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The RCC Report

NEWSLETTER OF THE NOAA REGIONAL CLIMATE CENTERS

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A New Paradigm for Climate Services

The Regional Climate Centers (RCCs) recently began an integrated project to develop tools that provide a foundation for new and improved climate services. The RCCs plan to develop capabilities to incorporate projections of future weather and climate change trends into our suite of available climate products, thus expanding our focus of providing current and retrospective climate information to aid decision-makers.

Working under contract for the National Climate Assessment (NCA), a project of the U.S. Global Change Research Program, the RCCs will: 1) survey users within our regions to determine current uses and needs for climate products that will enhance planning for various climate change and variability scenarios; 2) improve access to gridded climate data products developed both internally and by external agencies and organizations; 3) explore development of methodologies that merge gridded data with point-based observations of historical climate; and 4) develop climate data products that use merged data from point-based observations and gridded data sources.

Surveys are the starting point to determine user needs for new products and information. The Midwestern and High Plains RCCs are working with State Climatologists (SCs) and local extension offices to assess climate information needs of agricultural users. The goal is to assist agricultural producers in selecting seed varieties, planting dates, irrigation scheduling, pest control, and best management practices to optimize decisions for the wide range of climate regimes and long-term climate trends in the Midwest-High Plains region.

The Southeast RCC is partnering with SCs to analyze climate information requests to identify needed climate tools and products, and is also working with epidemiologists and health officials to identify vulnerabilities of the health sector to climate extremes. The Southern RCC will survey state government agencies across the region to determine current use of climatic information that guide and support planning and management decisions. An emphasis will be placed on guidance products that assist emergency management activities that include severe weather events, drought, and coastal hazards related to increased vulnerabilities and uncertainty related to climate change. The Western RCC is cataloging current product offerings and developing surveys to guide future product development. These efforts will be coordinated with the Western Governors Association, the Western States Water Council, and its Western Governors Wildlife Council in support of climate adaptation strategies.

Spurred by recent user demand for near-term and long-term climate information to aid planning decisions, the RCCs will develop methodologies and tools to integrate forecasts and model projections with near-term climate observations and archived historical data to deliver enhanced products. This effort, led by the Northeast RCC, has begun with the addition of sophisticated access methods to gridded datasets that span historical observations, near real-time data, short-term weather

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RESEARCH

The Societal and Meteorological Impacts of Inland-Moving Tropical Cyclones

The impacts of land-falling tropical cyclones frequently extend far inland from the coast and are often overlooked. The Southeast Regional Climate Center (SERCC) is studying the societal and meteorological impacts of inland tracking tropical cyclones across the southeastern region of the U.S. In addition to deaths from falling trees and floodwaters, inland-moving tropical cyclones are associated with a wide range of impacts, including power outages, event and school cancellations, environmental and agriculture damage, and mudslides. Economic benefits are also identified, including increased hotel occupancy with coastal evacuations and increasing business for tree-cutting companies, auto body repair businesses, grocery stores, hardware stores, and roofing firms.

Researchers at the SERCC scrutinized newspaper archives and the National Climatic Data Center's Storm Event database to identify these inland impacts. Newspaper sources provide a broader and more detailed perspective on societal impacts, especially those that are indirect and occur before or well after the passage of the cyclone.

These wide-ranging impacts are being compared with wind and precipitation fields in order to identify the meteorological aspects of each tropical cyclone that exert the greatest influence. Preliminary results suggest that wind impacts are greatest with

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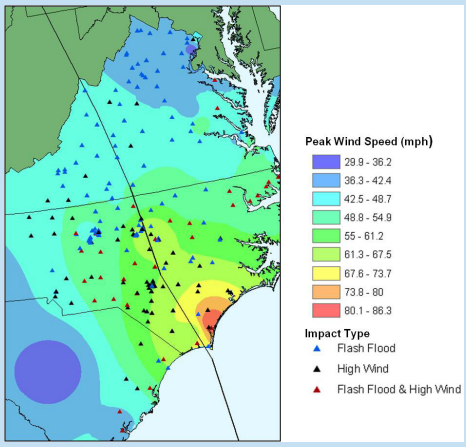


Peak wind speeds (contours) and distribution of high wind and flood reports (triangles) relative to the track of Hurricane Fran in 1996 (black line).

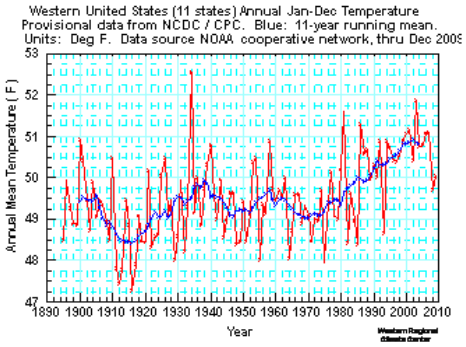
Western Temperatures on the Rise

Climatologists at the Western Regional Climate Center (WRCC) have been examining temperature trends in the western U.S., and have found some interesting outcomes within the temperature record.

Annual mean temperature in the 11 continental western states has been estimated back to 1895. For the first 80 years, temperature fluctuations lasting about a decade or so prevailed. Then, during a low point in the middle 1970s, temperature began to rise. This increase stalled starting about 1998, but at a level much above the previous 115 years. The decade ended with two cooler years. The 35-year rise from the middle 1970s to the late 2000s amounts to about 2 degrees F.

The starting year and the total rise are fairly close to climate model projections driven by greenhouse gases. Climate continues to be subject to other external factors (pollution particles, volcanoes, and small solar variations), and to internal factors (clouds, ocean patterns, and atmospheric circulation adjustments), so temperature is not expected to rise steadily. The WRCC has been closely tracking this increase for the past 15 years once it became apparent it was not reversing.

The period starting about 1998 has generally been warmer than average in the western and northern states, with little change seen in many parts of the Southeast U.S. This east-west asymmetry in United States warming appears to relate in turn to the manner in which the Pacific Ocean is warming. The atmosphere over North America adjusts to that heating by means of a warm ridge in the west and a cool trough in the east. This warming has many consequences for the western states, and its effects are the subject of many current climate studies. □



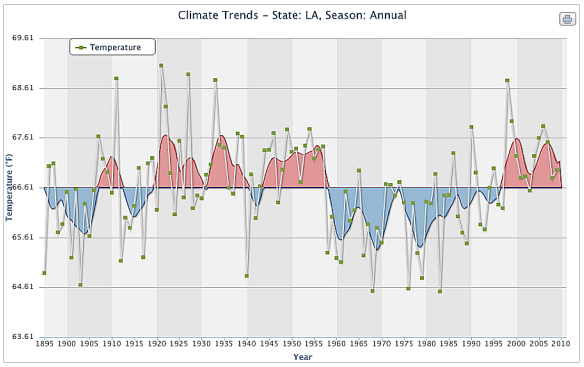
Average annual temperatures for 11 western states. The red line is the temperature. The blue line is the 11-year running mean.

Charting Climate

Chart-based applications of surface climate data are being developed by the Southern Regional Climate Center in partnership with the Southern Climate Impacts Planning Program (SCIPP). The charts provide a quick visual assessment of current and historical climate conditions by state, climate division, or observation site. Data used in these charts include monthly temperature and rainfall data from the National Climatic Data Center (NCDC) and daily temperature and rainfall data from the Applied Climate Information System (ACIS).

The charts are dynamically generated from live data and have an interactive user interface to allow users to select the data parameters, geographical region, and period of interest. Users can also interact with the displayed graphic to obtain values of data points on the charts and zoom to finer granular time frames.

Three products are currently included in the product suite, and more products will be developed in the future. The **Monthly**



This chart is a Historic Climate Trend chart for temperature in Louisiana. The central line is the long-term annual average, red regions above the central line indicate warm trends, and blue regions below the central line indicate cold trends. The trend line is calculated using 5-year moving averages for the period 1895-present and a spline is fit using moving averages.

Summaries product provides monthly temperature and rainfall values for a specified year and region (climate division or state). Long-term averages are included for comparison. This tool provides an easy snapshot of climate conditions for an entire month.

The **Historical Climate Trends** product provides a comparative seasonal analysis for a specified climate division or state. NCDC's monthly temperature and rainfall values are used to help compare seasons. Five-year moving averages of seasonal values were used to generate a trend line and help visualize wet and dry patterns of precipitation and warm and cold temperature patterns.

The **Climograph** displays daily temperature and rainfall values for a specified observation site and year. The 1971–2000 normals (averages for a 30-year period) data set are used to compare current conditions with long-term averages. Site selection is aided by a dynamic suggestion of observation site identifiers (station id) and site names.

All chart-based products are available online at: www.southernclimate.org/data.php □

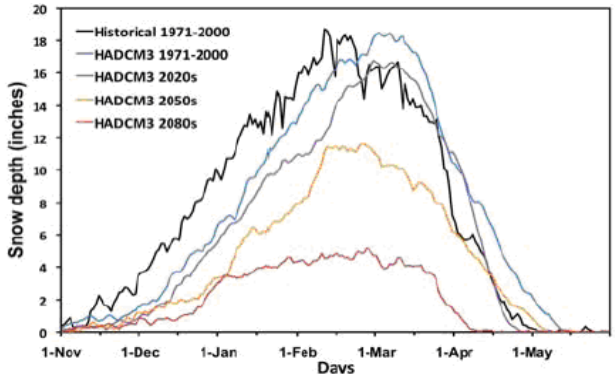
The New York State Climate Assessment

Over the past two years, the Northeast Regional Climate Center (NRCC) has played a principal role in conducting a climate assessment for New York State. The assessment includes both an inventory of impacts and vulnerabilities that eight climate-sensitive sectors will likely face as well as recommendations for adapting to climate change. The assessment will form the scientific basis for climate adaptation planning in New York.

The NRCC was involved in three key areas: 1) an ongoing stakeholder engagement process; 2) the assessment of historical climate conditions and trends; and 3) the downscaling of several sector-specific climate variables as a part of illustrative case studies.

The NRCC worked most closely with the ecosystems, agriculture, and water resources sectors. The vulnerabilities that these sectors face are overlapping, with potential adaptation strategies in one sector (e.g., increased agricultural irrigation) affecting the vulnerabilities of another (e.g., water supply reliability). Many sectors have already experienced climate-related changes that have affected their operations and planning. These were most often reported by the coastal and agriculture sectors.

The stakeholder interaction process highlighted many unique concerns. For instance, the dairy industry is concerned about livestock facility cooling capacity, fruit growers perceive an increased risk of frost damage from rapid spring degree-day accumulation, and ecosystem managers worry about the impacts of changing amounts of snow cover. Through its efforts in New York State, the NRCC is poised to participate in other state-based assessments in the region and is eager to apply the lessons learned in New York to their work as part of the upcoming national assessment. Similarly, the ideas generated during many stakeholder workshops are likely to drive a number of NRCC operational products and applied research projects in the coming years. □



Projected changes in snow depth at a site in the Adirondack Mountains based on the United Kingdom Meteorology Office Hadley Centre Climate Model version 3, using the high-emissions A2 scenario. Each line represents an average over a 30-year period. The climate model correctly estimates the amount of maximum snow cover and the shape of the seasonal distribution for the 1971–2000 baseline period (observations in black, model in blue). However, the model distribution is shifted slightly to later in the season. Projections for the period 2010–2039 (yellow), 2040–2069 (orange), and 2070–2099 (red) show progressively less snow cover and an earlier end to the snow season.

PARTNERSHIPS & COLLABORATIONS

WRCC a Partner in new Southwest Climate Science Center

The Western Regional Climate Center (WRCC) at the Desert Research Institute has partnered with the University of Arizona in a new Southwest Climate Science Center established by the U.S. Department of the Interior (DOI). The center will address current and future effects of climate change on the region's natural and cultural resources. The $3.1 million five-year grant to initiate the center that includes four other universities is one of eight regional centers established or planned by DOI in the nation. The center will include a mix of federal and university employees.

Most of the Great Basin (where WRCC is located) is under the stewardship of the Department of Interior, which includes the Bureau of Land Management, National Park Service, Fish and Wildlife Service, Bureau of Reclamation, U.S. Geological Survey, Bureau of Indian Affairs, and other agencies. WRCC and other researchers are tracking indicators of climate and its effects in the region, including rising temperatures, earlier spring snowmelt, earlier blooming of plants, upward movement of biological zones, and rising sea levels.

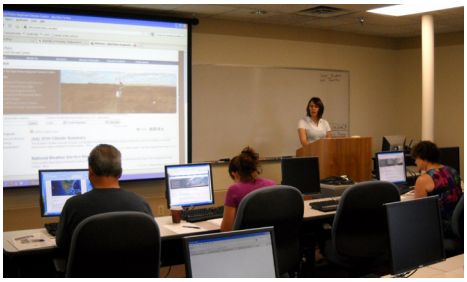
Complicating the patterns of impacts stemming from variations in climate is the tremendous diversity in topography, biology, hydrology, land use, as well as the climate itself in the region—a huge swath of land and coastal area stretching from the U.S.-Mexico border region north to the headwaters of the Colorado River and west to the Pacific Coast of California. The new Climate Science Center will provide for a post-doctoral position at the WRCC to work in observations, data monitoring, management, and visualization. □

HPRCC Hosts Climate Service Workshops

Staff of the High Plains Regional Climate Center (HPRCC) were busy during the summer of 2010 preparing for and hosting two different climate service workshops. The first was held at the National Center for Atmospheric Research (NCAR) Center Green Campus in Boulder, CO. Tribal college faculty from Sisseton Wahpeton College, United Tribes Technical College, and Fort Berthold Community College participated in a one-day climate services training session, given by the HPRCC Director and the Regional Climatologist. Faculty learned about the Regional Climate Center program, the HPRCC, and the services that we provide, and also received hands-on demonstrations on climate data access through online services.

While each participant's research interests varied, everyone benefited from the experience. In a post-workshop survey, one participant commented, *"Because of the size of the class, a lot of questions of concern to each participant were allowed, so many questions were answered. This was an important part of the workshop."*

A second workshop was held in Lincoln, NE at the School of Natural Resources; the theme centered around Regional Climate Services. In attendance was each State Climatologist in the High Plains region, NOAA staff from the Central Region Headquarters (including the new Regional Climate Services Director) and from the Climate Services Division, in addition to HPRCC staff, National Drought Mitigation Center staff, and the new Climate Variability Extension Educator for Nebraska. Updates were given from each of the participants, regional issues were discussed, and future collaborative research and outreach activities were planned. The meeting was quite successful and will become an annual event in the region. □



Regional Climatologist Natalie Umphlett takes Tribal College faculty through a tour of the HPRCC products and services.

Impacts of Cyclones continued from page 2

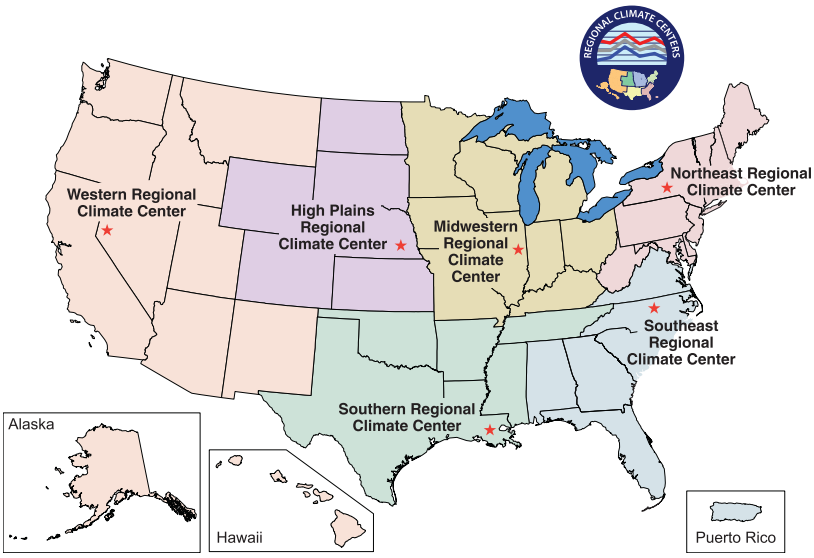
large, strong tropical cyclones whose right forward quadrant tracks inland over major metropolitan areas. Flooding and heavy rainfall impacts, on the other hand, are tied to slow-moving or large cyclones, especially those that move along or merge with a stalled frontal boundary. □

New Paradigm continued from page 1

forecasts, and climate projections. This will build upon product capabilities of the Applied Climate Information System (ACIS) and spur development of new applied modeling tools, visualization of climatic trends supported by enhanced time series graphics and analysis, and provide frequency analysis of temperature and precipitation spanning past and future time horizons. The emphasis on product development will create new decision support tools allowing users to consider past and present climate trends that affect near-term and long-term planning and management decisions. A benefit of using a gridded data approach, linked to existing point–based observations and analysis tools, is increased availability of reliable climate information at the regional and local levels where decisions are being made.

While simple in concept, these changes must integrate provision of new climate information techniques with existing information delivery at all RCCs. The RCCs will continue to provide climate service product users currently rely upon while expanding the scope of services for long-range planning activities. New products will begin to appear within the next year as services evolve to meet the increasing demand for climate information, particularly in the area of adaptation to climate change and variability. □

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

July 1-September 30, 2010

Total Web hits:	18,208,252
Data Requests/contacts:	2,177
Media requests:	165

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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**