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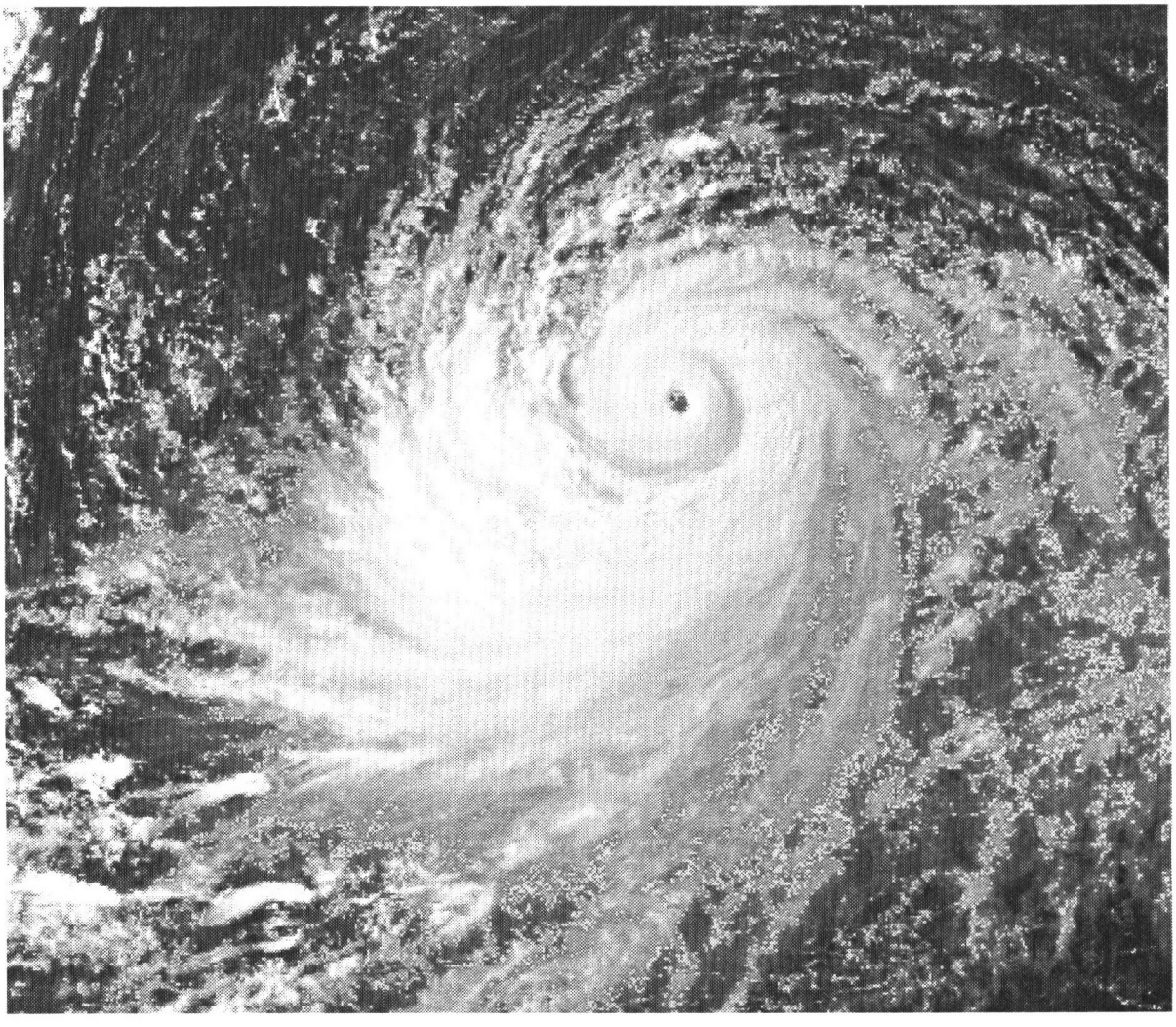

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On the cover: satellite image of Super Typhoon Winnie

NCDC's Satellite Services Group

The National Climatic Data Center's (NCDC) environmental satellite database accounts for almost 230 terrabytes, or 50 percent of the total current archive. This includes 40 terrabytes of polar orbiter satellite data, and 190 terrabytes of geostationary satellite data. The physical location of these data are Asheville, NC; Suitland, MD; and the Space Science and Engineering Center at the University of Wisconsin. Most of the servicing functions are provided by NCDC's Satellite Services Group at Asheville, NC.

The environmental satellite database, an element of the overall National Environmental Satellite, Data, and Information Services (NESDIS) database, is a unique source of data and information. It contains film imagery and digital data collected by a number of environmental satellites from 1960 to the present. These satellites include the National Oceanic and Atmospheric Administration's (NOAA) operational environmental satellites, various NASA research satellites, and the Department of Defense Meteorological Satellite Program (DMSP). Data are available from the TIROS Series beginning with TIROS-1 in June 1960 through TIROS-10, ESSA, ITOS, GEOS-3, SEASAT, NIMBUS-7, DMSP F-8 through F-13, NOAA-1 through NOAA-14, and the geostationary satellites ATS-1 launched in 1966 through GOES-9 launched in April 1997. In the future, data from the Canadian satellite, RADARSAT, will be made available on a limited basis to NCDC. While much of the collected data are meteorological, the data have been of considerable interest to agronomists, oceanographers, hydrologists, and geologists.

Environmental satellites are operated in two basic types of orbits: polar orbiting and geostationary. The instruments aboard the Pola

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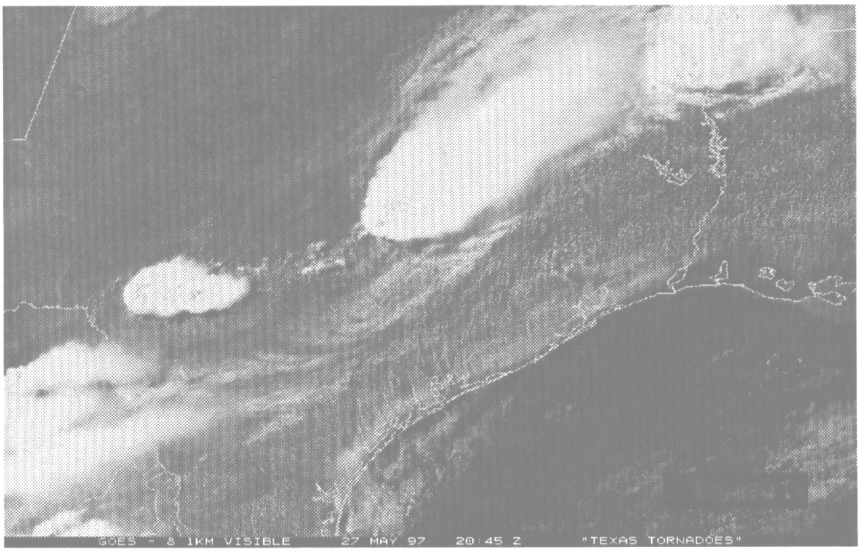
Orbiting Environmental Satellites (POES) and the Geostationary Orbiting Environmental Satellites (GOES) are presently collecting data which are available in image form and digital format.

The polar orbiting satellites operate in relatively low orbits, ranging from 700 to 1,700 km above the earth, and circle the earth 12 to 14 times per day (orbital periods from 99 to 115 minutes). The orbits are timed to allow complete global coverage twice per day (normally a daytime and a nighttime view of the earth) in swaths of about 2,000 km in width. Because of the polar orbiting nature of the POES series satellites, these satellites are able to collect global data on a daily basis for a variety of land, ocean, and atmospheric applications. Data from the POES series support a broad range of environmental monitoring applications including weather analysis and forecasting, climate research and prediction, global sea surface temperature measurements, atmospheric soundings of temperature and humidity, ocean dynamics research, volcanic eruption monitoring, forest fire detection, global vegetation analysis, and many other applications.



Texas Tornadoes May 27, 1997

With the closing of the Marshall Space Flight Center (MSFC) Distributed Active Archive Center (DAAC), NCDC has taken over the responsibilities for the distribution of data from the DMSP satellites to Earth Observing Satellite Data and Information System (EOSDIS) scientists. NCDC has been collecting data from this polar orbiting satellite series for its own users since 1987. The Special Sensor Microwave/ Image (SSM/I) is a seven channel, four frequency, linearly polarized, passive microwave radio-metric system which measures atmospheric, oceanic, and terrain microwave brightness temperatures. These data are available from 12/12/89 to 6/6/96 in level 1b format, or as Environmental Data Records (EDR), Temperature Data Records (TDR), and Sensor Data Records (SDR) from 6/87 to the present. Data from the Special Sensor Microwave/ Temperature Sounder (SSM/T), a seven channel microwave sounder designed to provide global, synoptic scale soundings of temperature throughout the troposphere and lower stratosphere, are available from the beginning of 8/87 to the present. Data from the Special Sensor Microwave/Water Vapor Profiler (SSM/T2), a five channel, total power, microwave radiometer with three channels situated symmetrically about the 183.31 GHz water vapor resonance line and two window channels, are available from

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6/94 to the present.

The GOES satellite system provides continuous monitoring necessary for intensive data analyses required by operational meteorologists and hydrologists. Each of the GOES satellites scans predetermined areas of the earth, including the continental U.S., at least four times every hour. In times of severe weather, the new generation of GOES satellites are capable of one minute interval imaging over the effected area. NOAA maintains a two satellite configuration, GOES-WEST and GOES-EAST, which enables total coverage from the central Pacific Ocean eastward to the west African coast. Currently, GOES-8 and GOES-9 are positioned at 75 degrees and 135 degrees west longitude, respectively, each orbiting the earth geosychronously along the earth's equatorial plane at a distance of 35,800 km from the earth's surface. A variety of products are produced in real-time mode and are directly incorporated into the daily computer model runs.

The Satellite Data Services Group of NCDC receives approximately 300 customer contacts each month from users of satellite data and products. Often, these requests go beyond simply filling an order, but require information about the satellite, instrumentation, data set format, or just general information about usages of the data. Some of the more common uses are: aircraft accident investigations, hurricane and thunderstorm studies, training for National Weather Service forecasters, flooding events, and lake effect snow evaluation.

Volcanic eruption images from satellites are another popular item available from NCDC. The eruption of Montserrat in the West Indies early in 1997 initiated GOES image requests from

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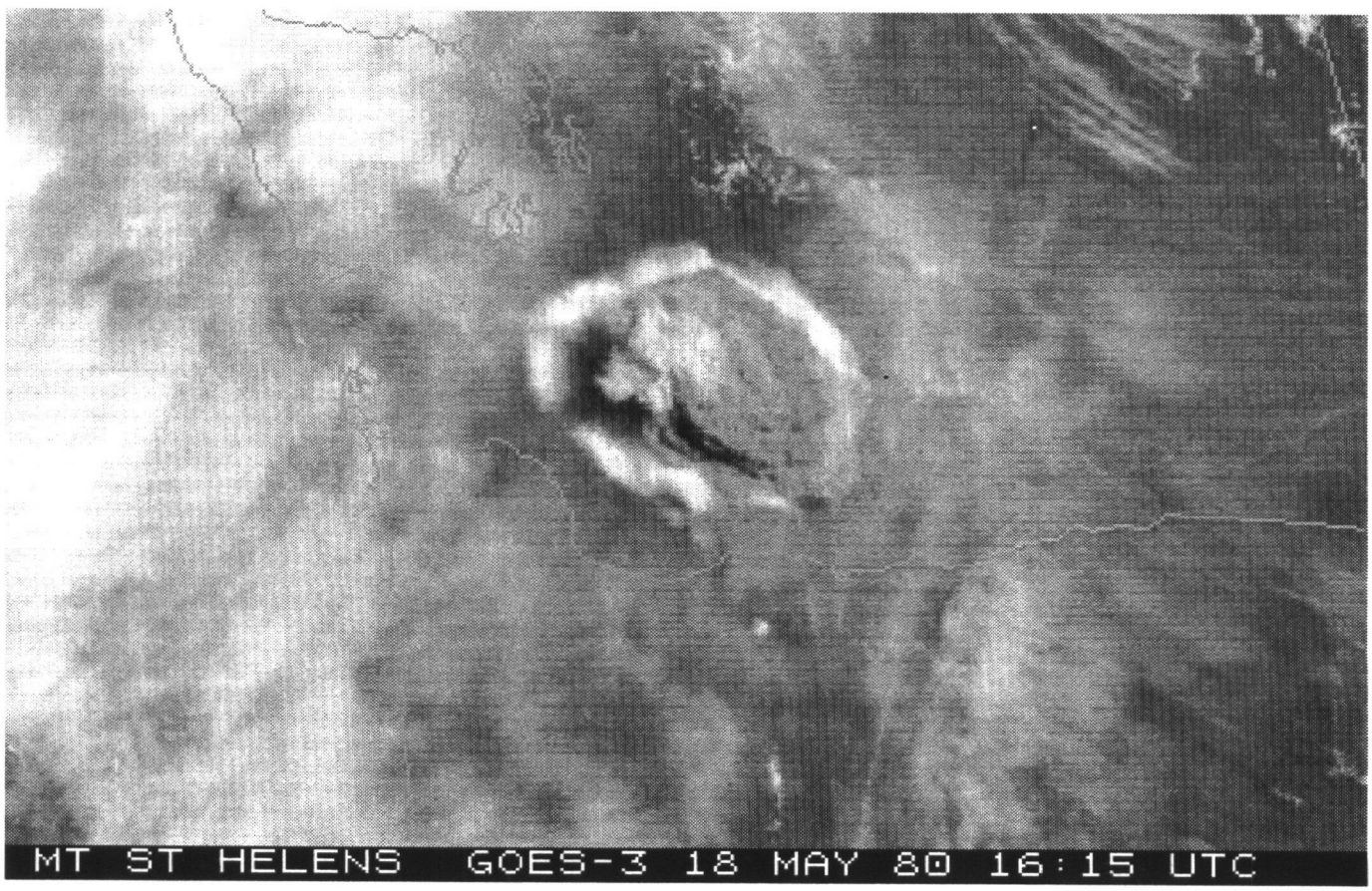

Satellite Image of Mount St. Helens Eruption

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scientists studying that particular event. The Government Information Service reported the pyroclastic flows reached the sea, and ash clouds were as high as 20,000 feet. Because of the falling ash, traveling conditions on parts of the island were very difficult, with some roads closed. The GOES-3 image of the May 1980 eruption of Mount St. Helens offers extraordinary views of the ash cloud as it begins to rise into the atmosphere. An mpeg video loop of this event can be found at http://www.ncdc.noaa.gov/pub/data/images/olimages.html.

Hurricane and tropical storm images have been used in feature films, short documentaries, television productions, educational releases, magazines, and on the nightly news. Many of the best images, and some mpegs, are found on NCDC's home page: http://www.ncdc.noaa.gov.

To obtain information on the NOAA satellite data, products and services, please contact:

Satellite Data Services Group
National Climatic Data Center
Room 120, 151 Patton Avenue
Asheville, NC 28801-5001
Tel: 704-271-4850
Fax: 704-271-4876
E-mail: satorder@ncdc.noaa.gov
or visit our web site at:
www.ncdc.noaa.gov/psguide/satellite/ sathome.html.

NCDC archives digital data, as well as non-digital satellite data, including miscellaneous slides, prints, film, and VHS tapes of special events. Please contact the Satellite Services Group for availability of specific images. Also, please contact them to confirm prices, ordering procedures, and digital formats.

Custom images are created for customer defined areas, times, and channels. These images are processed from the original digital files (level 1b from POES and GVAR from GOES) using McIDAS image display and processing software. When ordering, please specify satellite, geographic area, feature to be shown, satellite channel (visible or infrared), resolution, map projection, date and UTC time. There is no additional cost for gridding and mapping GOES images and making standard color enhancements. Highly enhanced images may be created for additional cost. Reproduction images are already available and can be copied from NCDC's image library. The majority of these images include significant events, such as hurricanes, blizzards, volcano eruptions, forest fires, etc.

NOAA's Satellite Active Archive (SAA) provides easy access to Polar Orbiting satellite data: www.saa.noaa.gov
The system allows users to search inventories of selected instrument data, preview representative earth images of that data, and download the data via ftp for processing/analyses.
Early in 1997, NCDC added the Historical GOES Browse Server on-line services:
www.ncdc.noaa.gov/psguide/satellite/goesbrowse/gb.html
The server is unique compared to other sites offering satellite images, in that it provides a growing archive of on-line retrospective images. The server is primarily intended to aid researchers performing long-term atmospheric studies involving satellite imagery. Browse imagery at 8 km resolution are available starting as early as December 14, 1996 up to the present. These daily browse imagery cover much of the western northern hemisphere at approximately 0000UTC (7:00pm EST) and 1200UTC (7:00am EST) for the infrared channel, and 1800UTC (1:00pm EST) for the visible channel. Plans include adding full disk GOES visible and infrared images back to mid 1992.

Special Sensor Microwave/ Imager Dataset (SSM/I) at http://www.ncdc.noaa.gov/ssmi/html/ssmi.html. This dataset contains 1.0 degree and 2.5 degree time series of the entire SSM/I archive from July 1987 to the present. These monthly average products include precipitation, cloud liquid water, total precipitable water, snow cover, sea-ice cover, and oceanic surface wind speed.

Bob Boreman
National Climatic Data Center

Beating the Bushes

John F. Griffiths
Texas State Climatologist

During a recent visit to the National Climatic Data Center (NCDC), our AASC Godfather, John Hughes, was lamenting the fact that he received little material for OUR newsletter. As he expressed it, he was always beating the bushes. Foolishly, as it turned out, I suggested the phrase was a good title for an article. His rejoinder was, "Yes, you can write it," which wasn't exactly what I had in mind. So now you are faced with this effort. However, upon looking at the title, I have some trepidation that the Texas Governor, and his father, may interpret this incorrectly. I guess I'll just have to risk it.

I thought that it may be helpful if the given example of "beating the bushes" stemmed from my on-going experience of trying to track down early data for Texas. The seemingly simple pursuit (trivial?) has led me into a bigger question - finding data nationwide. To make this article of reasonable length, I am defining "early" as being before July, 1891, at which time a national Weather Bureau was created in the Department of Agriculture, with Professor Mark K. Harrington as Chief.

While trying to find data for a book on Texas Weather pre-1880 (eventually printed in 1995), I stumbled across an interesting publication put out by the Signal Office at the end of the last century that gave basic details concerning station, location, period of record, and instruments used, allegedly for all stations up through 1890. This was a good start, but now the challenge was to find the data. As can be appreciated at that time, about ten years ago, no digitized data were discovered. However, remarks in various old material turned me toward the observations made at military posts. Actual measurements at these began in 1820, and it appears that prior to this date the only significant climatic records are to be found in old weather diaries, many of which are held at the National Archives and Records Administration (NARA) and some at NCDC. As far as I can discover, no complete catalog of these diaries exists.

The Surgeon-General (S-G) had mandated that registers of daily weather data be kept at all military posts, but owing to poor instruments, lack of instruction and standardization, the data for 1820 and 1821 were never published. In 1826, a Register of mean monthly data for 1822 through 1825 for about 15 posts was published. Nothing else appeared until 1840 when the data for 1826 through 1830, with an Appendix repeating the 1822-1825 issue, appeared. The next issue came in 1851, with 1831 to 1842 monthly data, followed in 1855, for 1843-1854 data and in 1860, for data covering 1855-1859. This was the last publication from the S-G's office. Over the years the observation times changed, and in 1837 rainfall measurements were begun. The year 1843 saw a standardization in the thermometers and a general improvement in the network. The number of stations for which data

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re given increased to around 75 by the mid-1850s. All of these monthly data have been digitized at NCDC.

The original registers, containing daily observations month by month, were microfilmed a few years ago before being destroyed. Copies of the microfilms are held by the NARA and NCDC. However, one report suggested that only a few of these registers from 1819 to 1872 were in existence. This microfilm set contains not only S-G data but also many data, from the networks discussed next, up through 1892. It must be mentioned that some of the microfilm is illegible.

Between about 1825 and 1847, networks of observers were instituted in New York State (mainly through the University), in Pennsylvania (guided by the Franklin Institution), in Ohio and in Massachusetts. However, it appears that, except for the New York system, no publications ensued.

In 1847 the Smithsonian Institution (SI) began to play an ever-increasing role in the development of a network of voluntary climate observers. Starting with about 150, it grew rapidly to over 500. Unfortunately, the SI only published one volume, of summarized monthly data, this was in 1861 and covered the period 1854-1859. In this it is noted that the earlier data, 1849-1853, had been bound into monthly volumes of daily data and retained at the SI. Actually, the 1861 book was a joint effort of the SI and the Patent Office, the latter entered the scene because of its interests in agriculture. Although the SI corps of observers continued in existence, and actually grew because most private and state networks were gradually merged with it, no more data appear to have been published until the 1863 Annual Report of the Department of Agriculture when data from a selection of SI stations for 1862 are given. This arrangement continued until 1870, but then ceased. These books are in the NCDC library. During this period of SI dominance in collecting climatic records, a network of stations was developed associated with the Survey of the Northern and Northwestern Lakes undertaken by the Superintendent of the U.S. Army Corps of Engineers. These reports, covering 1857-1876, were sent to the SI and then the Signal Office.

In 1874, responsibility for the SI network was transferred to the Signal Service of the Army and in its report for 1873, data are given for October, 1872, through September, 1873. It must be noted that through the mid-1870s, only some 20-30 stations are selected. All of these volumes are at NCDC. This method of dissemination of data persisted until 1891 when, as mentioned earlier, the Department of Agriculture assumed complete responsibility

There is at least one bush I have not yet discovered, so it remains unbeaten and I'd welcome any information in that direction. This concerns State Weather Services that appear to have been in operation around the 1880s. Which states had these, did they arise spontaneously, and did they all publish annual reports?

Two publications of great relevance were put out by the SI in its "Contributions to Knowledge" series. In 1868, a summary of precipitation data (compiled by Charles A. Schott) from 1,200 stations appeared and this was updated in 1881 to cover all data through 1874. Included are monthly, seasonal, and annual means for all stations, together with starting and ending dates plus the number of months of record and station location details. The second set gives the annual total for each year at all stations. Schott was a meticulous and industrious worker and it is clear that he really "beat the bushes" as he found data for some of the small state networks as well as those mentioned in this article. Since he was close in time to these observations, I believe if he has no reference to specific data it is either lost or extremely well hidden. Schott's volume on temperature is dated 1876 and

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covers records through 1870. Again, monthly, seasonal and annual values are given, starting and ending dates, number of months of record, and the method by which mean values are calculated. Another table gives the mean daily temperature for every day of the year at selected stations, while a third table gives the maximum and minimum for each month during the period of record. A fourth table presents the mean annual temperature by year for all stations. Photocopies of these helpful publications are held at NCDC.

Another set of most useful volumes held at NCDC are what are referred to as the "Means Books." These contain handwritten records of mean monthly temperature and precipitation amount by year for all known records, generally up through about 1910. They are bound according to state and are also attributed to the work of Schott. In conclusion, although it was published later than the period emphasized here, there is the "Bulletin Q" that appeared in 1906 giving data up through 1903. Note that only data summarized through period of record of station are given, not for individual month or year. Later, in 1926, "Bulletin W" was published, comprising three volumes of data, allegedly containing all data for every station through 1920. It is indeed a useful source for monthly rainfall totals, but other data are given only in summarized form and, as it happens, not all stations' observations are actually in the publication.

AASC Mourns the Passing of Former Colleagues

Mr. W. Joseph Moyer

Mr. W. Joseph Moyer, former State Climatologist for Maryland, died August 4 after a long illness.

Mr. Moyer was actively engaged in meteorology for 45 years. He served as State Climatologist for Maryland and Delaware from 1963 - 1973, and for Maryland from 1980 - 1988. He maintained a network of over 90 weather stations comprised of farmers, businesses, state agencies, and weather hobbyists that provided continuous records for cities and towns scattered across the state of Maryland.

He served as an advisor to those requiring Maryland climate and weather data, including government, private businesses, universities, and individuals, and provided climate input for several Washington area television weather announcers.

Born in Lilly, PA, July 26, 1914, Mr. Moyer graduated from St. Francis College, Loretto, PA, with a bachelor's degree in 1936 and received a master of science from Pennsylvania State University in 1947.

Mr. Moyer's career in meteorology began in 1943 when he was assigned to one of the Army's newly formed weather squadrons that were required for the growing number of aircraft deployed during World War II. He served in the European theatre until 1946 when he was honorably discharged as a captain.

From 1950 to 1963, he held a number of government Ai

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Weather and National Weather Service positions. From 1973 to 1975, he was Meteorologist-In-Charge at Dulles International Airport. From 1975 to 1980, he served as Disaster Preparedness Meteorologist in the Washington Forecast Office. After retiring from government service in 1980, he was invited by the University of Maryland to return as State Climatologist. As a member of St. Ignatius Loyola Parish in Oxon Hill, MD, Mr. Moyer served as the president of the St. Vincent DePaul Society and assistant director of the CCD program.

Mr. Moyer is survived by his wife of 45 years, Louise Morrissey Moyer of Richmond, VA; four children, Gail Moyer Stroup of Spokane, WA, Judy Moyer of Arlington, VA, Margaret Moyer Roberts of Gaithersburg, MD, and Richard Moyer of Laurel, MD. He has six grandchildren.

Mr. Moyer's funeral took place on August 8, 1997 at Our Lady of the Angels Catholic Church, at the Charlestown Retirement Community, Catonsville, MD.

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Dr. Allan H. Murphy

Dr. Allan H. Murphy, Oregon State Climatologist, 1981-1984, died at his home in Corvallis, OR, August 5, 1997.

Dr. Murphy was born in Cambridge, MA, on October 29, 1931. He grew up in nearby Lincoln, and graduated from the Belmont Hill School in 1949. From Lincoln, he went on to the Massachusetts Institute of Technology and earned a Bachelor of Science in Meteorology in 1954. After a tough battle with Army food and basic training, he served as a forecaster in the U.S. Army Signal Corps at Fort Huachuca, AZ, from 1955 to 1958. He then entered graduate school at the University of Michigan, earning Masters Degrees in Meteorology and Statistics, and a PhD in Atmospheric Science in 1974.

In 1971, the Murphy family moved to Boulder, CO, where Dr. Murhpy began work at the National Center for Atmospheric Research. There he continued research that applied probability and statistics to atmospheric science with unique emphasis on the quality and socioeconomic value of forecasts. The family moved again in 1979, and he became Professor of Atmospheric Science and Statistics at Oregon State University. While in Boulder, CO, and Corvallis, OR, Dr. Murphy held numerous visiting appointments in the U.S., Europe, and Asia. He also was a Certified Consulting Meteor-ologist and named a Fellow of the American Meterological Society. His work brought him international recognition and awards for service and outstanding research in statistical meteorology, most recently in 1997. Dr. Murphy became Professor Emeritus in 1993, and since then was Principal of his company Prediction and Evaluation Systems. He edited and published with dedication throughout his career, finishing his third book and several papers last year. He traveled extensively with his wife and family, and in 1996, despite his illness, was able to fulfill a lifelong dream of visiting Nepal and trekking near Mt. Everest.

There are plans to endow an AMS scholarship as a memorial to him and to his father, who was also a well known meteorologist.

He is survived by his wife, Shelley, of Corvallis, OR, his three sons, Kenneth, of Miami, FL; Christopher, of Boise, ID; Peter, of Durham, NC; and one daughter, Andrea Chaney, of Dallas, TX.

A Little Weather History...

Arnold Court
University of California
Northridge

State climatologists may be interested in the status of their predecessors 110 years ago. Here's a look at the Annual Report, dated 1887 SE 07, of the new Chief Signal Officer, General Adolphus W. Greely, for the fiscal year ending June 30, 1887. Just half a year earlier "he had assisted (since) December, 1886, owing to the ill health of (Brevet Major-) General (Wm. B.) Hazen" who died on January 16, 1887, after five years as C.S.O. On February 16, 1887, President Grover Cleveland appointed Greely to the post, and he received Senate confirmation in March.

Report of the Chief Signal Officer
State Weather Services.

The Chief Signal Officer is gratified to report a marked progress, both in the efficiency and extent of the state weather services and cooperating meteorological societies of the country. In addition to the New England Meteorological Society, there are 19 state weather services, of which there have been established during the present fiscal year New Jersey, Pennsylvania, North Carolina, South Carolina, Mississippi, Nevada, and Colorado, while the services of Michigan, Indiana, Kansas, and Nebraska have been reorganized. Efforts are also being made to organize cooperating services in California, New York, Oregon, and Wisconsin.

These state organizations play a most important part, not only in contributing a large amount of gratuitous data which beneficially supplements that of the nation service, but also in supplying special data for their respective states. Some of them have also been most useful promoting the rapid and extended distribution of data indications to their communities, as otherwise would make them too late for practical benefit.

As Professor Cook, director of the New Jersey service, has said, these organizations will tend to improve the accuracy of local and national forecasts, will provide agriculturalists with extended and valuable local meteorological means, ensure that engineers are better informed as to the character and amount of benefits and injuries which may result fro

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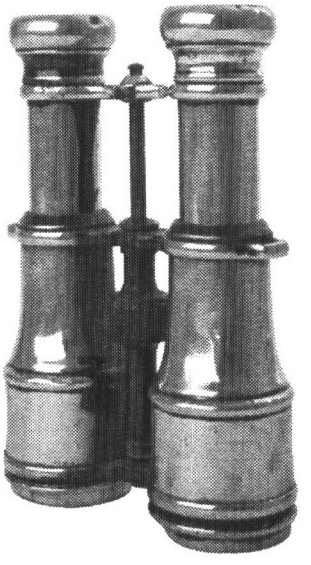
rainfall, and will provide physicians and their patients with information on how diseases are affected by meteorological conditions.

In addition to the practical advantages thus enumerated, may be added the benefit which the general service receives from investigations carried on by state weather services or meteorological societies, which result in improving the work of the national service. In this respect may be mentioned the work done and investigations undertaken through the intelligent direction of the New England Meteorological Society, the Iowa, Indiana, and Ohio services, and others.

These organizations have attracted the attention and engaged the hearty cooperation of many intelligent observers, some of them gentlemen of leisure, whose pursuit of the study of meteorology must ultimately work to benefit these services, and by their stimulating influences contribute to the high character and standing of the national service.

The Chief Signal Officer has pursued, and will continue to pursue, towards these services the policy of a hearty cooperation, as far as the means of this Service and the tenor of legislation will permit.

The policy of strict non-interference with such organizations, unless requested by state authorities, has been followed; and further, the tendency of the chief Signal Officer has been to discourage the multiplication of such organizations, where consolidation, as in New England, seems to answer better the purpose of the service, and for a smaller



Take a look into the past

outlay. In this connection he does not believe the interests of the Government demand his interference with, or criticism of, the methods pursued by these societies, which in turn, from their local surroundings and circumscribed areas, cannot be fully aware of the difficulties which beset predictions of a grand scale, and of the embarrassments which must be felt by the chief of a service which has so many complicated and conflicting interests constantly demanding attention and consideration. The Chief Signal Officer looks upon these state services as a most valuable means of communication with the people of the county, through which he may learn the needs of the different communities with reference to, and in connection with, agriculture, forestry, gardening, fruit raising, and other interests which are dependent either on normal climatic conditions, or are affected by rapid changes in meteorological conditions, and in turn receives from these organizations valuable information and data which has rebounded to the public benefit when utilized in the publication of the crop weather bulletin and other practical ways.

The observers detailed as assistants to the directors of the state weather services have, as a rule, performed their arduous and important duties most satisfactorily. It is to be regretted that the order of ability necessary for such responsible and exacting work is so meagerly compensated as is the case with these men.

Announcing...

The State Climatologist

is now on-line at:

http://www.ncdc.noaa.gov/ol/climate/aasc.html#stc

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