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The RCC Report

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Publisher: Steve Hilberg
Editor: Lisa Sheppard
Designer: Sara Olson

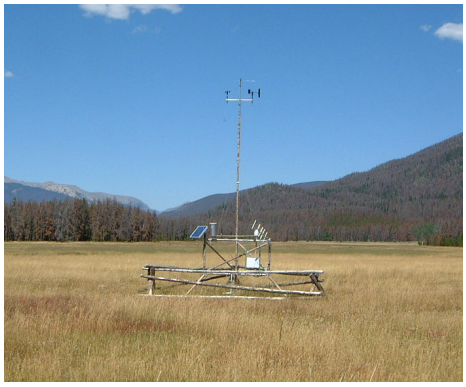
Cover photo courtesy National Park Service

WRCC is the Keeper of Fire Weather Data

Since the early 1980s, federal and state land management agencies have been installing and maintaining Remote Automated Weather Stations (RAWS) around the country (though dominantly in the West) to provide hourly fire weather information on temperature, relative humidity, wind, and precipitation. These stations are typically located at higher elevations and wildfire-prone areas, and the data provide wildfire personnel with key weather information for decision-making and planning.

There are approximately 1,800 permanent stations and 350 portables located across the U.S., including Alaska and Hawaii, along with select Pacific and Caribbean Islands. Since nearly the beginning of the RAWS program, the Western Regional Climate Center (WRCC) has been in partnership with the Bureau of Land Management (BLM) to archive the historical observations. In addition to storing the data, WRCC manages metadata (specific information about the stations and observations) and performs some data error checking. Many of the stations have been in place sufficiently long now to build a climate record.

Most of the data requests for RAWS are from fire agency personnel performing their own analyses. However, in recent years non-fire interests in the data, such as ecosystem management and wind energy, have evolved. These days WRCC receives requests from a wide variety of users ranging from research to general public use. WRCC maintains a Web site to retrieve RAWS data as well as a large number of data summary statistics and graphs. These summaries include daily and monthly statistics and time series, wind rose graphs and frequencies, data inventories, and station metadata and photos. The WRCC RAWS Web link is http://www.raws.dri.edu/index.html.



Harbison Meadow, Colorado RAWS in Rocky Mountain National Park

MRCC Unveils New Online Climate Information System

The Midwestern Regional Climate Center (MRCC) has replaced its long-running online data access system, the Midwestern Climate Information System (MICIS), with a new method that uses the Applied Climate Information System (ACIS) database. ACIS was developed and is maintained by the NOAA Regional Climate Centers (RCCs) and is designed to manage the complex flow of information from climate data collectors to the end users of climate information.

The new online system, the MRCC Applied Climate System (MACS), features

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RESEARCH

Technique Combines Radar and Rain Gauges to Estimate Precipitation

The Northeast Regional Climate Center (NRCC) has recently developed a refined approach for interpolating daily precipitation accumulations that combines radar-based information with observed daily rain gauge data from the Cooperative Observer Network to characterize the spatial distribution and gross accumulation of precipitation. The rain gauge data are used to adjust spatially varying errors in radar estimates.

The limited spatial resolution of rain gauge data has always been problematic in applications ranging from monitoring climate to providing input to site-specific models. This is especially true in summer, when convective rainfall totals can vary dramatically from gauge to gauge. Radar precipitation estimates provide a source of precipitation data at a much higher 4 km resolution. However, these values are often plagued by errors resulting from the conversion of radar reflectivity to rainfall rate.

Rain gauge observations are assumed to be the true value of precipitation at each station. For each site the estimated rainfall is obtained from National Weather Service radars. The difference between the daily precipitation amount measured with the gauge and estimated by the radar is then computed for each station. These differences are then interpolated to the radar grid, providing a daily adjustment that can be applied across the entire radar domain.

This approach is similar to the Multisensor Precipitation Estimators (MPEs) used operationally by the National Weather Service. However, the NRCC technique is applied at a daily rather than hourly time step. This allows more observed data to be used. In addition, the adjustments can vary across the radar domain. The MPE use a single domain-wide adjustment, while the NRCC technique can make adjustments for each 4 x 4 km grid point.

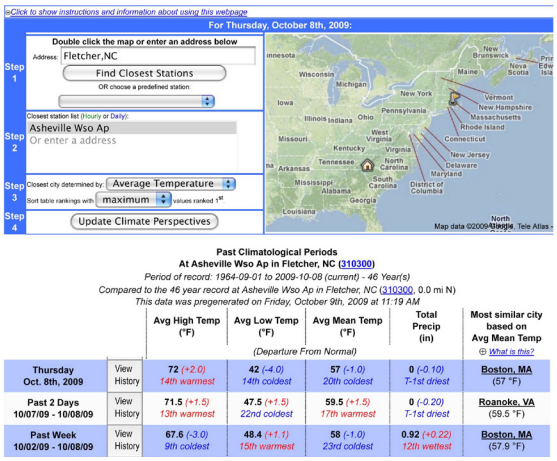
Comparisons between the two approaches show smaller errors in daily accumulations using the NRCC method. For monthly precipitation totals the NRCC methodology improves upon the estimates of interpolated precipitation given by the Parameter-elevation Regressions on Independent Slopes Model (PRISM). Thus, this new method provides a radar-based alternative to similar climatologies based on the spatial interpolation of gauge data alone.

Climatic Perspectives for the Southeastern U.S.

The Southeastern Regional Climate Center has developed a Web page to provide a rich mix of climatological information over a range of time periods. These climate perspectives provide a synopsis of recent temperature and precipitation patterns in terms of how they depart from what is normally observed. The daily updated climatological information allows the user to readily assess the extremeness of an ongoing weather event (e.g., exceptionally hot, cold, or wet conditions) over the prior days, weeks, or months by seeing how it compares with historical records during the same calendar period.

Unlike traditional climatologies, the identification of a time period with the most extreme departure from normal is not constrained to one calendar period such as a given month, season, or year. Weather departures are identified for time periods ranging from days to weeks to months and longer. The user can select any weather station from the Cooperative Observer Network or from National Weather Service first-order sites and develop climate perspectives for minimum, maximum, and mean temperatures and precipitation. In addition, a geographical perspective is provided by a map that plots the location exhibiting the most similar temperature based on its climatological normals. A daily maximum temperature of 22 degrees F in Greensboro, NC, for example, might be identified as being closest to the normal temperature for Minneapolis, MN on a given date in January.

The Southeastern Climate Perspectives page can be found at http://www.sercc.com/perspectives/



Sample output from the Climate Perspectives page

RCCs Roll Out Suite of Data Access Tools for ACIS

New climate data access tools have been developed for the Applied Climate Information System (ACIS) to meet the climate information needs of state climatologists, the National Weather Service, and others. The tools were designed around Web services calls, so that the tools can be easily incorporated into Web pages.

The ACIS interface that uses these tools exclusively, SC ACIS, features products to provide basic daily and monthly summarized data for a single weather station or a group of stations. Stations can be selected by any of a variety of common station identifiers or with Google-based search tools. Stations can be grouped by state, county, climate division, county warning area, or drainage basin. Maps are provided to guide users through each of these selection processes.

A series of weekly webinars were conducted during November and December to familiarize programmers at the Regional Climate Centers and the United States Department of Agriculture with these new climate data access tools. Online references and sample programs were developed to complement these training sessions. A dynamic user's guide is available on the Web with detailed descriptions and live examples of each of the Web services calls (http://data.rcc-acis.org/doc/). A blog was created with annotated programs to guide novice Web services programmers through the process of new product development. Also, a Web page was created to allow programmers to report and track bugs and request enhancements to the suite of products. Development and evaluation of SC ACIS are continuing.

Powered by ACIS
NOAA Regional Climate Centers

National Weather Service Visits High Plains Regional Climate Center

The High Plains Regional Climate Center (HPRCC) hosted seven visitors from the National Weather Service (NWS) Offices in Hastings and Valley, Nebraska. Representatives from both offices came to learn more about HPRCC and possible collaborations between HPRCC and their respective offices. During this day-long workshop, HPRCC faculty and staff highlighted many functions of the center, including research, product development, and outreach.

The workshop also included an online tour of the HPRCC's many products such as the current climate summary maps, the Climate Information for Management and Operations Decisions (CLIMOD) system, and Classic Online Services. A field trip to an Automated Weather Data Network (AWDN) station in Lincoln, NE provided an opportunity for the visitors to see the station configuration and learn more about the data-collection process.

The workshop proved to be an opportune place to talk about collaborations and the needs of specific NWS offices. One major outcome of the workshop was the addition of new data to the Norfolk, NE ThreadEx station. Collaborations continue to update additional datasets.

NWS personnel visit an HPRCC AWDN station in Lincoln, Nebraska.

Preliminary Indications of Observed Climate Change in the High Plains Region

The Fourth Assessment Report of the Intergovernmental Panel on Climate Change called for more investigation into trends and impacts at regional and local scales. The High Plains Regional Climate Center has begun evaluating changes in maximum, minimum, and average temperatures for states in the region. The study is using data from the 176 stations in the six-state region that are part of the U.S. Historical Climatology Network. Results for Colorado, Kansas, Nebraska, North Dakota, South Dakota, and Wyoming are included in the following table. The trends in annual temperature are shown for those states where the confidence level is high. Values that were not significant are labeled NS. Temperatures below 1 degree C per decade can also be translated to the number of degrees per hundred years (e.g., 0.15 degrees C per decade can also be considered as 1.5 degrees C per hundred years).

For all states, the trends for minimum and average temperatures during the 1895 to 2009 time period were found to be significant. The trends for minimum temperatures range from 0.08 degrees C per decade in Wyoming to 0.15 degrees C per decade in North Dakota. Average temperatures ranged from 0.06 degrees C per decade in Nebraska to 0.13 degrees C per decade in North Dakota. Trends in maximum temperature were significant only in Colorado, North Dakota, and Wyoming.

Results of a trend analysis for the states within the HPRCC boundaries for 1895–2009 relative to the base period 1961–1990. Temperatures in degrees C per decade.

State	Maximum	Minimum	Mean
Colorado	0.10	0.11	0.11
Kansas	NS	0.10	0.07
Nebraska	NS	0.09	0.06
North Dakota	0.11	0.15	0.13
South Dakota	NS	0.14	0.10
Wyoming	0.12	0.08	0.10

NS = No significant trend

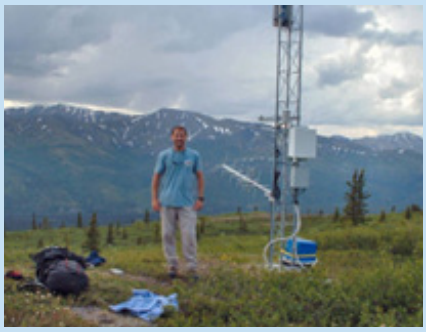
PARTNERSHIPS & COLLABORATIONS

Climate Monitoring and the National Park Service

Over the past five years the NOAA Western Regional Climate Center (WRCC) has provided expert advice to the National Park Service Inventory and Monitoring (NPS I&M) Program. The I&M Program was implemented as part of an effort to improve park management through greater reliance on scientific knowledge. It provides guidance, funding, and technical assistance to complete a set of 12 natural resource inventories for the parks. These inventories serve as a baseline for establishing long-term ecological monitoring, known as "Vital Signs Monitoring."

Vital signs are a subset of physical, chemical, and biological elements and processes of park ecosystems that are selected to represent the overall health or condition of park resources, known or hypothesized effects of stressors, or elements that have important human value. As part of the I&M Program, the NPS has organized more than 270 parks into 32 ecoregional networks to conduct inventory and monitoring activities (http://science.nature.nps.gov/im).

The NOAA WRCC, under agreement with the NPS I&M Program, collaboratively authored a comprehensive climate inventory for each of the 32 I&M Networks (http://www.wrcc.dri.edu/nps). Additionally, the WRCC has provided directed guidance on establishing climate monitoring protocols, database and metadata development and standards, climate monitoring network design (site selection), and instrumentation.



WRCC's David Simeral working collaboratively with Denali National Park & Preserve scientists to deploy a climate monitoring network.

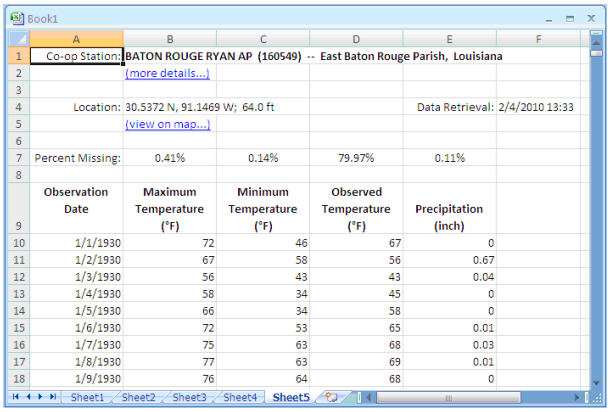
Excel Plug-in for Access to ACIS

Many users of climate data prefer to download data and then import it into a spreadsheet for further analysis. The steps involved in downloading, importing, and error-checking the data can be cumbersome. A plug-in tool for Microsoft Excel 2007 developed by the Southern Regional Climate Center allows users to open an Excel spreadsheet and directly access daily data from ACIS to perform graphing, specialized statistical analysis, or custom data-driven reports.

When properly installed, the plug-in tool will appear as a "Climate Data" tab located on the top-level menu bar. Opening this tab displays a menu bar that will provide the user with options for station selection by state, county, station name, date range, and variables to download. County lists are specific to the selected state, station lists are specific to a selected county, and date range and climate variable offerings are specific to the station selected. Other options include loading small "trace" rainfall amounts into the spreadsheet as a "T" or as a numeric value of "0" or excluding a data column if all values are missing.

After all parameters are selected, the data can be retrieved from ACIS archives. Within a few seconds the spreadsheet will be automatically populated with the requested climate information. The user is then free to use these data in their specific application. The downloaded information includes both the climate data and metadata. The complete metadata history and the station location can be viewed on a Google map.

The plug-in is currently undergoing testing and is expected to be available for general use later this spring.



Book1

	A	B	C	D	E	F
1	Co-op Station:	BATON ROUGE RYAN AP (160549) -- East Baton Rouge Parish, Louisiana				
2		(more details...)				
3						
4	Location:	30.5372 N, 91.1469 W; 64.0 ft			Data Retrieval:	2/4/2010 13:33
5		(view on map...)				
6						
7	Percent Missing:	0.41%	0.14%	79.97%	0.11%	
8						
9	Observation Date	Maximum Temperature (°F)	Minimum Temperature (°F)	Observed Temperature (°F)	Precipitation (inch)	
10	1/1/1930	72	46	67	0	
11	1/2/1930	67	58	56	0.67	
12	1/3/1930	56	43	43	0.04	
13	1/4/1930	58	34	45	0	
14	1/5/1930	66	34	58	0	
15	1/6/1930	72	53	65	0.01	
16	1/7/1930	75	63	68	0.03	
17	1/8/1930	77	63	69	0.01	
18	1/9/1930	76	64	68	0	

Sheet1 Sheet2 Sheet3 Sheet4 Sheet5

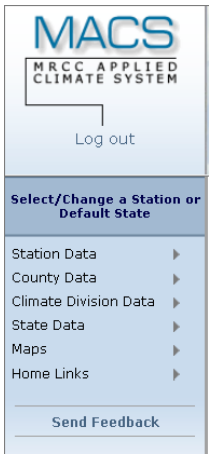
ACIS climate data inserted into an Excel spreadsheet showing the first 9 of 29,254 extracted records.

MRCC new online system continued from page 1

a new look and a logically organized user interface. It reproduces most of the products that were included in MICIS along with a number of enhancements. Staff at the MRCC continually solicited input from MICIS subscribers to guide the design of the products included in MACS.

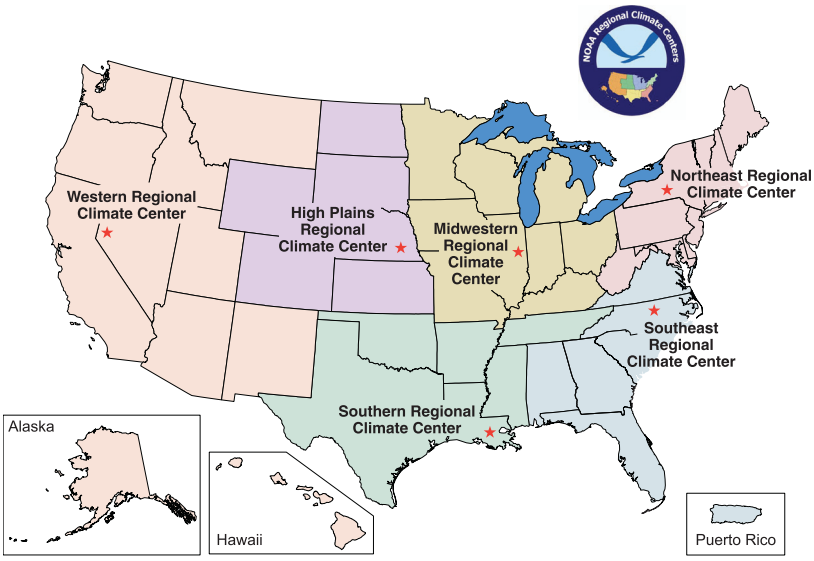
"The transition from MICIS to MACS went remarkably well for us and our customers," said Steve Hilberg, MRCC Director. "The success of this major undertaking represents the hard work and dedication of the entire MRCC staff."

MICIS was the foundation of the MRCC online data and product delivery system for more than 15 years. MICIS was officially retired on December 10, 2009.



The MACS data access menu

For more than twenty years NOAA's Regional Climate Center Program has been recognized by Congress as vital to the efficient, coordinated delivery of NOAA climate services from national to local levels. The mission of the six centers is to provide quality data stewardship, improve the use and dissemination of climate data and information for the economic and societal good of the U.S., and conduct applied climate research in support of improved use of climate information.



BY THE NUMBERS

October 1-December 31, 2009

Total Web hits:	18,232,709
Data Requests/contacts:	2,453
Media requests:	123

High Plains RCC University of Nebraska, Lincoln, NE	**(402) 472-6706**
Midwestern RCC University of Illinois, Champaign, IL	**(217) 244-8226**
Northeast RCC Cornell University, Ithaca, NY	**(607) 255-1751**
Southeast RCC University of North Carolina, Chapel Hill, NC	**(919) 843-9721**
Southern RCC Louisiana State University, Baton Rouge, LA	**(225) 578-5021**
Western RCC Desert Research Institute, Reno, NV	**(775) 674-7010**