CRN NEWS
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Marshall Test Site – CRN Science For the Future

As climate observation technology changes over the next several decades, the U.S. Climate Reference Network (USCRN) Program must keep pace with these developments for several reasons. First, manufacturers of current instruments may not be in business for the entire lifetime of the network, so it is important to prepare high quality replacements for primary CRN instruments. Second, even within the same manufacturer, models change over time, and need to be compared thoroughly for any changes in response characteristics. Finally, since the USCRN is a Climate Reference Network, instrument intercomparisons are an important part of our mission, so that measurements taken by other stations and networks can be compared to CRN observations. Precipitation has proven to be most sensitive to instrument type and wind shield, and has been the focus of most testing done by USCRN. Previous test bed work had been completed at Sterling, MD, and Johnstown, PA, covering most of the range of conditions under which precipitation gauges perform. When the USCRN test bed at Sterling needed to be moved, a decision was made to identify a new test bed site with existing electronic infrastructure and a range of climate extremes not tested before.

Figure 1. Precipitation gauges installed over a portion of the USCRN Marshall Testbed Site.

Late in 2008, the USCRN instrument testbed was relocated to the National Center for Atmospheric Research (NCAR) Marshall test facility in Boulder, CO. At this site, the testbed will be subject to a variety of high wind and snow events that will exceed the extremes of previous testing and allow more valuable information to be gathered about instrument performance during these extremes. The testbed contains duplicates of each type of instrument to gather multiple independent measurements of precipitation under a wide range of conditions. The configurations at the site include current USCRN designs, potential variants of that design for USCRN in Alaska, and the National Weather Service Historical Climate Network – Modernization (NWS HCN-M) Program. In collaboration with Environment Canada and the NWS Snow Sensor Study group, multiple automated snow depth measuring instruments have been deployed. The combination of highly accurate precipitation and snow depth measurements will be used to develop methods to estimate snowfall without human intervention. The Marshall testbed is now collecting data that will be used for fundamental instrument measurement science, and to preserve the continuity of the USCRN into the future.

Preparation for Soil Climate Instrument Installation Continues

The preparations for deploying relative humidity and soil moisture / soil temperature instruments in the USCRN are continuing through the winter. The USCRN engineers and data ingest specialists are revising computer programs to accommodate the new data stream, and the engineers have refined their procedures for installing the systems. One final step before deployments begin will be a workshop in March bringing together experts on soil moisture and temperature measurements, soil climate and modeling, the use of surface measurements for interpreting satellite observations of soil, and other technical experts. The invited expert panel will discuss the USCRN plans, drawing upon their expertise to provide useful information and advice.

Shortly after the workshop, the deployment plan will be finalized, and engineers from Atmospheric Turbulence and Diffusion Division in Oak Ridge, TN, will begin to install the RH instrument and the soil moisture/temperature probes during annual maintenance visits. As currently planned, three probes will be installed at each of five standard depths: 5 cm, 10 cm, 20 cm, 50 cm, and 100 cm. The triplicate configuration will provide a means to quality check the measurements at each level in the soil, and also provide redundancy if a probe fails.

Figure 2. Soil probe used by CRN.

Not every USCRN site will have RH instruments and soil probes installed during 2009. It is expected that 40-60 instrument sets will be in place by Fall 2009, with the remainder planned to be installed (as resources allow) during the 2010-2011 timeframe. There are sites that will have only the RH instrument added, as some USCRN stations are located on solid rock where soil probes cannot be installed. This time table is also dependent on the timing of the arrival of funds for the instruments and installation. The National Integrated Drought Information System (NIDIS) is providing the funding for this effort, which will result in a tremendous increase in high quality soil moisture data for monitoring climate variability and change.

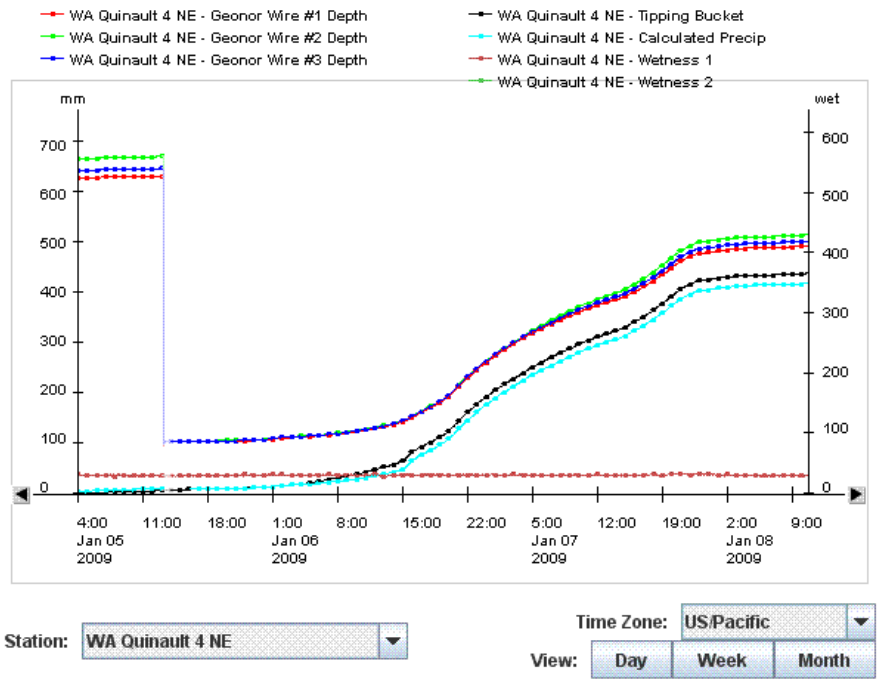
Event of the Quarter: Flooding Rains in the Pacific Northwest

[Editor's Note: This is the first of a regular series of reports.]

The USCRN station in the Olympic National Park in far northwestern Washington State is situated in one of the wettest locations sampled by the network. It was very well situated to report in real time on the heavy flooding rains that fell in the Pacific Northwest on 6-7 January 2009. WA Quinault 4 NE is at an elevation of only 95 m (286 ft), so it does not heavily reflect mountain slope influences, yet 384.5 mm (15.14 inches) of precipitation fell in 48 hours. Many rivers flooded in the region, and at times all major highways leading to Seattle were cut off by flooding of north-south routes and by avalanche danger in the east-west routes through mountain passes.

The event record (Figure 3) shows not only the tremendous accumulation over just a few days, but also the diligence of the site technical contact, who visited the gauge on January 5 to drain it and prepare it for the predicted precipitation onslaught. Note the depth of fluid in the Geonor gauge drops from about 650 mm (a large capacity gauge is installed here) to 100 mm on the 5th, so that there would be room to accurately

Figure 3. Rain gauge depths and cumulative precipitation (mm) for WA Quinault 4 NE, 5-8 Jan 2009.

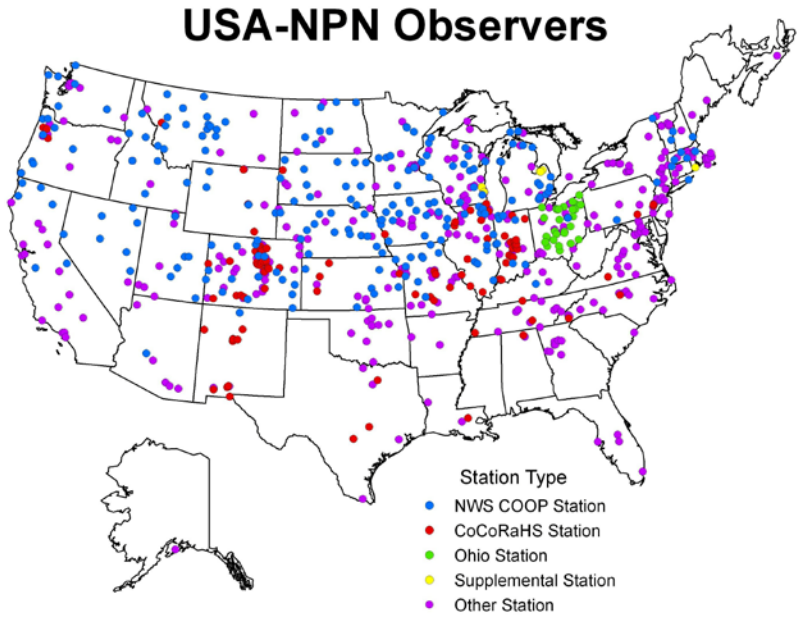


measure the large precipitation event. The depth rose to nearly 500 mm in just two days, and could have potentially over-topped the gauge if it were not drained before the event. This reflects the need for prompt responses to requests for gauge drainage or other less routine remedial actions that are important for the preservation of accurate and continuous observations for stations in the USCRN. We certainly appreciate the dedication of all our site technical contacts.

The USA National Phenology Network

We have been apprised of an opportunity that may be of interest to our site hosts and their personnel. Given the close linkage of the USCRN to site locations with stable vegetation cover, and the location of the first USCRN station at the North Carolina Arboretum, we thought you may wish to learn about the USA National Phenology Network (USA-NPN). Dr. Mark D. Schwartz, the Chair of the Board of Directors of USA-NPN, provided us with the following information.

Figure 4. Current observers in the USA-NPN and their affiliations.



Phenology is the study of periodic plant and animal life cycle events that are influenced by local environmental changes, especially seasonal variations in temperature and precipitation driven by weather and climate. Wide ranges of phenomena are included, from first openings of leaf and flower buds, to insect hatchings and return of birds. Each one gives a ready measure of the environment as viewed by the associated organism. Thus, timings of phenological events are ideal indicators of the impact of local and global changes in weather and climate on the Earth's biosphere.

The USA-NPN was launched in 2007 in order to engage observers from a number of existing networks to create one with more complete US spatial coverage. The USA-NPN is facilitating collection and dissemination of phenological data to support global change and basic environmental research. Just as the Climate Reference Network program serves as a basic foundation for collecting surface climate data, so USA-NPN serves as a similar resource for dynamic biological information. USA-NPN will provide guidance to help you select and observe appropriate species at your location. Initially, the program will include cloned indicator plants (lilacs or other species that facilitate comparisons between sites) and a small set of native plants especially suited to each region.

If you would like to know more about the USA-NPN, or join its observer network, their Web site is: http://www.usanpn.org/. Also, if you have any further questions, wish to enroll in the USA-NPN, or are already participating as both a USCRN and USA-NPN observer, please e-mail Dr. Schwartz directly at: mds@uwm.edu.

New Data Products from the USCRN

Many site hosts and institutional personnel take advantage of having a CRN station in their location and use the data for a variety of applications. Recently, the USCRN has made available a new set of easily accessible fixed field format text files with hourly observations and calculated values for many variables. This product is referred to as hourly02, and is at: ftp://ftp.ncdc.noaa.gov/pub/data/uscrn/products/hourly02/. A helpful README.txt file is available at the same address, describing in detail the format of the product. There are two formats in which the data are available. Files are arranged by station-year for those seeking all data for a station. In the most recent monthly period, copies of our hourly data transmissions are kept; these are arranged by hour, with all data reported for a particular USCRN transmission hour grouped together for all stations. The variable list is in the README.txt document.

If you use USCRN data for your own monitoring/research needs, or know of someone at your location using these data, we would be very interested to hear about it. Please send an e-mail description to: michael.palecki@noaa.gov. Thank you for your feedback.

USCRN PERSONNEL PROFILE: Brent French, Engineer ATDD, Oak Ridge, TN

Figure 5. Brent French working on Montana USCRN station MT Wolf Point 29 ENE in November.

Brent French has been involved with the USCRN Program since May 2001, and is currently an engineer with NCDC's USCRN partner, the Atmospheric Turbulence and Diffusion Division (ATDD) of NOAA's Air Resources Laboratory (ARL) in Oak Ridge, TN. Brent worked at a peach orchard when he was a teenager, and worked his way through college doing a variety of jobs, including construction and interning with the US Department of Agriculture, both providing useful skills for his future. Brent graduated from the University of Tennessee with a degree in Agricultural and Biosystems Engineering in 2000. His career with ATDD started with a bang in May 2001, when after less than one week of orientation, he joined Lead Engineer Mark Hall on a long road trip to install and maintain USCRN stations. After this experience, or maybe despite this experience, he "stayed on here anyway", and now leads technicians on his own road trips.

A typical work week when he is in the office at Oak Ridge consists of calibrating instruments, communicating with site hosts and answering their questions, and monitoring system flags and data for issues that need to be addressed. Closer to a road trip, Brent will prepare for the next set of installations or annual maintenance visits. When on the road, Brent and his crew start work early every day and work until the work is completed, or it is too dark to work. The routine is repreated day after day until the trip is done.

Sometimes, work is not routine. On one memorable trip, Brent recalls, "there were four of us installing the USCRN site in Nunn, CO in March 2002. The first day on site the weather was pleasant and we were able to get the infrastructure in place. That night it started to snow, and when we got up the next morning, there was about a foot of snow on the ground. Since we were driving a 2WD van at the time, we decided not to go out. Good decision. By that night there was three feet of snow, the interstate was closed, and part of the Denver airport roof had collapsed. It was about four days later before the interstate was reopened and we were able to leave the Ft. Collins Holiday Inn. When I initially talked to Mark Hall about the situation, he advised me to just sit tight. He said that we were basically in the perfect storm. I told him that was not something that I wanted to hear, because I had just seen the movie *The Perfect Storm* and all of the people that were caught in that storm had perished"!

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