The Western Regional Climate Center

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THE REGIONAL CLIMATE CENTER PROGRAM

During the second half of the 1980's a system of six regional climate centers developed in the United States. These centers are intended to serve as a link between climate service efforts on the national scale and the state scale. In September 1990 administration of the Regional Climate Center Program was transferred from the National Climate Program Office to the Climate Analysis Center in the National Weather Service. Center personnel are employees of their respective parent institutions, under contract with the federal government. All centers perform four major functions:

1) Maintain regional historical climate databases

2) Disseminate, interpret, summarize, and manipulate climate data and information for the benefit of users in federal, state, regional, and local government, and private organizations and individuals

3) Conduct applied and some basic research on climate issues of importance to the region

4) Serve as a focal point for coordination of climate related activities among agencies and organizations

These functions have been described more fully by Changnon et al. (1990).

THE WESTERN REGIONAL CLIMATE CENTER

The Western Regional Climate Center (WRCC), initiated in August 1986, serves the 11 western states. (Wyoming and Colorado participate in two regions.) WRCC also maintains data for Alaska, Hawaii and the Pacific Islands as well. This region covers 39 percent of the continental U.S. and has a population of 50 million people. The rugged topography exerts a dominant influence on climate, and sharp climate gradients are common. Much of the region is elevated and most of the states are generally arid. Climates range from desert to rainforest to tundra. Summer streamflow is primarily the result of winter snowfall; the complicated hydrologic regime, and the water distribution system, are characterized by important lags in time and substantial physical separation between water supply and demand.

DATA

Data necessary to characterize climate in the West are often difficult to identify and obtain. WRCC has obtained all major data sets for the digital period of record for the West available from the National Climatic Data Center (NCDC). An exception is the hourly airways data, which because of volume have

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only been obtained for the last decade. These NOAA data sets include:

1) Daily climate observations for the digital period of record from 5212 cooperative stations (2200 now active, 1500 with temperature records)
2) Summarized monthly climate data (5240 stations)
3) Hourly precipitation data (1937 stations)
4) 15-Minute precipitation data (1082 stations)
5) Twice daily upper-air soundings (50 stations)
6) Surface hourly airways observations (97 stations)
7) Station historical listing for the United States

All data sets are updated annually. As part of the national cooperative quality control program administered by NCDC, monthly updates of daily data are received in preliminary form 5-6 weeks after the end of the month, and in final form 3-4 months after the end of the month. All cooperative data from the last few years through the most recent month are maintained on-line.

WRCC acts as the archive for Remote Automated Weather Station (RAWS) data gathered by the Boise Interagency Fire Center (BIFC). Cooperating agencies include the Bureau of Land Management (BLM), Forest Service (USFS), Fisheries and Wildlife Service (FWS) and the National Park Service (NPS). Hourly observations of temperature, wind direction and speed, humidity, precipitation, pressure, and sometimes other elements, from 500-600 sites are sent via GOES satellite to BIFC. Quarterly archive updates are furnished to WRCC; digital records begin in 1985. WRCC also acts as the archive for the Automatic Lightning Detection System (ALDS). These data consist of the position, time, polarity and strength of each lightning stroke observed in the western United States. Starting dates for these data are in the range 1984-1986. A direct line to WRCC to permit real-time capture of ALDS and RAWS is to be installed in early April 1991.

Fifteen-minute meteorological data from the Bureau of Reclamation Agrimet network, mostly in the Columbia River Basin, are stored at WRCC from the late 1980's. Data from the Washington PAWS network are received and stored also.

Daily snow water content, precipitation and temperature are measured by the 550 stations in the SNOTEL network, run by the Snow Survey in the Soil Conservation Service. These data, though not now stored at WRCC, may be accessed through SCS facilities.

Real-time Family of Services products issued by the National Weather Service are obtained via satellite downlink through Zephyr Weather Information Services. Hourly airways observations and radiosonde data obtained from the FAA604 line are captured and archived for all 11 western states. Alphanumeric weather data for anywhere in North America can be saved as needed. Map products are printed continuously, and satellite loops and numerical forecasts are displayed on demand with PC-McIDAS using the Wisconsin-Unidata channel.

SERVICES

WRCC prefers to operate in a digital environment to the extent that a quality level of service can be maintained. This facilitates achievement of the goal of providing 24-hour turnaround for most standard data requests. The

service component entails the following activities:

1) Routing of requests to state climate centers or other expertise as needed.
2) Provision of original or raw climate data listings.
3) Manipulation or summarization of original data to provide value-added products. Tabular or graphical formats as desired. Development of software to meet most frequent or important needs.
4) Interpretation of climatic information: meaning, caveats regarding use, observational circumstances, strengths and limitations.
5) Updating of data bases. Development of efficient storage and retrieval procedures.
6) Provision of expertise on climate issues. Educational activity in institutional settings and for the public.

Services are provided on a reimbursable basis or for in-kind exchange. Data and information can be provided on paper, diskette, magnetic tape, or via dial-in retrieval. Users can place orders a dial-up system. No provision yet exists for users to generate and retrieve their own output. The climate center can be reached at 702-677-3106; data requests should be directed to 702-677-3140.

INSTITUTIONAL LINKAGES AND RESEARCH

WRCC maintains ties with organizations involved in providing climate services, and participates in research and research support activities in conjunction with federal agencies and university departments.

Active links exist with state climate programs in the western states, and with the National Climatic Data Center and the Climate Analysis Center. All of these interact through the American Association of State Climatologists. WRCC is a member of the Western Regional [Climate] Coordinating Committee-47, which serves the Agricultural Experiment Stations.

Through a cooperative agreement, WRCC provides support and consultation for the Climate Data Access Facility of the Soil Conservation Service in Portland. Projects to improve quality, access, metadata, presentation and dissemination of RAWS data are underway with the Forest Service. Quality control of fire weather observations is a subject also of joint interest with the Forest Service. Issues associated with maintenance of the growing RAWS data base are the subject of agreements with the Bureau of Land Management.

Under the Global Change Program, WRCC participates in US Geological Survey studies of the American-Carson-Truckee River Basins and the Gunnison River Basin. The Bureau of Land Management will use RAWS and other climate data for Global Change studies, and requires mapping expertise to assist with this process. The National Park Service plans to utilize existing and anticipated new climate data bases for several Global Change assemblages in the West. The Environmental Protection Agency, through the EMAP program, will make use of all available large climate datasets in the region.

WRCC is working diligently with the National Weather Service, the Climate Analysis Center and the National Climatic Data Center to insure continued attention to quality and temporal consistency, particularly of observations from the cooperative climate network, ASOS--the Automated Surface

Observing System, and other observing systems crucial to detection and study of climate changes and fluctuations. WRCC has participated in the Centennial Cooperative Weather Station Program, and in efforts to upgrade the quality of the U.S. historical daily data base. Other efforts involving the National Weather Service Office of Hydrology and western states are geared toward specification of the likelihood of weather extremes, such as short duration heavy precipitation.

Topics of research studies in which WRCC is involved include El Nino/Southern Oscillation relations to western U.S. climate, data quality control and validation, climate variability, climate impacts, climate trends, cloudiness and climate, observation time bias, reforestation, drought, spatial estimation and interpolation of climate data, climate extremes and climatic indices.

PERSONNEL

Full-time personnel include a regional climatologist and a data specialist. Part-time personnel include a director, deputy director, programmer, climate assistant and publications coordinator. WRCC is physically located within the Desert Research Institute's Atmospheric Sciences Center just north of Reno in Stead, Nevada.

FACILITIES

Facilities include a Sun 4/280 operating under Unix, two 892 Mb disk drives, a 9-track 1600/6250 tape drive, laser printer, line printer, a SparcStation One Plus and dial in/out modems. Installation of a second tape drive, an 8 mm digital tape drive and a 600 Mb disk are planned. Arcinfo GIS software is installed and running on the SparcStation. National Weather Service Family of Services data are obtained through a Zephyr downlink. Maps and map products are printed continuously. Airways (FAA604) surface and upper air data are captured to disk for the western states, and can be saved for all of North America. A PC-McIDAS terminal displays continuous satellite loops, numerical forecasts, and other products on the Unidata-Wisconsin channel. Plans call for installation of Unidata software to capture and manage data from the Domestic Data Plus line. Dial in/out access is available (702-972-5101: 1200 baud; 702-972-5130: 2400 baud; 8 bits, no parity, anonymous login: **wrcc**, then <return>). The system is connected to NSFNET at address **wrcc@nimbus.unr.edu** or **wrcc@134.197.1.107**.

REFERENCES

Changnon, S.A., P.J. Lamb, and K.G. Hubbard, 1990. Regional climate centers: New institutions for climate services and climate impact research. Bull. Amer. Meteor. Soc., 71(4), 527-537.