wind speed (0.1 knots)
- Maximum sustained wind speed (0.1 knots)
- Maximum wind gust (.1 knots)
- Maximum temperature (0.1 degree Fahrenheit)
- Minimum temperature (0.1 degree Fahrenheit)
- Precipitation amount (0.01 inches)
- Snow depth (0.1 inches)
- Indicator for occurrence of:
  - Fog
  - Rain
  - Snow
  - Hail
  - Thunder
  - Tornado/ Funnel Cloud

NCDC also has various inventories (e.g., global surface, NEXRAD) and guides on-line in its WWW server, and in the */pub/data/inventories* subdirectory. A "README.TXT" (upper-case) file describes its contents.

The instructions for obtaining these files are the same as for the summary-of-day data above. These inventories, along with the summary-of-day data, will be updated and enhanced as often as possible, so users are encouraged to check frequently to see what's available. Additional inventories and datasets are planned for the near future.

Other periods of historical summary- of-day data (as well as many other datasets) can be obtained off-line from NCDC. For additional information, please contact NCDC's Climate Services Branch at:

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NOAA/NCDC/Climate Services
Federal Building
Asheville, NC 28801
Telephone: 704-271-4800
Fax: 704-271-4876
E-mail: *orders@ncdc.noaa.gov*

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