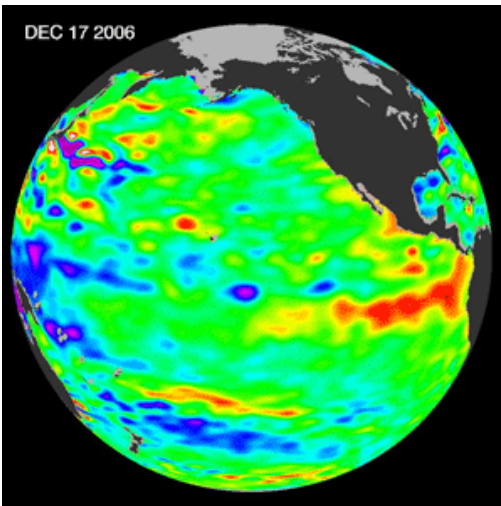
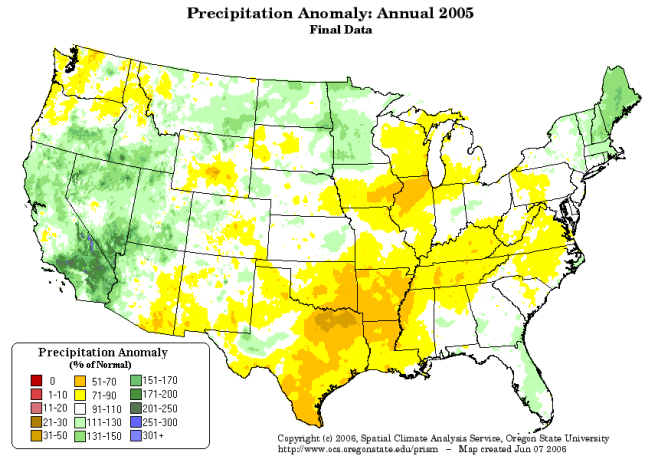


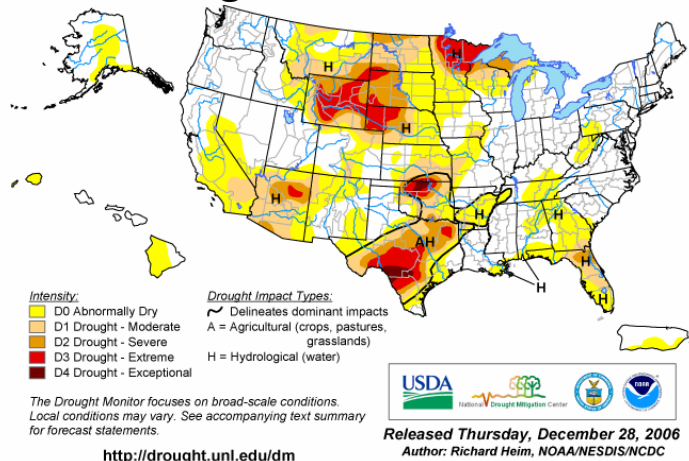
THE STATE CLIMATOLOGIST

2006 Annual Summary
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Editor's Note

The State Climatologist is an annual report of activities of members of the American Association of State Climatologists. It has been a pleasure to be the editors of this year's edition, covering the period January-December 2006.

We would like to express appreciation to all the state climate offices, regional climate centers, AASC partners and others who contributed to this year's edition.

Laura M. Edwards
Desert Research Institute

Melissa L. Griffin
Florida Climate Center
Florida State University

July 15, 2007

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About the American Association of State Climatologists

The American Association of State Climatologists(AASC) is a professional scientific organization composed of state climatologists (one per state), directors of the six Regional Climate Centers and associate members who are persons interested in the goals and activities of the Association. State Climatologists are individuals who have been identified by a state entity as the state's climatologist and who are also recognized by the Director of the National Climatic Data Center of the National Oceanic and Atmospheric Administration as the state climatologist of a particular state.

State Climatologists currently exist in 42 states and Puerto Rico. They are typically either employees of state agencies or are staff members of state-supported universities. Associate members may be assistant state climatologists or other climatologists under the employ of the state climatologist, representatives of federal climate agencies, retired state climatologists, or others interested in climate services. The total membership of the Association is approximately 150. For more info, see <http://lwf.ncdc.noaa.gov/oa/climate/stateclimatologists.html>.

ARSCO

A state climate office may gain status as the AASC-Recognized State Climate Office (ARSCO) by providing:

1. A document detailing current and planned activities meeting ARSCO requirements;
2. A letter of support from the state's Regional Climate Center Director;
3. A letter of support from at least one National Weather Service Forecast Office serving the state.

Candidate offices must demonstrate the following capabilities:

- Communication capabilities – the office must be able to communicate with its clientele via multiple media, including telephone, Internet, mail, E-mail, and fax;
- Information services – the office must be capable of providing a range of data and information;
- Research – the office must conduct research on climate and human activities;
- Outreach – the office should design products and services for education, climate information, awareness, and the media;
- Monitoring and assessments – monitoring climate conditions, evaluating future impacts, and providing historical context to events are activities conducted by ARSCOs.

Upon receipt of the materials and approval of the AASC Executive Board, a Memorandum of Agreement (MOA) with the National Climatic Data Center shall be issued.



Spring, 2007

Dear AASC Members and Friends,

This year has heightened my awareness of the diversity within the AASC. The media has focused attention on the differences that some members have on the causes of the global warming trend. The political shift within the nation has brought new opportunities and pressures on climate offices within certain states and regions. The struggles of the federal budget continue to morph our partnership with NOAA. Besides these external differences, our membership represents those with expertise from physical geography to climate modeling and more. Our offices are sustained by state line-item budgets to hand-to-mouth grants. Some have staffs that are in the double digits, many have only part-time assistants. Yet we have accomplished much in 2006. I present to you the annual reports of the ARSCO's, RCC's and affiliated SC's and congratulate you on a job well done.

Sincerely,

Paul Knight
AASC - President

Creating Outreach and Education Opportunities from Climate Research and Services

By *Laura M. Edwards and Melissa L. Griffin*

Many of us who are in state and regional climate offices have a built-in passion for communicating. Whether it's emailing with students and teachers, talking on the phone to an observer, or conducting media interviews, we love to talk about climate. It's no wonder that for many in our midst, outreach and education efforts have come to be in the spotlight and among some of our favorite activities. In addition, more and more research sponsors are requiring that outreach be a part of your deliverables, integrated in disseminating your research results. Despite challenges that such a requirement may present, creating opportunities to spread the word about our field is often rewarding.

It is clear from annual reports submitted this year that most of the AASC membership is participating in some form of outreach and education in both proactive and reactive modes. In this day and age, much of the initial contact of a potential audience looking for climate-related outreach and education activities is by way of the internet. Anecdotally, the majority of the email at the Western Regional Climate Center begins with "I visited your website and..."

We performed a short review of most AASC member websites, and some other groups such as NOAA's Regional Integrated Science Assessments (RISA) program. Some offices, such as the Oklahoma Climatological Survey, have some examples of what is possible for proactive outreach. They have used climate data to produce products, tools, websites and lesson plans for public safety, teachers and students, in order to learn about Oklahoma climate. In addition, they have educational resources online that are generated by the OCS staff that explain weather and climate, with a glossary, tornado safety, and graphics. Indiana's state climate office also has resources that they have generated for classrooms, teachers and students. It is clear that most of us are great at responding to requests (reactive mode) to participate in outreach and education efforts in our geographic areas of interest, such as speaking to classrooms, giving demonstrations on weather phenomena, and presenting climate information to stakeholders.



Figure 1. North Carolina State Climate Office groups such as the Imagination Station.

Climate and weather is interesting to many people, and it shows that AASC members are responding by having websites. Simply making your presence known to answer questions or redirect constituents to better sources of information is an easy service to provide. In our website review, however, it was surprising how many states do not have any explicit outreach or education information or links. Of all 50 states, Guam and Puerto Rico, only three states do not have state climate websites. We found 18 of the 49 websites that are available did not have visible outreach or education information. Most members that did have an outreach or education section on their website had links to other sources of information, such as NWS, GLOBE and NCAR.

A number of the state climatologists and regional climate centers have partnered with RISAs around the nation. A key component of RISA activities is the outreach and

communication with stakeholders about relevant issues in their region, so this partnership can help state offices get in touch with constituents. Some RISA programs have performed surveys and other types of social science research to learn how users of climate data get the information they need and what purposes the data serve.



Climate specialists affiliated with the RISA program are an up-and-coming group. CISA, the Carolinas RISA, and Sea Grant have come together and plan to hire a climate specialist for their region to address their coastal constituents' needs. Dr. Mike Crimmins in Arizona, although not funded by RISA, is one example of how effective these people can be in fostering interaction between scientists and users.

One of the newer programs that offers a great opportunity to tell and teach others about climate is Community Collaborative Rain, Hail and Snow network (CoCoRaHS). Nearly 20 states are on board, and more are making plans and working with partners to join the network.



Some states have their own similar weather observing network, such as Minnesota, Nebraska, and Arizona. Many state climatologists, regional climate centers, and NOAA's National Weather Service have been active participants in CoCoRaHS. The original CoCoRaHS state of Colorado has had much success in motivating citizens to watch the weather in their backyards each and every day. The enthusiasm of the coordinators, both nationally and locally, can be contagious. This is one activity that encourages hands-on learning and thinking about the weather and climate in your area, and shows

that everyone can learn something new about their local or regional climate. More information about CoCoRaHS can be found at: <http://www.cocorahs.org>.

The National Phenology Network (NPN) has been making efforts to grow in numbers of participants as well. This is another opportunity where the AASC membership may have some interest. At first glance it may appear as if climatologists would have little interest in plants blooming, but research has been published that describes earlier blooms in lilac and honeysuckle in the western U.S., based on data recorded in a phenology network (Cayan et al., 2001). More information regarding the expanding NPN can be found at: <http://www.uwm.edu/Dept/Geography/npn/>.



We all are sitting on gold mines of data, as we have heard it said, and people are becoming more and more interested in what information we can give them, and how climate affects their lives and decision-making processes. Each of us has the data resources at our fingertips through Applied Climate Information System, state mesonets, NCDC, and RCCs. It is clear that each office has varying demands on its staff in the way of time and financial resources. This annual report shows that despite these challenges, AASC members have a lot to offer for the public, teachers, and students (both K-12 and college). We are already participating in outreach and education efforts, and it may be worth noting this on our websites to demonstrate our abilities in preparing audience-specific resources. So maybe the next time you give a talk to a grade school classroom, or have a TV interview, or help a teacher create a lesson plan, think about posting it on your website and making yourself known. It is easy to create opportunities for exciting work with new partners in education, and before you know it, future colleagues and climatologists-to-be will be knocking on your door eagerly wanting to learn more.

References:

Cayan, D.R., S.A. Kammerdiener, M.D. Dettinger, J.M. Caprio, and D.H. Peterson, 2001. Changes in the Onset of Spring in the Western United States. *Bulletin of the American Meteorological Society*, Vol. 82, No. 3, 399-415.

NOAA Climate Program Office RISA program: http://www.climate.noaa.gov/cpo_pa/risa/

Applied Climate Information System: <http://www.rcc-acis.org/>

2006 SUMMARY OF THE UNITED STATES CLIMATE

Compiled by Trevor Wallis, National Climatic Data Center

National Temperature

For the contiguous United States, 2006 marked the ninth consecutive year with temperatures much warmer than the long-term average (Fig. 1). The past nine years have all been among the 25th warmest years on record, a streak which is unprecedented in the historical record. The long-term warming trend for annual temperatures is approximately 1.0°F (0.56°C) warmer than at the start of the twentieth century.

Preliminary data available at year's end showed that the nationally-averaged temperature for 2006 was 55.0°F (12.78°C), ranking this year as the warmest on record. The 2006 annual average temperature was 0.07°F (0.04°C) warmer than the previous record in 1998 and 0.11°F (0.06°C) warmer than 1934,

making these three years nearly identical in rank. An improved dataset will be for historical national temperature analyses in 2007. This new dataset also shows 2006 and 1998 to be the two warmest years on record for the contiguous United States, but with 1998 slightly warmer than 2006.

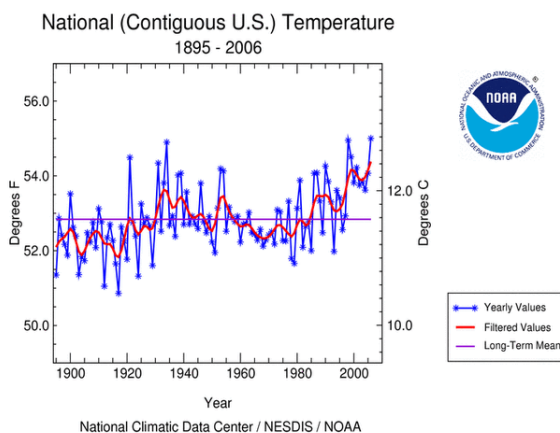


Figure 2. Annual average national temperature for the contiguous U.S.

The 2005-06 winter season (December-February) temperatures were above average across most of the nation with near average temperatures limited to parts of the Northwest and Southeast and no state ranking below average. The warmer-than average winter season was due in part to record warm temperatures that affected the nation in January. The nationally averaged temperature for January 2006 was 39.0°F (3.9°C), which is 1.8°F (1.0°C) warmer than the previous January record set in 1953. All states within the contiguous United States were warmer than average during January, with thirteen states, mostly located in the central and northern Plains and Great

Statewide Ranks Dec 2005-Feb 2006

National Climatic Data Center/NESDIS/NOAA

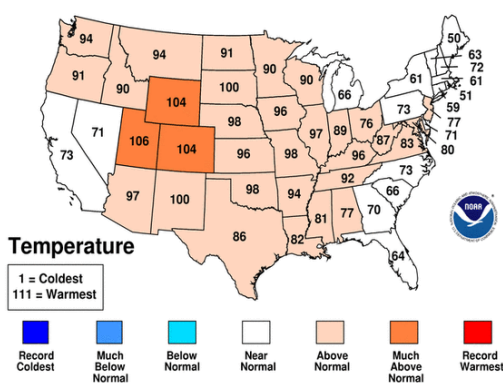


Figure 3a. Statewide temperature ranks for winter 2005-06. Period of record 1895-2006.

Lakes, ranking as their record warmest (Fig. 2a).

Cold air outbreaks affected the western states during March and the Southeast during May, but warm temperatures dominated the nation during most of the 2006 spring season (March-May). Much warmer-than average temperatures affected most of the central states with Texas and Oklahoma having the warmest spring on record. April ranked second warmest in the 1895-present record for the nation with an average temperature of 56.1°F (13.4°C). The summer (June-August) months were characterized by an intense and long-lasting heat wave which began in mid-July in the northern Plains and Upper Midwest, breaking records that stood since the Dust Bowl years in some locations. The heat spread across the Plains and moved into the West before returning to the northern Plains by late July, and then expanded to the East Coast by the first week of August (Fig. 2b). More

Statewide Ranks Jun-Aug 2006
National Climatic Data Center/NESDIS/NOAA

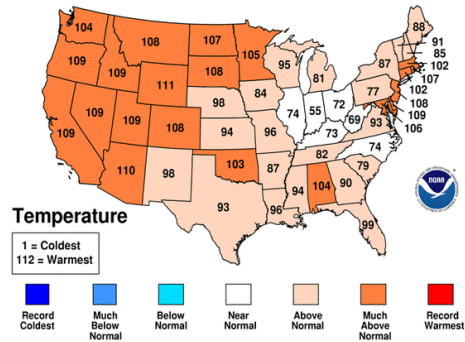


Figure 2b. Statewide temperature ranks for summer 2006. Period of record 1895-2006.

than 2300 daily temperature records were broken in the United States during the last two weeks of July and several more during the first half of August. More than fifty records for the highest temperatures in any July were established. Many locations from the West Coast to the central Plains broke records for the most days above 90°F (32.2°C) and 100°F (37.8°C). The month of July 2006 ranked as the second hottest month ever in the 112-year record with a nationally averaged temperature of 77.2°F (25.1°C), only 0.43°F (0.24°C) cooler than the record hottest month, July 1936. Nationally-averaged temperatures gave summer 2006 a rank of third warmest on record just behind 1934 (second warmest) and 1936 (warmest).

The persistent widespread warmth for much of the year resulted in the warmest January-August period on record. Colder weather during September and October brought a brief respite before unusual warmth returned to much of the country during November and December. December 2006 ranked fourth warmest on record.

January-December 2006 Statewide Ranks
National Climatic Data Center/NESDIS/NOAA

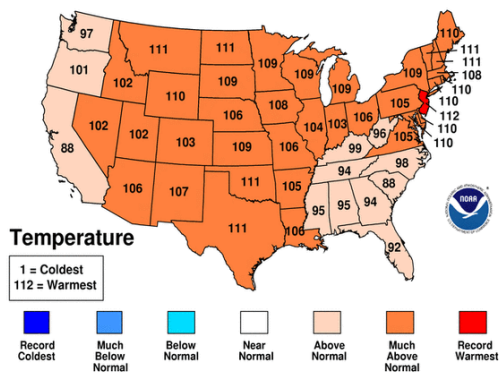


Figure 4. Annual temperature ranks within the 1895-2006 record.

For the year as a whole, New Jersey recorded its warmest year ever. Six states (Montana, North Dakota, Oklahoma, Texas, Vermont, and New Hampshire) were second warmest on record. All of the 48 contiguous states were either record warmest, warmer or much warmer than average (Fig. 3). No state ranked near to or below average during 2006. This contrasts with the spatial pattern during the second and third warmest years, 1998 and 1934, when at least one state ranked colder than average for the year. The 2006 annual temperature

for Alaska ranked near the 1918-2006 average, breaking a string of persistently warm years dating back to 2000. Winter temperatures in 2006 were above average for the seventh consecutive year. Both spring and summer were slightly cooler than average and fall was slightly warmer.

National Precipitation and Drought

Precipitation in the contiguous United States during 2006 was 29.2 inches (742mm), marginally above the long term mean of 29.1 inches (739mm) (Fig. 4), but was variable throughout much of the country; with periods of excessive rainfall, especially across the Northwest, Great Lakes, and the Northeast; and persistent and developing drought in other areas. Winter storms in the Northwest contributed to the ranking of tenth wettest winter for the region. The Southwest had its second driest winter, with Arizona and New Mexico having their driest winters on record. Precipitation averaged across the nation was below average during spring. Regionally, the Southeast had the third driest spring, whereas the West ranked sixth wettest. The Northeast region had its wettest summer, exceeding the previous record by more than 1 inch (25.4 mm), while summer ranked ninth driest in the region consisting of the northern Great Plains and northern Rockies states. Three states (New Hampshire, New York, Rhode Island) had the wettest summer on record. Fall was generally wet across the contiguous United States resulting in a rank of 15th wettest for the nation. Regionally, the Northwest and Northeast ranked tenth and fourth wettest

autumn periods, respectively.

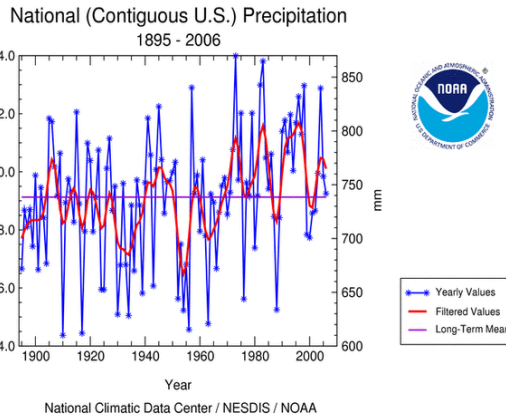


Figure 5. Annual average national precipitation for the contiguous U.S.

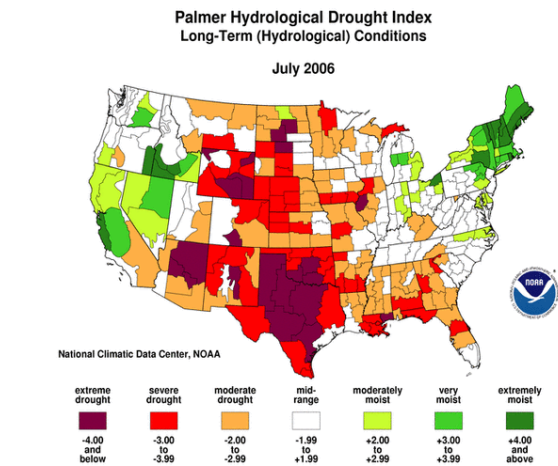


Figure 6. Palmer Hydrological Drought Index for July 2006.

Five of the first seven months of the year were drier than average for the contiguous United States as a whole. Combined with unusually warm temperatures, this exacerbated drought across much of the country. By late July, half of the contiguous United States was in moderate to exceptional drought. Annual precipitation ranks ranged from third driest in Florida and fifth driest in Wyoming and Georgia, to second wettest in New Hampshire and third wettest in Indiana. The Northeast region had another wet year, ranking sixth wettest in 2006 and marking the fifth consecutive year with above-

average precipitation. In fact, the top two wettest annual periods in New Hampshire occurred during the past two years. Nationally, annual precipitation was near the long-term mean, ranking as the 55th driest year on record.

The year began drier than average across a broad swath of the country from the Southwest to the Great Plains, across much of the Gulf Coast, and into the coastal Southeast. Above average precipitation continued to erode the drought areas in the Pacific Northwest. This pattern continued throughout the spring and into the summer (Fig. 6.14). By fall, drought was concentrated in the Plains, especially in Texas and Oklahoma. By the end of the year, drought subsided in much of the Southeast, but was prominent across parts of the Plains.

Several short-lived dry episodes occurred in other regions throughout the year, notably in the mid-Atlantic in February and March, the Northeast coast in March, the Pacific Northwest in July and August, and Florida for much of the year. The percent area of the contiguous United States experiencing moderate to extreme drought (as defined by the Palmer Drought Index, Fig. 5) grew steadily from 20% in January, to a peak of about 52% by July, and then declined during the second half of the year. Impacts from the 2006 droughts were felt especially hard by the agricultural and hydrological communities. The South Platte River was nearly dry during the summer, low water levels in the Mississippi and Missouri Rivers forced an early end to barge transportation, several municipalities imposed water use restrictions, livestock was prematurely sold, and crops died before harvest. In some areas, such as in South Dakota and Nebraska, recovery of grazing lands from drought is not expected for at least two years.

Snow Storms and Snowpack

The 2005-06 snow season was generally above average across parts of the Northwest and below average across the Southwest. The snow cover extent was below average for the North American continent as a whole during the winter season, in which January 2006 had the second lowest snow cover extent after 1981, as well as during the spring season. This is consistent with a trend towards reduced spring snow cover for North America since 1986. By the end of the spring season, snowpack was above average across the western mountains from the Sierra Nevada in California to the Washington Cascades, and into the interior Northwest.

Notable snow storms in 2006 include a blizzard during the month of February that affected areas of the Mid-Atlantic and the Northeast on 11-12 February. This storm produced 26.9 inches (68.3 cm) of snow in New York City's Central Park. This amount broke the all-time storm total record of 26.4 inches (67.1 cm) set during the 26-27 December 1947 storm. The Northeast Snowfall Impact Scale (NESIS) classified the February blizzard as a Category 3 (Major) storm and ranked it as the 20th most intense on record for the Northeast. In Hartford, Connecticut, a snowfall total of 21.9 inches (55.6 cm) broke the old storm total record of 21 inches (53.3 cm) set in 1983. Many locations in the region reported 10-20 inches (25-51 cm) during this event.

An active Pacific storm track during the winter and spring brought a steady supply of snow to the West, Northwest and Intermountain West. On the other hand, snowfall across Arizona and New Mexico was exceptionally low throughout the season with most basins reporting less than 40% of normal snowpack at the end of spring.

The 2006-07 snow season started with above average snowfall across parts of the West. Snowfall accumulations of up to two feet (60 cm) fell across the Cascades in late-November. During December 2006, two major winter snow storms impacted Colorado and parts of the High Plains. Denver, Colorado had its third snowiest December on record and endured a major blizzard which brought the city to a standstill during the holiday travel season. Snowfall in excess of three feet (90 cm) fell across portions of the Colorado front-range and western High Plains during these two events.

Wildfires

Continuing a pattern of increased large fire activity that extends back to the early 1990s, wildland fires reached record levels in 2006. According to the National Interagency Fire Center (NIFC), preliminary estimates of the area burned exceeded 9.8 million acres (~4 million ha) across the United States this past year. In contrast to the total acreage burned, the annual number of wildfires has decreased steadily since the 1980s; over 96,000 fires were reported in 2006, the sixth consecutive year that the annual number of fires for the entire United States has been below 100,000.

There were several notable aspects to the record fire season in 2006, in terms of its timing and severity. Wildfires that initially began across the southern Plains in December 2005 persisted into early 2006. Below normal precipitation and extreme drought conditions aided in the development of numerous wildfires across Oklahoma, Texas, and Arkansas, with over 1.5 million ac (~600,000 ha) burned over the first three months of the year in the Southern Area (which encompasses 13 states, Puerto Rico, the Virgin Islands, and the District of Columbia). During the spring, fire activity spread to the Southwest, with the most severe activity concentrated in New Mexico and southern California. By summer, wildfires had spread into the Great Basin and Pacific Northwest, with large fires affecting most of the West by the end of July. Large fire activity spread northward, as the Pacific Northwest was the focal area in August and early September, while during the fall, activity shifted again into southern California.

Severe Extratropical Storms

Several severe extratropical cyclones affected the United States in 2006. The first of these occurred early in the year on 18 January, when a powerful winter storm brought heavy rainfall, strong winds, and heavy snowfall to sections of the East Coast. During the spring peak in severe weather, several tornado outbreaks occurred in the southern Plains, as well as the Tennessee and Ohio Valleys, which produced over 500 tornadoes and nearly 50 fatalities during March and April combined. Northwestern Tennessee was the hardest hit region, with 23 fatalities attributed to the storms. According to preliminary statistics compiled by NOAA's Storm Prediction Center, there were 1333 tornadoes reported across the United States in 2006, with April having the most of any month (324). The most severe day of the year was 12 March when 142 tornadoes were reported.

Two large extratropical storms of note occurred toward the end of 2006. On 21-22 November, a strong extratropical cyclone developed off the southeastern coast of the United States, producing a variety of severe weather events in the Southeast and Mid-Atlantic regions. Heavy rainfall and strong winds were reported along the coastline from South Carolina northward through Virginia. Winds gusting over 115 km hr^{-1} (70 mph) were reported along the coast of North Carolina. On 13-15 December, a powerful storm

system came ashore along the Pacific Northwest coast and generated strong winds, heavy rainfall and high elevation snows. Wind gusts reaching hurricane-force caused power outages across Washington and Oregon.

Atlantic Hurricanes

The 2006 Atlantic hurricane season produced ten tropical storms (TS), five hurricanes (H) and two major hurricanes (MH) (categories 3-5 on the Saffir-Simpson scale). These values are slightly below the 1950-2000 averages of 11 TS, 6 H, and 2.5 MH.

A widely used measure of seasonal activity is the NOAA's Accumulated Cyclone Energy (ACE) Index, the sum of squares of all 6-hourly maximum sustained wind speed in knots equal or greater than 34kts. The ACE Index accounts for the combined strength and duration of TCs during the season. The 2006 ACE Index was 90% of the 1950-2000 median value ($87.5 \times 10^4 \text{ kt}^2$), indicating a near-normal season (Fig. 6).

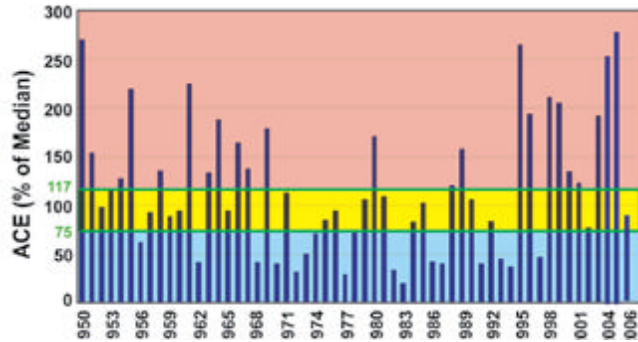


Figure 7. ACE Index expressed as percent of 1951-2000 median value, ($87.5 \times 10^4 \text{ kt}^2$).

The reduced activity during 2006 reflects the competing influences of two dominant climate factors. The first dominant factor, El Niño, suppressed activity during September and October through anomalous upper-level convergence and sinking motion across the Caribbean Sea. Anomalous circulation features not related to El Niño accentuated this signal at times, and also contributed to the reduced activity. The second dominant climate factor was the set of ongoing oceanic and atmospheric conditions that have been conducive to above-normal hurricane seasons since 1995, which remained strong during the climatological peak months August-October (ASO) of the season. El Niño's typical impacts over the western tropical Atlantic Ocean and Caribbean Sea include increased vertical wind shear between 200-850 hPa and anomalous sinking motion in the middle and upper atmosphere. During ASO 2006, El Niño appears to have suppressed TC activity mainly by contributing to anomalous upper-level convergence and sinking motion across the Caribbean Sea. This suppressing influence was particularly notable during September and October, when only one TC developed over the Caribbean Sea despite low wind shear ($< 8 \text{ m s}^{-1}$) and anomalously warm SST. During September, the same conditions, but with no anomalous sinking motion, led to the formation of several hurricanes and major hurricanes over the central and eastern tropical Atlantic Ocean.

SST anomalies during ASO were positive throughout the North Atlantic. For the entire Main Development Region (MDR), which encompasses the tropical Atlantic Ocean and Caribbean Sea area-averaged SSTs during ASO were 0.68°C above average, the second warmest in the historical record, dating back to 1871.

Although El Niño appears to be the primary cause for the reduced TC activity, highly variable circulation features not linked to El Niño also helped to suppress the activity. For example, during August increased vertical wind shear associated with an

enhanced mid-oceanic trough led to reduced activity across the central MDR. During September, a deep trough near the United States east coast contributed to anomalous sinking motion over the Gulf of Mexico. During October, an enhanced upper-level ridge over the south-central United States and western Gulf of Mexico contributed to the anomalous sinking motion over the Gulf of Mexico and accentuated the sinking motion over the Caribbean Sea. These conditions resulted in the third earliest end (following 1983 and 1993) to seasonal activity since routine daily satellite coverage began in 1966.

Only three Atlantic tropical storms, Alberto, Beryl, and Ernesto, struck the continental United States during 2006, the first year since 2001 that there were no hurricanes to make landfall. This represents a sharp drop in strikes compared to the preceding four years (2002-05), when an average of seven named storms and three hurricanes per season struck the continental United States. In September, (four of the five 2006 hurricanes formed in September) the deep trough near the United States east coast was critical in steering hurricanes out to sea long before they reached the coast. The overall suppression of activity over the western part of the Atlantic basin due in part to El Niño also contributed to fewer United States strikes.

Partner Summaries

NOAA/National Weather Service Climate Services Division

1325 East-West Hwy W/OS4

Silver Spring, MD 20910

www.weather.gov/os/csd/

www.weather.gov/climate

In 2006, NWS Climate Services Division (CSD) continued the implementation of its regional and local climate services program. In addition to continuing development of new local climate forecast products, data related activities have increased. The following activities are highlighted.

Observations and Data Issues

The CSD continued to play a leading role to ensure the integrity of the nation's climate record. CSD cooperated with climate service data partners, including the National Climatic Data Center (NCDC), Regional Climate Centers (RCC), and State Climatologists (SC), on the following ongoing projects:

- 21st Century Cooperative Observation program (COOP): CSD is working with NCDC to develop criteria whereby COOP stations will be evaluated for quality. Also being developed are remedial actions, should they be necessary, so that COOP in the 21st century will be as reliable as possible.
- Historical Climatology Network (HCN) Modernization: CSD is coordinating NOAA requirements for the modernization of the HCN. This is where current NOAA efforts related to COOP modernization are focused. Deployment of modernized HCN is expected to begin in 2007/2008.
- Fischer & Porter Update: CSD is working with NWS Science and Technology and Operations to ensure the stability of the Hourly Precipitation Data gauges in COOP. This activity continues previous activity to replace the punch paper tape mechanism with electronically recorded data. Deployment may begin in late 2007.
- Paperless Initiative: CSD is leading the effort to move COOP into a paperless environment. In coordination with NCDC and the RCCs, this effort leverages, improves, and synchronizes existing methods of daily electronic COOP data input and transmission (Wxcoder [web] and IVROCS [touch tone telephone]) and allows this transmission to become the official COOP submission. Paper will no longer be required nor encouraged for COOP observers. Enhanced QA/QC should greatly reduce errors inherent in the manual recording environment.
- Quality Control: CSD continues to coordinate with NCDC and partners on developing a set of common quality control procedures for all NOAA climate data. CSD is also working with NWS regions to set policy for common QA/QC in each field office.
- Threadex: CSD coordinated consistent data extremes for 255 Local Climatological Data stations with NCDC and the RCCs.
- Snowfall/Snowdepth: CSD continues on evaluation team for automated snow sensor studies. Field tests are shifting focus to reliability of deployment and development of calibration algorithms.

Training

CSD continued to improve training of NWS regional and field personnel through redesigning and updating much of the existing Climate Professional Development Series Professional Competency Units, including residence training, teletraining, distance learning, and website links (online at: <http://www.nwstc.noaa.gov/nwstrn/d.ntp/meteor/clipds.html>)

AASC members are encouraged to use these materials. Training includes guidance to NWS field personnel on appropriate referral to various partners (NCDC, RCCs, SCs, etc.) for climate data and information. 2006 training events included:

- May – Two distance learning training sessions on Local 3-month Temperature Outlooks (L3MTO), a new product consisting of downscaled Climate Prediction Center forecasts at specific locations across the country. (<http://www.nws.noaa.gov/om/csd/pds/pcu4/IC4.2/index.htm>)
- June 6-8 - Residence training on field office Climate Operations for Pacific Islands; Honolulu HI.
- June 13-15 - Residence training on WFO Climate Operations, at the NWS Training Center, Kansas City MO, the 5th offering in FY06, completing a 1st round of training for all NWS field office Climate Services Focal Points.
- Aug. 29-31 - Residence training on Climate Variability at COMET (Cooperative Program of Operational Meteorology, Education, and Training), Boulder CO.

New Product development

L3MTOs were released experimentally in 2006 and went operational with the monthly release in January 18, 2007. Work is currently underway for a Local 3-Month Precipitation Outlook.

Outreach Activities

The 2006 Climate Prediction Assessments Science (CPAS) Workshop was held in Tucson AZ on March 21-24. The 2007 CPAS Workshop was held in Seattle, WA, March 20-23. Consideration for the site of the 2008 CPAS is underway and partners are welcome to apply as hosts. CPAS workshops identify new climate prediction applications research, promote interactions between climate-sensitive integrated research and service communities, and assess impacts of climate forecasts on environmental-societal interactions. More information is at <http://www.nws.noaa.gov/om/csd/workshop/>.

CSD attended 2006 NWS sub-regional stakeholder meetings on April 18-19 in Brookings SD and July 18-19 in West Lafayette IN. CSD will attend 2007 NWS sub-regional stakeholder meetings in Lexington KY, Fargo ND, and Laramie WY.

Fact sheets for public distribution and customer support have been developed for **L3MTO, NOWData, El Niño Southern Oscillation, and Drought**. (see <http://www.weather.gov/om/brochures.shtml>) .

International Activities

CSD coordinated a 2-day meeting (February 22-23, 2006) to discuss development of a WMO Regional Association IV Climate Center Pilot Project for Central America.

NOAA's National Climatic Data Center (NCDC)

Veatch-Baley Federal Building

151 Patton Avenue

Asheville, NC 28801-5001

Radar/Climate Contact: ncdc.info@noaa.gov

www.ncdc.noaa.gov

Satellite Contact: ncdc.satorder@noaa.gov

Editor's Note: This letter appeared in NOAA's NCDC 2006 Annual Report, published April 2007.

During 2006, the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC) accomplished a variety of key activities, related to data set development, climate monitoring, observing system effectiveness, a variety of services, and climate assessments. NCDC has a distinctive role within NOAA, acting as our Nation's scorekeeper regarding climate trends and anomalies, while also providing a wide variety of climatic data to our diverse customer base. In partnership with organizations, both internal and external to NOAA, I am pleased to report that NCDC met or exceeded all its performance measures during 2006, sometimes surpassing them by a considerable margin. Each year offers new challenges in providing climate data and products of the highest-quality to meet the needs of society and to do so reliably and timely.

NCDC plays a central role in providing access to weather and climate data, which serves broad social and economic interests. Climate data are used in business decision-making across many different industries including agriculture, transportation, utilities, and manufacturing, to name a few. Emergency planners and decision-makers also use this information to promote environmental awareness, public safety, homeland security, the protection of property, and sustainable development. In the broadest perspective, the Department of Commerce's Bureau of Economic Analysis estimates that at least 1/3 of the United States Gross Domestic Product is climate sensitive, a potential impact of \$4 Trillion a year.

In addition to traditional weather and climate services, NCDC's climatic data are also used in key national and international scientific assessments. Our scientists participated in several of these assessments including the Climate Change Science Program (CCSP) report on "Temperature Trends" (1.1), the CCSP report on "Climate Extremes" (3.3), and the Intergovernmental Panel on Climate Change (IPCC) 4th Assessment Report. Public awareness, media interest, and the scientific consensus in support of global climate change is increasing, as these assessments detail the state of the science and provide valuable information for policy decision-making.

NCDC scientists are also involved in the development of a National Integrated Drought Information System, which will provide an integrated, interagency drought monitoring and forecasting system for the Nation. It is important to note that the achievements identified in this report and many others not listed are a result of the extraordinary efforts put forth by NCDC's talented and dedicated personnel, often working with other NOAA and non-NOAA colleagues. NOAA and the Nation are extremely grateful. We will continue to collaborate within and outside NOAA to develop new climate data resources and applications, in order to meet the needs of our Nation's people. Together, we can make 2007 an even more productive year.

Thomas R. Karl
Director

Natural Resources Conservation Service
National Water and Climate Center
1201 NE Lloyd Blvd, Suite 802
Portland, OR 97232
<http://www.wcc.nrcs.usda.gov>



National Water and Climate Center Overview

The National Water and Climate Center (NWCC) is part of the Natural Resources Conservation Service within the United States Department of Agriculture. The Center's mission is to "*lead the development and transfer of water and climate information and technology that support natural resource conservation.*" The primary goal of the NWCC is to be "*a globally recognized source for a quality snow, water, and climate information and technology.*"

Staffing

The NWCC consists of three branches; Water and Climate Services (WCS), Water and Climate Monitoring (WCM) and Information Systems (IS). Water and Climate Services has two main functions: produce water supply forecasts for the western U.S. and provide climate services for the NRCS and other cooperating USDA agencies nationwide. The climate services staff consists of the following individuals:

- Phil Pasteris, Supervisory Physical Scientist, Water and Climate Services Branch Leader, phil.pasteris@por.usda.gov, 503-414-3058
- Jim Marron, Resource Conservationist, jim.marron@por.usda.gov, 503-414-3047
- Jan Curtis, Applied Climatologist, jan.curtis@por.usda.gov, 503-414-3017

Snow Survey Centennial Celebration

1906-2006 

"In 1906 I offered to climb Mount Rose every month for a year to obtain temperatures on mountaintops. The United States Weather Bureau furnished the thermometers, the Adams Fund was available for research in agriculture, and the Nevada Agricultural Experiment Station was willing. The Study of snow was begun."

-Dr. James E. Church, The Snow Surveyors' Forum, Western Snow Conference, 1952

The Mt. Rose snow sampler and scale were developed and patented in the winter of 1908-09 to determine the water equivalent of the snow deposited on the ground; and in the Spring of 1910, Dr. Church produced the first forecast of the Lake Tahoe rise...the first known water supply forecast in the Western United States.

The Federal government entered the snow survey picture July 1, 1935, by an Act of Congress to coordinate and expand the system of snow surveys then existing, for water supply forecasting to all of the Western States. The techniques developed by Dr. James E. Church and others were the beginning of the current NRCS Snow Survey and Water Supply Forecasting Program that is carried out by NRCS field personnel under the direction of their respective State Conservationist.

Throughout 2006, the centennial year of the study of snow, the fascinating history of this remarkable program, including stories and pictures of actual surveys, helicopter accidents, avalanches, moose attacks, economic analyses, floods, droughts, saving the farm and even death are available at: <http://www.wcc.nrcs.usda.gov/centennial.html>

New Products

a. SNOTEL and SCAN Data Collection Networks and new product support is summarized at:

<ftp://ftp.wcc.nrcs.usda.gov/downloads/centennial/article3220060925.pdf> and can be accessed from: <http://www.wcc.nrcs.usda.gov/gis/>.

b. Spatial Mapping of Climate Data – PRISM

The following articles were released during the past year to highlight the important applications that PRISM has contributed to the physical and biological sciences:

PRISM: The New Climate Mapping Paradigm

<http://www.nrcs.usda.gov/news/thisweek/2006/061406/techtip06.14.06.html>

PRISM Has Wide-Spectrum of Applications

<http://www.nrcs.usda.gov/news/thisweek/2006/080906/techtip08.09.06.html>

PRISM Helps Generate Daily Precipitation and Temperature Surfaces for the U.S.

<http://www.nrcs.usda.gov/news/thisweek/2006/122006/techtip11.20.06.html>

PRISM Adaptation Model Supports Grass Production in China

<http://www.nrcs.usda.gov/news/thisweek/2006/091306/techtip091306.html>

PRISM to Help with SNOTEL Quality Control

<http://www.nrcs.usda.gov/news/thisweek/2006/070506/techtip07.05.06.html>

PRISM Reveals Statewide Climate Averages

<http://www.nrcs.usda.gov/news/thisweek/2006/071906/techtip07-19-06.html>

PRISM is a GEM

<http://www.nrcs.usda.gov/news/thisweek/2006/083006/techtip08.30.06.html>

PRISM: The future?

<http://www.nrcs.usda.gov/news/thisweek/2006/101806/techtip101806.html>

Other Projects

QC of SNOTEL Data Continues

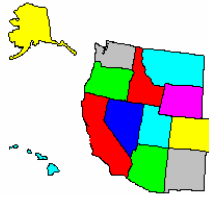
When installation first began in the middle 1970s, the network was never envisioned as a data source for climate change studies; however the network has become a de facto source for middle and higher elevation snowpack, precipitation and temperature data. While technology continues to improve the quality of these observations, PRISM methodology is now being employed to correct these archived data. The results of this effort may indeed provide the basis for identifying a “benchmark” SNOTEL and snow course network for climate change studies (<http://mistral.oce.orst.edu/www/snotelqc/>). After assessing maximum and minimum temperatures this past year, the quality control effort will now evaluate daily precipitation data.

New Maps of SNOTEL Data

NWCC launched a full suite of GIS-based products that provide users with a clear picture regional and state snow water equivalent, snow depth, precipitation, and temperature observations. The maps are available from - <http://www.wcc.nrcs.usda.gov/gis/index.html>.

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**Western Regional
Climate Center**

During 2006 WRCC continued its involvement in a variety of new projects and ongoing activities.

At the start of February 2006, WRCC welcomed a new post-doc, Christopher Davey, with a fresh dissertation in ecology and atmospheric sciences under Roger Pielke, Sr. at Colorado State University. Christopher serves as day to day manager of the National Park Service National Climate Inventory project. This project relates well to his experience and interest in siting issues for NWS cooperative sites and other climate stations.

Significant effort was spent among 6 WRCC staff on the National Park Service National Climate Inventory Project. This entails writing 32 reports, each 90-100 pages, covering climate needs, available data and metadata, and suggesting potential locations for new or augmented sites or climate activities if deemed useful or necessary. On March 15-16, WRCC hosted a project meeting to review progress and status, and agree on details to be included in the metadata. This project is relying heavily on the Applied Climate Information System. By the end of 2006 Christopher had produced about half of the 32 reports expected.

On February 14th Laura Edwards gave a presentation to high school students in the Nevada KEEP program about careers in climatology.

Kelly Redmond taught a 400/600 level course on Physical Climatology at the University of Nevada during the Spring 2006 semester, jointly with Dr. Mark Potosnak.

During the year, under the Enhanced California Climate Monitoring project headed by Kelly Redmond, Dave Simeral (with occasional help from Greg McCurdy) installed new long-term monitoring sites at Point Reyes (2 locations, one of them atop a 500-foot cliff above the Pacific Ocean), atop Cisco Butte at 6429 ft in the western Sierra Nevada, at snow monitoring site Alpha (7657 ft), and atop 12,327 ft Mt Warren just east of Yosemite National Park.

WRCC personnel also maintained a number of other stations in the Sierra Nevada, atop the White Mountains of California, around Reno, and along the coast of Big Sur. Greg McCurdy continued to maintain the 27 stations in the Community Environmental Monitoring Project surrounding the Nevada Test Site, Yucca Mountain, and the Nevada Test and Training Range.

On June 14, Mike Anderson and Art Hinajosa, Hydrology Branch Chief of the California Department of Water Resources (CA DWR) Division of Flood Management, visited WRCC and met primarily with Kelly Redmond and Laura Edwards, WRCC California Climate Specialist. Mike was later appointed state climatologist. The purpose of the visit was to become familiar with WRCC and its Division of Atmospheric Sciences, and to ascertain ways in which WRCC and DWR could work jointly to make

the CA State Climatologist office more useful and effective, in part through collaborative projects.

Jim Ashby, Michelle Breckner, and Heather Angeloff developed a "Reno Area Weather Network" addition to WRCC's web site. The stations comprise both official Coop sites and other unofficial sites, whose reporters are equally dedicated. The url is: www.wrcc.dri.edu/Reno_Network/index.html and can also be accessed from the main page by clicking on "WRCC Projects." This is a precursor to a similar statewide page to be developed in conjunction with the Nevada State Climate Office, using many stations established by recently deceased former State Climatologist John James.

Kelly Redmond, Laura Edwards and Christopher Davey attended the annual meeting of the American Association of State Climatologists in Rapid City from June 20-23. The AASC presented a special award to Dr. Davey for the best dissertation of 2005.

On August 10 WRCC personnel met at DRI with regional cooperative program managers from NWS Western and Central Regions to obtain a better understanding of the operation of this program. The meeting was motivated by a desire to improve the amount, reliability, and quality of coop data, in response to comments and requests from customers from around the West. The meeting was very informative and useful.

A joint project between the NWS, NCDC, and WRCC ramped up in late summer. Weather Coder III extends web-based software developed by NWS for entering daily coop data into local data bases, and forms a counterpart for a phone-based system called IV-ROCS. Several thousand coop observers are expected to use this when implemented in autumn 2007. The system is built around ACIS, and software will be shared among the six RCCs. Grant Kelly, Greg McCurdy and Kelly Redmond are working on this.

On August 28, Dr. John Abatzoglou, a new post-doc, joined WRCC. With a degree in Earth System Science from University of California, Irvine and a background in planetary wave dynamics, John is interested in more applications-oriented work. He has developed techniques for monitoring climate in near real time, using California as an example. This work has necessitated the development of techniques for identifying non-homogeneities in climate data, and for infilling patchy records. This work is proving extremely interesting and illuminating in developing better data sets.

From Sept 13-15, Kelly Redmond, Laura Edwards, and John Abatzoglou attended the annual California Climate Research Conference in Sacramento CA. They presented a poster on a current research initiative, which includes developing climate monitoring indices for California climate.

Kelly Redmond attended the MTNCLIM 2006 Conference, sponsored by the Consortium for Integrated Climate Research in Western Mountains, as an organizer, participant, and co-chair of a Working Group, at Timberline Lodge on Mount Hood Oregon, September 19-22. Kelly gave the opening presentation and introduced the guest keynote, Jon Jarvis, director of the Pacific West Region of the National Park Service. Along with Mark Losleben of Colorado's Niwot Ridge LTER (Long Term Ecological Research) site, Kelly co-chaired a meeting of the Working Group on Mountain Climate Observations. CIRMOUNT also released first copies of a new publication, Mapping New Terrain, discussing mountain climate needs and issues.

Laura Edwards planned and organized the annual meeting of WERA-102: Climate Data and Analyses for Applications in Agriculture and Natural Resources, held at DRI October 31st through November 3rd including "Evapotranspiration Day" on

Halloween. About 20 individuals participated, including western SCs, and representatives from WRCC, NCDC, BLM, NRCS and BuRec.

A second phase of work with the National Park Service begun in late summer, to make climate data available for summary and manipulation by NPS, involving Grant Kelly, Greg McCurdy and Kelly Redmond.

John Abatzoglou developed the California Climate Tracker to monitor the climate of the state <http://www.wrcc.dri.edu/monitor/cal-mon/index.html>. A thorough EOF and cluster analysis of monthly time series from 200 stations and about 800 PRISM grid points led to a decision to divide the state into 11 regions. These provide a refinement on the regions used by NCDC.

On October 19, at the Regional Headquarters of the National Park Service in Oakland, Kelly Redmond gave a presentation on what is known about climate change in the western states, the role of the national parks in monitoring climate and the effects of its variability, the status of the current national weather and climate data inventory, and suggestions for potential roles for NPS as this subject unfolds. The meeting was called by the Regional Director, Jon Jarvis, and was attended by superintendents and resource managers for parks in the Pacific West region.

On October 25, Kelly gave the opening talk for a set of climate sessions at the CalFed Climate Science Symposium in Sacramento. The presentation focused on efforts at WRCC to develop a climate tracking mechanism for the state of California. New WRCC postdoc, John Abatzoglou, contributed significantly to this effort, which was co-authored by Laura Edwards.

Compiled by Dick Reinhardt, Kelly Redmond and Laura Edwards.

Midwestern Regional Climate Center

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Data, Data Systems, and Data Management

The MRCC continues to develop a new ACIS (Applied Climate Information System)-based data system called MACS (MRCC Applied Climate System). The first five products are now complete, along with an accounting system and a station selection system. The service office is transitioning special subscription and internal software to access ACIS data, and have developed an hourly database that will replace the hourly data products in our legacy system. The MRCC is supporting an active ACIS server, which will soon be upgraded to include the Spread technology to synchronize with the other ACIS servers. MRCC staffers have been participating in the development of climate data quality control guidelines for the National Weather Service (NWS), and developed a prototype system for technicians to visualize real time climate observation outliers that are flagged as questionable by an automated procedure.

Climate Services and Collaborations

The MRCC Web site attracts more than 1 million hits per month. When a Google search is done on “MRCC” or “Midwest climate”, the MRCC web site is in the first position on the search results list. The most popular page on the MRCC web site is the Midwest Climate Watch, which provides access to a variety of climate maps updated daily, and a Weekly Climate Highlights narrative about ongoing climate events. This past year, the maps available to users were improved. The MRCC Web site provides direct links to the State Climate Offices in the region, and generates state level maps of climate variables for states requesting this service. A variety of other free services are also provided to the public, including easy to access information on climate normals, climate record events, and climate calendars for more than one thousand cooperative observer stations. All the state climate offices in the region have free access to MRCC data services.

The MRCC continues to cooperate with the NWS on a variety of issues, especially with efforts by the Central Region of the NWS to develop standard procedures for climate data quality assurance at the field level. MRCC Regional Climatologist Mike Palecki participated in a QA/QC Data Stewardship Meeting for the Central Region of the NWS. During Fall 2006, Mike represented the MRCC at the National Partner Workshop on Best Practices for Quality Assurance and Control in Asheville, NC. Steve Hilberg, MRCC Director, attended the NWS Climate Services Sub-Regional Workshop in West Lafayette, IN (hosted by Dev Niogi, Indiana SC), to help inform NWS personnel regarding the RCC system of climate services. Steve also continued his practice of visiting NWS offices as opportunities arise. In cooperation with Illinois SC Jim Angel, the Illinois State Water Survey, the NWS offices covering Illinois, and the University of Illinois Extension

Service, Steve Hilberg spearheaded the effort to bring the Community Collaborative Rain, Hail, and Snow Network (CoCoRaHS) to Illinois.

Collaborations with the National Climatic Data Center (NCDC) and the National Oceanic and Atmospheric Administration (NOAA) are increasingly numerous and vigorous. In addition to the climate data QA/QC interactions, the MRCC contributes to other efforts, including attending multiple meetings and joining committees regarding the development of a National Integrated Drought Information System (NIDIS) by NOAA, examining the future of NOAA data systems, and advising NOAA on climate model data and intercomparisons. Ken Kunkel, MRCC Principal Investigator, has been chosen as Convening Lead Author of Chapter 2 (“Observed changes of weather and climate extremes and related impacts”) of the U.S. Climate Change Science Program Synthesis and Assessment Product 3.3 entitled “Climate Extremes”, and is also one of the lead authors of Assessment Product 3.1 entitled “Climate Models and Their Uses and Limitations: Climate Sensitivity, Feedbacks, and Uncertainties”. Regional Climatologist Mike Palecki interacts regularly with the authors of the U.S. Drought Monitor, North American Drought Monitor, and U.S. Drought Outlook, with regards to status and evolution of drought in the Midwest. Karen Andsager leads a deep collaboration with NCDC’s Climate Database Modernization Program (CDMP) regarding the management of the digitization and quality assurance of 19th Century daily data. Extensive connections to private sector stakeholders impacted by climate variations are maintained through our service office and Senior Scientist Stan Changnon.

Applied Research

Unlike in the relatively recent past, the RCCs are no longer funded at a level necessary to maintain large portfolios of RCC-funded research. Fortunately, the P.I. level scientists at the MRCC have all been successful in attracting additional support to maintain independent research projects that are well aligned with the interests and mission of the Center. In addition, the home institution of the MRCC, the Illinois State Water Survey, provides significant support directly as salary line items and through funds to conduct climate oriented projects. Major research initiatives explored in the last year include:

Ken Kunkel – extreme climate event counts and their statistics, early 20th C. pluvial in the western U.S., regional modeling of future climate and air quality, 20th C. snow data quality and trends

Stan Changnon – severe storm climatologies (freezing rain, winter storms), severe weather and climate event impacts and policies, quick response reports on severe events, case studies of severe events and their impacts

Nancy Westcott – high resolution precipitation gauge networks, evaluation of radar/rain gauge blend products and their use in river forecasting, dense fog development

Karen Andsager – stewardship of CDMP 19th C. daily data digitization and quality assurance, station history project

Mike Palecki – 19th Century short-duration climate extremes, multi-decadal variations in global drought frequency/magnitude as modulated by North Atlantic Ocean temperatures, developments in drought monitoring tools, forcing of the frequencies of climate extremes

State Summaries

Alabama Office of the State Climatologist

John R. Christy, State Climatologist

Bob Clymer, Assistant State Climatologist

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National Space Science and Technology Center
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<http://www.atmos.uah.edu/aosc>

The major effort of Alabama Office of the State Climatologist (AOSC) in 2006 was to continue the installation of modernized cooperative network stations. We coordinated this effort with the NWS (Ken Crawford, Steve Pritchett at HQ and Mike Asmus at Southern Region HQ) and NCDC (Sharon LeDuc and Bruce Baker). Having most of the instrumentation and programmatic issues solved in 2005, our discussions dealt mostly with site selection and implementation. The site selection team still is co-chaired by John Christy, State Climatologist and Mike Asmus of SR NWS. The local NWS offices in HUN, BHM and MOB have been indispensable in allowing this effort to achieve the results we have seen.

At the end of calendar year 2006 the following stations were operating: Cullman, Guntersville, Lawrence County Airport, Russellville Airport, Scottsboro Airport, and Valley Head (see figure). Cullman (old St. Bernard), Scottsboro and Valley Head are becoming replacements for the HCN stations, which are now being simultaneously-observed with their older counterparts to generate accurate transfer functions for climate analysis. The new stations contain the CRN instrumentation for temperature and precipitation and thus provide data at the best level of calibration.

Approval for sites continues for Muscle Shoals, Gainsville Lock and Dam, Clanton Airport, Greensboro, Selma and Brewton. These will all eventually replace current HCN stations, hopefully in 2007.

Also in 2006, the AOSC worked with NCDC to establish one new Climate Reference Network Station to complement the two installed last year. The new site is in Fairhope AL and will replace the HCN station there. This was especially useful as it is a Gulf Coast site, which will aid in tropical storm and hurricane observations.

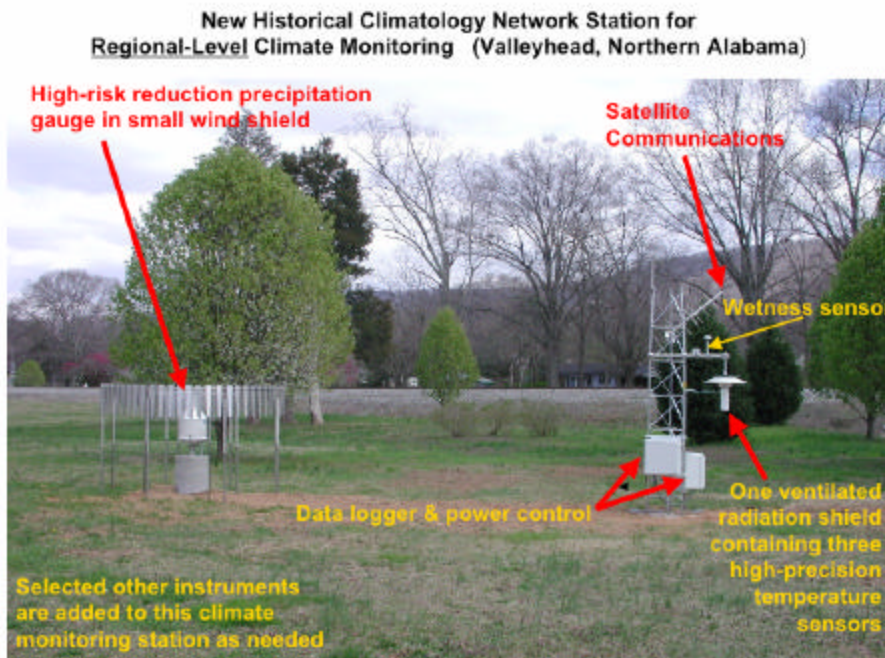
Alabama has 15 HCN stations. By the end of 2007 we hope to have COOP modernization and CRN stations reporting at 9. The remaining 6 are Highland Home, Talladega, Thomasville, Troy, Tuscaloosa ACFD and Union Springs 9S. If funding is obtained in 2007, we will continue the modernization for the remaining 6 stations, which reside in central and south Alabama.

Due to a shortfall in the State's budget in 2004, funding for the AOSC has been zero since that time. We are working to re-establish this funding. We operated the office on very limited UAH monies or on a volunteer basis depending to some extent on the infrastructure of the Earth System Science Center which Christy directs.

The AOSC expanded the daily Lawn and Garden index to South Carolina, Georgia and Florida: http://vortex.nsstc.uah.edu/aosc/lawn_garden_se.html

Alabama does not participate as well as other SE states in agriculture due to the influence of typical summer drought conditions. With only minimal additional water in the summer, the state could rival any in terms of productivity. The AOSC continues to work with other universities to answer questions about economic development, water resources, employment, land-use changes and water quality related to the establishment of wide-spread irrigation in Alabama. Funding for this project has been secured and AOSC is playing an important role in water resource development and climate variability.

Many other traditional functions were performed to keep the AOSC engaged in climate information and economic development activities for Alabama.



Office of the Arizona State Climatologist

Andrew W. Ellis, State Climatologist

Nancy J. Selover, Assistant State Climatologist

Arizona State University

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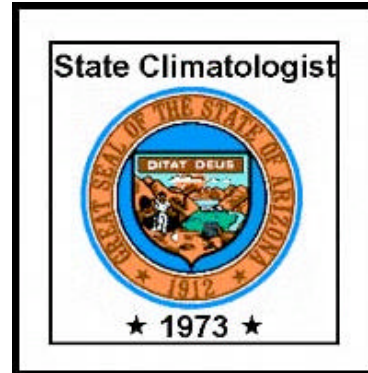
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The Arizona State Climate Office (ASC) is located within the Office of Climatology of the School of Geographical Sciences at Arizona State University in Tempe, AZ. The office consists of the State Climatologist, Dr. Andrew W. Ellis, an Associate Professor, and Assistant State Climatologist, Dr. Nancy J. Selover. The purpose of the program is to: (1) manage and disseminate climatological information about the State of Arizona, (2) monitor the climate of Arizona and the region, (3) collaborate with state agencies in need of climate data and advisement, and (4) conduct research aimed at an improved understanding of the spatial and temporal variability of the climate of Arizona.

In addition to serving as a link to established climate data resources, the Office receives and archives data from the Phoenix Real-time Instrumentation for Meteorological Studies (PRISMS) station network. The network is comprised of 17 stations across the Phoenix metropolitan area and is maintained by a local utility company. Also archived by the office are data from the Automated Surface Observing System (ASOS) of the National Weather Service Office in Phoenix. Two stations on the campus of Arizona State University are operated by the Office of the ASC – a cooperative observer station of long record and a newly constructed automated precipitation station.

The Arizona State Climate Office maintains several service roles within the state. The State Climatologist was appointed to the Governor's Arizona Drought Monitoring Committee in 2004 (Department of Water Resources drought page; www.azwater.gov/dwr/drought/), and the State Climate Office has been part of the Arizona Flood Warning System since that multi-agency group was established in 1994 (Department of Water Resources/National Weather Service; <http://data.afws.org/sui/>). Our arid southwestern location, coupled with extreme topographic variation, dictates that we are generally in the midst of a drought, punctuated by severe flooding. The Office also works with the Arizona Department of Environmental Quality (www.azdeq.gov) on pollution transport issues, and the local utility/water provider Salt River Project (www.srpnet.com) on run-off modeling or water supply projects. We make presentations on drought, climate change, urban heat island, and extreme weather to primary and secondary school students, civic groups and state agencies, as well as to other University researchers. We do interviews for newspaper, television and radio programs statewide,

and handle requests for climate data from citizens, researchers, and a large variety of government agencies and private companies, including insurance, developers, energy, and landscaping, and law firms.

Research activities generally focus on hydroclimatology (North American monsoon, winter precipitation variability, drought monitoring) and study of surface-atmosphere interactions (urban heat island, influence of urban lakes).

As the ARSCO for Arizona, the Office of the ASC is committed to supporting the objectives of the AASC. Below is a brief description of the activities of the Office over the past year that addresses each of the ARSCO qualifications:

Communication Capabilities

- Updated our ASC web page (<http://geography.asu.edu/azclimate>), and moved it to the Geography server. The website continues to include general climate information, statewide climate updates, educational information, real time weather information and forecasts, and links to other resources.
- Archived more than 200 GB of national and Arizona data annually, through an LDM server. We are planning to move the local data into a database for quicker data access and response to requests for spatial data sets.
- Maintain a voicemail system to take data and information requests when we are not able to physically staff the office. All calls are answered or returned within 24 hours. Most data requests come through the phone or e-mail, and data are served back through the phone, fax, e-mail, postal service, or the Internet.

Information Services

- We filled just over 300 e-mail requests for data or information, 126 voice mail requests for data, and had over 2000 hits on our website since October. We did 7 media interviews, and were involved in 3 legal cases as consultants/expert witnesses.
- Our website was updated to include a daily monsoon update in the summer months, and monthly maps of statewide normal precipitation (1971-2000). We also added a spreadsheet of rain days for Phoenix in the recent past, in response to a large number of data requests for days with greater than ½ inch of rainfall, which apparently is a new City of Phoenix requirement for contractors. We post monthly statewide climate updates with temperature and precipitation by watershed. (<http://geography.asu.edu/azclimate/>)

Research

? We are currently involved in a project, funded by the Arizona Water Institute (www.azwaterinstitute.org/), to assess the Navajo Nation's hydroclimate network, consisting of over 215 precipitation gages, both recording and non-recording, 8 stream flow gages, 8 snow courses, and 10 weather stations. The ultimate goals are to integrate the Navajo network with the surrounding networks including NWS, USGS, and coal companies, achieve an appropriate station density to characterize the conditions, and have the network be manageable with the current Navajo Nation resources.

? Analyzing surface meteorological and ozone data for an EPA-Ozone project called AMI, to determine whether remote-sensing methods can be used to identify surface ozone transport across the U.S.-Mexican border regions, in collaboration with the Southwest Consortium for Environmental Research and Policy (SCERP).

? Estimating swimming pool evaporation from the Phoenix Metropolitan area based on hourly pan evaporation data.

? Using a Thornthwaite water balance model, determined annual run-off for the Salt-Verde watershed, and estimated future run-off using IPCC scenarios, in conjunction with the Decision Center for a Desert City NSF center.

? Investigating the rate of heating, and maximum temperature inside closed automobiles, as each year infants, young children, and dogs die after begin left in cars in the Phoenix area in the warmer months.

Outreach

- Presentations to community groups, water managers, middle school students, and state agencies on climate change, drought, severe weather, and the urban heat island. Interviews for feature stories in local newspaper, radio, and television on drought, extreme heat events, climate change, water supply issues, and daylight savings time.

- Monthly calculation of the SPI for Arizona's 15 watersheds, which is used to determine drought status, and presentations to the local county drought impacts groups on the drought assessment methods. We are also involved in improving our drought assessment methods by incorporating groundwater well data from the Arizona DWR..

- Service on the Arizona Flood Warning System Committee.

Monitoring and Impact Assessments

- Monthly statewide temperature and precipitation updates issued as part of the technical monitoring committee of the Governor's Drought task Force.

- Started work on potential NERON-NIDIS sites near current USHCN sites, but effort has been postponed.

- Archive data from the PRISMS network for Phoenix and the Phoenix first-order weather station; developing climatologies for the Phoenix metropolitan area for wind and precipitation.

Compiled by Nancy Selover.

Office of the California State Climatologist and CalClim (California Climate Data Archive)

Mike Anderson, Acting State Climatologist

Laura Edwards, Western Regional Climate Center (WRCC), Desert Research Institute

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The California Office of the State Climatologist (OSC) is housed in the California Department of Water Resources (DWR) Division of Flood Management. Interacting with other divisions within DWR which makes up the state climate office (SCO) and the California Climate Data Archive (CalClim) group at the Western Regional Climate Center, the OSC is continuing the process of reviving and expanding climate programs in California.

The California OSC used 2006 to move forward implementing elements of the California Climate Program Plan. Contact was made with other climate related elements within DWR as well as with agency and academic personnel dealing with climate issues. Efforts were made to coordinate activities within DWR and opportunities to interact with agency and academic personnel were sought out. Initial interactions with the press occurred as well. At the end of 2006, DWR hired Elissa Lynn as a senior meteorologist. She will assist the CA OSC with outreach activities.

Work continues on updating the state's rainfall intensity duration frequency design curves, maintaining the California Irrigation Management Information System (CIMIS) and California Data Exchange Center (CDEC) data portals, and continued development of a state climatologist web site (<http://www.climate.water.ca.gov>). In addition, the state meteorologist, Matt Winston, brought his website on line (<http://www.weather.water.ca.gov>). The California Water Data Library (<http://wdl10.water.ca.gov/index.cfm>) is now online and will soon have climate data from DWR District Office Cooperators. Over the course of 2006 approximately 500 data requests were handled through the office via email and phone. As for the data portals, CDEC recorded 49 million page views in 2006 while CIMIS recorded 290,279 data reports generated.

CalClim continued to provide data as well to researchers and others who are investigating climate in the state, and answered California climate questions at WRCC. A NWS Technical Attachment on the extreme July 2006 heat wave was co-authored by Laura and Dan Kozlowski at the California-Nevada River Forecast Center.

Travel and presentations increased for the CA OSC in 2006. Presentations and/or session moderating duties included meetings for the California Water and Environment Modeling Forum, California Cooperative Snow Surveys, the Western States Water Council, the California Energy Commission (CEC)'s Annual Climate Change Conference, the USDA WERA-102 annual meeting, the annual Yosemite Hydroclimate Meeting, a UC Davis Climate Change Workshop, and the California Floodplain Management Association annual meeting. The 2006 Fall Meeting of the American Geophysical Union was also attended. Additional travel and presentation opportunities are expected in 2007.

Representing CalClim, Laura traveled to the AMS Annual Meeting, Pacific Climate Workshop, CEC's Climate Change Conference, and organized WERA-102 meeting in Reno, among attending other small meetings and giving climate presentations in the local area. She also had a number of outreach and education opportunities where students visited DRI facilities or she gave weather, water and climate presentations at schools. WRCC hired a post-doctoral researcher, Dr. John Abatzoglou, who is assisting with many California projects, including CalClim. Using climate station data and PRISM, he has produced a methodology for the creation of new climatic regions for the state, as well as issuing a regular monthly updated index of temperature and precipitation variables for climate monitoring. This product is posted as the *California Climate Tracker*, <http://www.wrcc.dri.edu/monitor/cal-mon/index.html>.

Looking ahead to the coming year, the California OSC and WRCC plan to continue coordination of activities. The state climatologist will continue efforts to engage climate researchers active in the state through communications and in-person visits. Finally, the California OSC will start the process to apply for ARSCO certification for California.

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The Colorado Climate Center (CCC) was established by the state in 1974, through the Colorado State University Agricultural Experiment Station, to provide information and expertise on Colorado's complex climate. Through its threefold program of Climate Monitoring (data acquisition, analysis, and archiving), Climate Research and Climate Services, the Center is responding to many climate related questions and problems affecting the state today. The Center monitors climatic conditions on both broad, regional scales and very local scales. By documenting climate variations in time and space, the relationships between climate, water supplies, other natural resources, agriculture and societal responses can be better understood and applied. Specific objectives include: 1) Maintain the historic Fort Collins weather station. 2) Expand the Colorado Agricultural Meteorological Network (CoAgMet) to include dryland farming and grazing areas of Colorado. 3) Develop specialized applications of CoAgMet weather data in cooperation with agricultural researchers and practitioners in Colorado such as soil moisture monitoring and modeling. 4) Integrate the citizens of Colorado into climate monitoring activities through local volunteer Web-based rain and hail observing networks. 5) Preserve long-term statewide (100-year plus) climate monitoring activities in Colorado. 6) Coordinate climate monitoring and applications research with other scientists, other agencies and other disciplines. 7) Disseminate climate information, expertise and applications to users.

Recent publications are available from the CCC's web site at (<http://ccc.atmos.colostate.edu>)

DeMouche, L., D. Bathke, and N. Doesken, 2006: Master Gardeners Role in encouraging water conservation using a rain gauge network. *Journal of Extension* accepted for publication.

R.A. Pielke, K. Wolter, O. Bliss, N. Doesken, and B. McNoldy, 2006: July 2005 Denver heat wave: How unusual was it? *National Weather Digest*, accepted for publication.

W.A. Brazenec, N.J. Doesken, and S.R. Fassnacht, 2006: Evaluation of ultrasonic snow depth sensors for automated surface observing systems (ASOS). Submitted to *J. of Climatology*.

Pielke Sr., R.A. J. Nielsen-Gammon, C. Davey, J. Angel, O. Bliss, M. Cai, N. Doesken, S. Fall, D. Niyogi, K. Gallo, R. Hale, K.G. Hubbard, X. Lin, H. Li, and S. Raman, 2007: Documentation of uncertainties and biases associated with surface temperature measurement sites for climate change assessment. *Bull. Amer. Meteor. Soc.*, in press.

Doesken, N., and R. Pielke, 2006: The climate of Colorado. Colorado Agricultural Outlook Forum, Denver, CO, February 23, pp 6-8.

Reges, H., R.C. Cifelli, N.J. Doesken and J. Turner, 2006: The CoCoRaHS Network – Hands-on science for communities right in their own backyards. Preprints, 15th AMS Symposium on Education, Atlanta, GA, paper 1.6A.

Brazenec, W.A., N.J. Doesken, and S.R. Fassnacht, 2006: Ultrasonic snow depth sensors for measuring snow in the U.S. AMS 10th Symposium on IOAS-AOLS, AMS, Atlanta, GA, Paper 4.4.

ARSCO Qualifications: CCC is designated by the AASC as the official state climate office for Colorado. The following describes ways in which CCC addresses each of the ARSCO qualifications:

Communication Capabilities:

Colorado Climate Center’s personnel traveled throughout the state in 2006 to provide climate information and expertise. Many interviews were given and featured in newspapers, radio and television. The National Drought Mitigation Center and NOAA have also used this information in their monthly updates. The Center encourages interdisciplinary research through collaborations with other groups both on and off the Colorado State University campus. We are members of the Colorado Water Availability Task Force and State Flood Task Force, and we give updates on the availability of water conditions at many meetings each year. The monthly climate maps and drought presentations are at the following urls:

<http://ccc.atmos.colostate.edu/coloradoprecipitation.php>

<http://ccc.atmos.colostate.edu/droughtpresentations.php>

Information Services

The Colorado Climate Center website <http://ccc.atmos.colostate.edu> provides climate data and information to a large number of users. Temperature and precipitation data are available from the NWS cooperative weather stations across Colorado. CoAgMet automated weather station data are used for agriculture purposes such as irrigation scheduling and pesticide applications. Precipitation information is provided via the Community Collaborative Rain, Hail and Snow network website. An extensive list of web resources is available for the user. Data requests from general public continue to be answered by the staff. Schedule of fees for data requests and internet data access are at the following url: <http://ccc.atmos.colostate.edu/datarequests.php>.

Research:

Research during 2006 focused on improving the measurements of rain, hail and snow and examining the characteristics of local patterns, variations and extremes in precipitation. A network of automated ultrasonic snow depth sensors was deployed in collaboration with the National Weather Service. Methods to estimate snowfall from changes in total snow depth on the ground were explored. Trends in Colorado temperatures were revisited following a thorough review of metadata for Colorado’s best long-term climate observing stations. We assisted the Colorado Water Conservation Board in an assessment of hail cannons and their potential effects in San Luis Valley of southern Colorado. We conducted a detailed investigation of “Heating and Cooling Design Temperatures” to determine if engineering design standards from the past remain valid in today’s climate.

Outreach:

The Colorado Climate Center continued out efforts to combine climate monitoring and research with extensive outreach and education through the Community Collaborative Rain, Hail and Snow network (CoCoRaHS). CoCoRaHS was introduced to several other states during 2006 -- see <http://www.cocorahs.org>. Climate presentations were given to the public via invited talks and seminars, field trips and tours, news media, traditional publications, and the Colorado Climate Center web site.

Office of the Delaware State Climatologist

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The Office of the Delaware State Climatologist is located in Newark, Delaware in the Center for Climatic Research at the University of Delaware. It is closely allied with the Department of Geography, which operates a Ph.D. program in Climatology. Both the Office and the State Climatologist provide unfunded climate support services to the State of Delaware.

The Office of the Delaware State Climatologist is an AASC Recognized State Climate Office (ARSCO) and partners with the National Climatic Data Center, the Northeast Regional Climate Center, and the National Weather Service in Mt. Holly NJ to provide data and climate services to the citizens of the State of Delaware. As with most State Climate Offices, we provide climate data and expertise to both the public and private sector as well as conduct newspaper, radio, and television interviews and, occasionally, court testimony. The Delaware State Climatologists also man the Technical Assistance Center of the Delaware Emergency Management Agency during critical weather events. In addition, the Office currently has three main projects underway:

The Delaware Environmental Observing System (DEOS)

Our main funding effort has been the establishment of a real-time system dedicated to monitoring environmental conditions across the Delmarva Peninsula. The Delaware Environmental Observing System (DEOS) is designed as a tool for decision makers involved with emergency management, natural resource monitoring, transportation, and other activities throughout the State of Delaware. DEOS also provides both State agencies and the citizens of Delaware with immediate information as to environmental conditions in and around the State. Being that it is supported by the Office of the Delaware State Climatologist, DEOS also provides a climate archive of the data to support the developing needs of high-resolution (in time and space) requests for environmental data. (<http://www.deos.udel.edu>)

Being a peninsula, isolated by the Delaware Bay, the Delaware River, and the Chesapeake Bay, the Delmarva Peninsula is very much affected by coastal storms and processes. To make appropriate decisions that depend upon these environmental conditions, decision makers must have environmental data with the highest spatial and temporal resolution possible. Data needs include weather information, observations of

streamflow, bay and ocean conditions, and water and air quality. But more importantly, these data must be of the highest quality, readily available, and easily applied. DEOS integrates existing observations from federal, state, and local sources and augments these existing observations with approximately twenty additional observing sites (primarily weather stations, but installed sensors also have included water temperature, wave period, and water quality for the Delaware Bay) around Delaware, Maryland, and Pennsylvania. These observations are connected to a central data collection facility through existing telecommunications capabilities. DEOS currently provides timely data dissemination to State agencies, the National Weather Service, and the public and also is in the process of developing reliable data quality control and quality assurance procedures.

DEOS consists of three main components: (1) the DEOS Environmental Monitoring and Observing Network (DEMON), a network of approximately thirty new meteorological observation sites coupled with existing weather and other environmental observation sites in and around Delmarva, (2) the DEOS Integrated Visualization and Analysis System (DIVAS), a GIS-based integration of surface weather observations with National Weather Service WSR-88D radar estimates of precipitation, thereby providing estimates of meteorological and environmental variables over a high spatial resolution grid, and (3) a number of DEOS Analysis Systems (DAS), designed to provide decision support in a variety of environmentally-sensitive areas. One such system will provide transportation and emergency management officials with real-time assessments of coastal and stream flood risk potentials. We also have undertaken a project with the Delaware Department of Transportation to enhance our snowfall monitoring capabilities and a project with the Delaware Department of Energy to provide support to people seeking financial assistance from the State to install wind generators and solar energy cells.

The DEOS Environmental Monitors Program (DEMs)

The DEOS Environmental Monitors Program (DEMs) continues to enhance our state's cooperative weather network. DEMs is a statewide spotter network of nearly fifty volunteers that make daily measurements of rainfall, snowfall, and (for some) air temperature. DEM volunteers also serve as local spotters to inform State Weather Officials of breaking severe weather as well as provide local conditions during emergency weather events. DEMs volunteers enter their data directly into the DEOS database through webpage access (a few, however, still prefer to use mail-in cards). We also have discussed the possibility of incorporating these observers into the CoCoRaHS network with Nolan Doesken and Henry Reges.

K-12 Education and the State Climate Office

The Office of the Delaware State Climatologist has partnered with the Delaware Geographic Alliance – a National Geographic and State Department of Education supported teacher's alliance – to enhance teaching of the State's Science and Geography standards as related to weather and climate. With our database of climatic information for the State and DEOS, we are able to supply real-time and historical scenarios to enhance K-12 education throughout the State. This has begun in a number of areas

including the use of Geographic Information Science and Remote Sensing Technology, which has been supported, in part, through cooperation with Delaware's NASA Space Grant Consortium.

In summary, the Office of the Delaware State Climatologist is growing. In the past three years, we have obtained support for four undergraduate and four graduate students working on specific projects with DEOS and State Climate personnel. We recently have obtained permanent support for a technician and a programmer to continue our development of DEOS.

Florida Climate Center

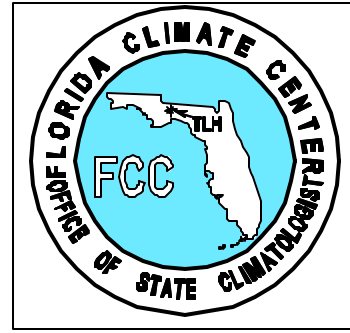
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About the Office

The Florida Climate Center is housed at the Center for Ocean-Atmospheric Prediction Studies (COAPS) in the Fuqua Research Complex at Innovation Park. Though physically located off-campus, COAPS and the Florida Climate Center are part of the Department of Meteorology at Florida State University. The office space, facilities, and equipment are provided by COAPS, but the Climate Center receives ongoing state financial support that covers the salaries of 1.5 full-time employees. The Florida Climate Center full-time staff currently consists of David F. Zierden, current State Climatologist, Melissa Griffin, Assistant State Climatologist, and Marcus Williams. Joining the Climate Center in 2004 as a part-time researcher is Preston Leftwich, retired from the National Weather Service Central Region Headquarters. He now is a part-time research associate and teaches an introductory meteorology course to undergraduates in the main department on campus. Also contributing is Dr. Mort Winsberg, author of *Florida's Weather* and professor emeritus of geography at FSU. Of course, Dr. J. J. O'Brien, previous State Climatologist and now State Climatologist Emeritus, remains involved and provides welcome leadership to the Florida Climate Center.

The Florida Climate is an AASC Recognized State Climate Office (ARSCO) and works in partnership with the National Climatic Data Center, Southeast Regional Climate Center, and National Weather Service to provide data and climate services to the citizens of the State of Florida. The State Climatologist Emeritus is a noted expert in ocean modeling, El Niño and climate variability, and he uses this office to conduct further research and to educate the citizens and institutions of the state in the new science of climate prediction. To this end, we perform research developing downscaled climate forecasts and products tailored to specific user groups.

Information Services

One of the primary missions of the office is to provide routine climate data and services. In addition to the inquiries that come straight to the office, they are also referred to us from NCDC, the regional climate centers, and the National Weather Service Forecast Offices. The Florida Climate Center receives dozens of phone calls, emails and faxes each day requesting everything from answers to simple climate and weather questions to detailed data requests.

A wealth of climate information is distributed through the climate center's website. Information on normals, detailed monthly and daily data sets, and links to other climate resources are all available free of charge through our website (www.coaps.fsu.edu/climate_center). Recently, we have added a detailed wind climatology for the first-order stations, complete with wind roses for each month of the year. These new products were developed as a result of frequent requests.

More specific data requests are filled by the staff, drawing from data sets located in house, at the regional climate centers, and at NCDC. The Florida Climate Center does charge a fee for our services, with set prices for various types of data or at a set hourly rate for more unique requests. Fees are commonly waived for requests by private citizens, students, and other research facilities. The Florida Climate Center has embraced the opportunity to provide services to the legal community. Common services include certifying data, rendering expert opinions, and giving expert testimony in depositions and the court of law.

Research

The Florida Climate Center is the leading authority on climate variability in Florida, particularly as related to ENSO. The climate Center is involved with the Southeast Climate Consortium, one of the Regional Integrated Science and Assessment (RISA) teams funded by NOAA's Office of Global Programs. Through this involvement, we conduct research into downscaled and localized climate forecasts and their application to the sectors of agriculture, forestry, and water resources. Recent expansion of the consortium now includes the State Climate Offices of Georgia and Alabama, as well as agriculturist, hydrologists, and social scientists from the University of Florida, University of Miami, University of Georgia, University of Alabama Huntsville, and Auburn University. The Southeast Climate Consortium now receives additional funding through USDA and USDA Risk Management Agency.

An example of the climate information products developed by Florida Climate Center is a method of forecasting wildfire threat based on the Keetch-Byram Drought Index (KBDI). The experimental forecast expresses wildfire threat in probabilistic terms and is used by the Florida Division of Forestry for planning management strategies and allocation of resources. This year the wildfire threat forecast was expanded include the states of Georgia and Alabama. These results were presented at the National Seasonal Assessment Workshop, Eastern and Southern States in January of 2006. The KBDI forecast for the Southeast was included as guidance in the final report.

Communication and Outreach

The Florida Climate Center provides outreach and education is several different ways. One is through our website, where users can learn about the different aspects of

Florida's climate through a variety of climate maps, data tables, raw data sets, and links to other resources. We have cooperated with Mort Winsberg in the second edition of his book entitled *Florida Weather*, the definitive reference for climate and weather issues in Florida. The State Climatologist and staff are also active with community service groups, routinely giving presentation on various climate topics to such groups such as the Rotary Club, Alumni Association, The North Florida Gulf Fishing Club, Lion's Club, etc. The State Climatologist will also brief state agencies such as the Agriculture Commissioner's office, Public Service Association, Public Health Center on current climate issues. The State Climatologist Emeritus serves on Florida Commission on Hurricane Loss Projection Methodology, which advises the insurance commissioner and industry on coping with the hurricane threat.

The Florida Climate Center has been involved in a major outreach and extension activity this past year through our partnership in the Southeast Climate Consortium. The Climate Center has been a key participant in the development of *AgClimate* (www.agclimate.org), a web-based decision support system facilitating the effective use of climate forecast information in agriculture and forestry in the Southeast U.S. *AgClimate* displays information on ENSO climate variability based on historical weather data from over 200 cooperative observer stations in the Southeast. In addition, *AgClimate* provides probabilistic information on how climate variability affects yields of such crops as peanuts, tomatoes, and potatoes. *AgClimate* also provides background information on ENSO and climate as well as management options of crops and forests during the various ENSO phases.

A key to the effective use of the information in *AgClimate* is the proper education and outreach to the users. The agriculture extension services in Florida, Georgia, and Alabama is a key partner in this outreach. The Florida Climate Center has participated in many extension-sponsored workshops in recent months and will continue to provide training and to promote *AgClimate* in the coming year.

For those who live to fish -- or fish to live -- along the Southeastern coast from the Outer Banks of North Carolina to Alabama, climate scientists from Florida State University and the University of Georgia have recently unveiled a unique online source for all manner of regional data on weather and fishing conditions: COASTALCLIMATE.ORG. COASTALCLIMATE.ORG shares onshore climate data such as temperatures, rainfall and winds for each month and each phase of El Nino/La Nina, while offshore data includes water and ocean bottom temperatures and buoy-generated wind readings. Anglers can access extensive data on the region's various fish types -- plus a handy tide generator for every harbor along the Southeast coast. Visitors to COASTALCLIMATE.ORG also will find detailed histories of hurricane tracks and occurrence statistics for each Southeastern state's coastline. Funded by the National Oceanic and Atmospheric Administration (NOAA), O'Brien co-lead the Web site's yearlong development with UGA Assistant Professor David Stooksbury. COASTALCLIMATE.ORG is a key component of the Southeast Coastal Climatology Project, a multidisciplinary, multi-institutional team within the Southeast Climate Consortium that forms partnerships with user communities.

Finally, the State Climatologist and staff are always available to the media for facts and opinions on current climate issues. We have a working relationship with such newspapers as the *USA today*, *Tampa Tribune*, *St. Petersburg Times*, *Tallahassee*

Democrat, Gainesville Sun, News-Press, Florida Today to name a few, and television outlets such as the *Florida News Channel*. The State Climatologist and staff comment on such issues as global climate change, drought, El Niño, hurricanes, and damaging freezes.

Changes this past year

Dr. James J. O'Brien, Florida State Climatologist and founder and director of the Center for Ocean-Atmospheric Prediction Studies (COAPS) at Florida State University, retired at the end of 2006. Assuming the role of director of COAPS is Dr. Eric Chassignet. Dr. Chassignet's areas of interest are general oceanic circulation from the complementary perspectives of ocean modeling and ocean observations. Taking over the role of State Climatologist is David Zierden, the Assistant State Climatologist since 1999. Although retired, Dr. O'Brien remains highly involved in the climate research, services, and applications efforts performed at COAPS through our partnership in the Southeast Climate Consortium and activities of the state climate office. Dr. O'Brien is considered the "State Climatologist Emeritus" and continues to be an active presence in the climate services and applications community, including AASC.

Goals for 2007

Plans for 2007 include working with the Colorado Climate Center on the implementation of the Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) in the state.

Georgia State Climatology Office

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The Georgia State Climatology Office is located in Athens, GA, on the campus of The University of Georgia in the Biological and Agricultural Engineering Department. The office houses two full-time climatologists: Dr. David Stooksbury, the State Climatologist and Associate Professor, and Pam Knox, the Assistant State Climatologist. We also have a postdoctoral scientist, Dr. Pierre Gerard-Marchant, working on hydrologic projects.

The Georgia State Climatology Office continues to be involved in a variety of research and public outreach activities. We maintain a web site and actively interact with users from around the state. These contacts include university scientists, educators, lawyers, construction and insurance companies, government agencies, reporters, and private citizens. Many of these data requests come by way of email, but we also receive phone calls, walk-ins and the occasional letter.

In the past year we continued to work on development of a mesonet network of weather stations project around Georgia. This project was undertaken as a cooperative effort with the National Weather Service and the National Climatic Data Center as part of the movement to modernize the National Cooperative Network. A multi-agency task force was identified and a large number of potential sites for automated weather stations were reviewed by a committee of interested agency representatives. A total number of 233 sites were surveyed and reviewed by the interagency committee. We planned to continue this work in the summer of 2006. However, continued funding from the National Weather Service was not available due to changing priorities at NWS headquarters, and this project has been put on inactive status for the foreseeable future.

The State Climatology Office has also been heavily involved this year with the Southeast Climate Consortium on a variety of research projects. We have participated with other states in training activities for Extension agents on the use of the AgClimate.org website, a web site which relates climate statistics for the Southeastern US to El Niño phase and crop management issues. We are now in the process of developing a similar site for water managers (to be called HydroClimate.org or something similar) which will provide assistance in planning for drought and wet conditions using El Niño phase information and Climate Prediction Center projections of current and upcoming precipitation amounts. We also contribute to the CoastalClimate.org web site content.

In addition to research activities, we provide guidance to a number of state agencies on weather and climate conditions and severe weather, including the State Drought Monitoring Committee (which Dr. Stooksbury co-chairs with the Director of the Georgia Environmental Protection Division) and the Georgia Emergency Management Agency (GEMA). The State Climatologist regularly monitors water conditions across the state and issues drought statements and other special climate statements when conditions warrant it.

Compiled by Pam Knox.

Hawaii State Climate Office

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Julie Miura, Student Assistant
Mary Long, Graduate Research Assistant



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The Hawaii State Climate Office (HSCO) is located on the campus of the University of Hawaii, in Honolulu. The HSCO is a part of the School of Ocean and Earth Science and Technology at UH Manoa, in the department of Meteorology. The office was established in 2000. Dr. Pao-Shin Chu is the State Climatologist.

The Hawaii State Climate Office is the AASC Recognized State Climate Office and is also partnered with NCDC and also maintains a website in order to provide accurate climate data for Hawaii residents and researchers.

The biggest project this year for the Hawaii State Climate Office was the continuation of updating the annual average rainfall maps for parts of the state. The period of record for the maps is from 1975 through 2004. The index for Kauai County has been completed and the final report submitted. Work is still on going to finish the indices for Maui County and Hawaii County. The remaining maps should be completed by mid 2007. The last comprehensive annual rainfall report was published in 1973 by the Department of Land and Natural Resources. The new maps will be a valuable current climate reference for all in the state.

The Hawaii State Climate Office also provides climate data for a variety of projects. Many of the common requests are for: researchers, students, private sector government agencies, visitors, and residents. Last year there were approximately 200 requests for climate data. There have been numerous requests for rainfall amounts on Kauai this past year during the months of February, March, and April, when the island had forty-four days of straight rain, a record-breaking event. The heavy rainfall resulted in a dam break which killed seven people on the North East shore of Kauai. The island of Oahu also received over forty days of rain, but was fortunate enough to not have suffered the same damage as Kauai.

The Hawaii State Climate Office also maintains records from the early 1900's. Many of the records are journals kept by the sugar cane and pineapple plantations which were plentiful throughout the state in the early part of the twentieth century. Among the collection of archived data, HSCO also has past streamline analysis maps for the Central Pacific. The Hawaii State Climate Office has been in contact with NCDC to acquire funding to digitize the past records and would be made available to more research projects.

Compiled by Julie Miura.

Idaho State Climate Services

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Climatic information is essential to every citizen of Idaho. To help people obtain the climatic and water data and information necessary to planning and every day work, the State Climatologist Program strives to acquire, archive, process and disseminate, in the most cost effect manner possible, all climate and weather information which is or could be of value to policy and decision makers in the state and to provide climatic services which are important to the people of Idaho.

The functions of the State Climatologist and State Climate Services are to:

- act as liaison between Idaho weather information users and the National Climatic Data Center
- maintain a data bank of climatological and hydrological data and information
- supply data in a form useful to users
- perform requested climate analyses or refer requests to other appropriate persons, agencies or consulting firms
- maintain contact with users of climatic and hydrological data in order to ascertain their needs for data and analyses
- maintain a bibliography of publication pertinent to Idaho and Pacific Northwest climate

In May, 1978, an agreement was concluded among the National Climatic Data Center, the National Weather Service and the University of Idaho to provide climate services which had been provided by a former National Weather Service program. BCS became the AASC Recognized State Climate Office (ARSCO) for the State of Idaho in 2001.

Idaho State Climate Services is housed in the Department of Biological and Agricultural Engineering and is directed by the Idaho State Climatologist. It is supported by the Idaho Agricultural Experiment Station and the Idaho Cooperative Extension System in cooperation with the Idaho Water Resources Research Institute.

ARSCO Qualifications: ISCS is designated by the AASC as the official state climate office for Idaho. The following describes the ways in which ISCS addresses each of the ARSCO qualifications:

Communication Capabilities:

- ISCS maintains internet, email, telephone, and fax communication links.

Information Services:

- Maintain an online archive of the complete period of record for all Idaho Cooperative Observer data sets in cooperation with the University of Idaho Library, which may be downloaded by user-selected station. <http://inside.uidaho.edu/asp/liststations.asp>
- Responded to more than 400 e-mail requests for climate data/information/services.
- Answered more than 200 telephone requests
- Interviewed by more than six Idaho newspapers.
- Maintain an automated weather station, a Cooperative Observer Station with over 110 years of data, and a recording precipitation gage, and partially fund a Sno-Tel site.
- Established three Idaho Transportation Department Road Weather Information System Weather Stations.

Research:

- Use remote sensing to simulate snowmelt runoff from the Upper Snake River.
- Examine the effect of climate change scenarios on snowpack and runoff volumes and timing for the eastern Snake River Plain, the principal water supply for southern Idaho.
- Analyzing historical temperature trends at climate stations across Idaho
- Analyze socio-economic impacts of various climate change scenarios
- Developing algorithms and models to assimilate remotely sensed data for use in spatially distributed land surface-atmosphere exchange models
- Developing a meteorological downscaling model to apply global weather forecasts to small watersheds. Results will be used in snowmelt runoff modeling for reservoir operation
- Conduct studies for the Idaho Transportation Department assessing relative merits of different proposed highway alignment alternatives with regard to the impact of climate on those alternatives.

Outreach: Participation and collaboration of the following outreach activities:

- Climate Presentations to local elementary schools
- Provide news interviews
- Serve as a climate expert on Idaho Public Television talk shows.
- Work with Boy Scouts of America as a merit badge counselor for environmental science

Illinois State Climatology Office

Jim Angel, State Climatologist

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The Illinois State Climatologist Office (SCO) is located at the Illinois State Water Survey (ISWS) in Champaign Illinois on the campus of the University of Illinois. The ISWS supplies the salary for the state climatologist, as well as computer and communication support and office space. The office also operates the coop site for the ISWS with a paid observer. The ISWS has served as host for the Illinois SCO since 1973.

One of the main accomplishments for climate services in Illinois this year was the establishment of a successful Community Cooperative Rain Hail and Snow (CoCoRaHS) network. This was a joint effort with the Midwestern Regional Climate Center, the five National Weather Service offices covering Illinois, and University of Illinois Cooperative Extension along with considerable help from Colorado State University. Activated on December 1, 2006, we now have over 400 observers signed up and have conducted several training workshops.

ARSCO Qualifications: The AASC has designated the Illinois SCO as the state climate office for Illinois. The following describes the ways in which the office addresses each of the ARSCO qualifications:

Communication Capabilities

The Illinois SCO has phone, fax, and email services with high-speed Internet service for the rapid transfer of data. The state climatologist maintains a web site devoted to climate data and information on a wide variety of climate topics.

Information Services

The Illinois SCO receives numerous requests for climate data and information. In a typical year, the office handles about 600-1000 phone calls and email requests. The web site contains maps, plots, and tables of current climate conditions, historical data, and climate summaries. The web site includes information on important climate topics in Illinois such as El Niño, drought, winter storms, and heat waves. The benefit of a web site is that it can off-load many of the routine requests for climate information. The office maintains a voicemail recording of the daily coop observations for the Water Survey site. A monthly report of the coop observations at the site is prepared and sent in the mail and published on the web.

Research

- Climate change in Illinois with special emphasis on reconstructing the 19th century climate of the state and examining model output for Illinois from GCM simulations used in the 2007 IPCC reports.
- Co-PI on a NOAA Climate Program Office grant on “Using the Forts Daily Climate Observation Data Set to Extend Analyses of U.S. Extreme Climate Events in the mid-19th Century. Manuscripts on the results of this research will be forthcoming.
- Pielke Sr., R.A. J. Nielsen-Gammon, C. Davey, **J. R. Angel**, O. Bliss, M. Cai, N. Doesken, S. Fall, K. Gallo, R. Hale, K.G. Hubbard, H. Li, X. Lin, D. Niyogi, and S. Raman, 2007: Documentation of uncertainties and biases associated with surface temperature measurement sites for climate change assessment. *Bulletin of the American Meteorological Society* (in press).
- **Angel, J.R.**, 2006. Tropical Storms Reduced Drought in Illinois in 2005. *Transactions, Illinois State Academy of Science*, Vol. 99, #3&4, pp. 111-124.
- Kunkel, K. (Ed.), **J. R. Angel**, S. Changnon, M. Palecki, R. Scott, D. Winstanley, R. Claybrooke, S. Hilberg, and R. Larson, 2006. The 2005 Illinois drought. Illinois State Water Survey Informational/Educational Material 2006-3, 80 p.

Outreach

- Wrote contributions to the monthly ISWS Water and Climate Summary;
- Provided data and guidance to agencies in Illinois, including the Illinois Drought Response Task Force, the Northeast Illinois Planning Commission, and the Illinois Emergency Management Agency;
- Provided between 100 and 300 interviews with the media per year and produced regular press releases;
- Gave 19 public talks mostly about climate change and the outlook for the 2007 growing season;
- Served as adjunct professor in the geography departments at both the University of Illinois and Northern Illinois University;
- Worked with local NWS offices and the Midwestern Regional Climate Center on issues related to climate, including visits to NWS offices, the sharing of data and climate information, and coordinating efforts on CoCoRaHS.

Monitoring and Impact Assessment

- Continued development of a series of web-based products for monitoring conditions in Illinois, a very popular site available to the public;
- Provided input into the U.S. Drought Monitor;
- Monitored climate/meteorological events as they unfolded including the drought in west-central Illinois during the 2006 growing season, the November 30 – December 1, 2006, snow and ice storm, the heavy snows and cold temperatures of February 2007, and the hard freeze of early April 2007 that caused significant damage to Illinois fruit crops.

Indiana State Climate Office

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The Indiana State Climate Office (Iclimate) has been involved with a number of activities over the past year. Our work takes place under three broad areas: Research, Extension and Education. In this report, we highlight some of our completed and ongoing projects.

RESEARCH

Severe Urban Weather

In the past two years Iclimate has been working on the development of a 5-year climatology for severe weather in and around the central Indiana / Indianapolis urban region. The focus of the study is to examine the effects of land-surface processes on thunderstorms, mesoscale convection and precipitation in and around a large urban area. Results indicate the urban areas such as Indianapolis can alter the storm characteristics of an approaching frontal system leading to preferential regions of increased thunderstorm activity downwind of the urban areas. The project will also be extended to study the impact of urbanization and thunderstorm changes for the upper great lakes regions as well as parts of India and China, which have shown dramatic urbanization in the recent decade. Available at <http://landsurface.org>

Soil Moisture and Evapotranspiration (ET) Modeling

Soil moisture is an important component of the regional hydrology. Iclimate is developing and testing a soil moisture balance model, SIMBAL, for the development of regional soil moisture fields. SIMBAL is unique in that it is designed for simulation of not only well-drained soils, but also tilled soils that are poorly drained with perched water tables. An ultimate objective is to develop soil moisture and ET climatology over Indiana, which in conjunction with the rainfall and temperature information, will provide a more comprehensive understanding of regional climate. This study is underway and is expected to develop a new product that will be disseminated through the Iclimate and Cooperative Extension.

Climate Change Impacts of Doubling of CO₂ Under Varying Soil Moisture Conditions in the Global Climate Model (GCM)

Following on the assessment of soil moisture feedback, modeling studies are underway to examine how soil moisture regulates humidity and temperature near the earth's surface. Is the impact due to doubling of CO₂ similar under normal soil moisture or under drought

conditions? This is one of the questions this study addresses. We are using global climate model of intermediary complexity called “Planet Simulator” to stimulate climate change with current and doubled CO₂ concentrations under various soil moisture conditions. The GCM stimulated zonal mean boreal summer precipitation (or temperature) is shown in the figure on the right. Clearly, soil moisture is an important regulator of regional climate, and our ongoing studies will look further into this feature.

Measuring the Variability in Land Surface Characteristics and their impact on weather and climate

Numerous atmospheric phenomena, ranging from the initiation of thunderstorms to the development of local wind flow patterns, have been linked to variations in land surface characteristics such as land cover and vegetation density. In collaboration with scientists at the National Center for Atmospheric Research (NCAR), an investigation of the effects of variability in land surface characteristics on meteorological measurement and modeling was initiated in 2006. The results of the work, much of which was conducted during a three-month visit to NCAR during the summer of 2006, have yielded unique methods for quantifying spatial variability in airborne measurements and for linking these atmospheric variabilities to those in land surface characteristics. Two papers have been accepted dealing with this topic.

Health of the U.S. Historical Climate Network (HCN) Sites in Indiana

The Historical Climate Network in Indiana has been in operation for over 100 years and is used for measuring climate change. There are 32 HCN sites currently operating in Indiana. These sites are part of the U.S. Historical Climate Network (USHCN). The intent of the study is to assess the health of the HCN network in Indiana, by examining microclimate around temperature sensors by using onsite visits, photos, and GIS assessment, to develop a metadata base that will help assess the quality of observations beyond the data quality control and quality assurance procedures undertaken at the National Climatic Data Center (NCDC). The underlying objective is to determine whether or not a station is influenced by micrometeorological changes. The data in these cases may not be a reliable indicator of large-scale climate change. In an era of important climate change, it is critical to examine the data being used for analysis and to realize with biases the data might have. Our assessment will provide information that can be useful for this purpose. The documented HCN site pictures are put on a Iclimate website at <http://iclimate.org/hcn>. A thesis by Ms. Ashley Brooks (2007) documents these findings and can be found at <http://landsurface.org>

Extreme Weather – A Result of landuse land cover change and urbanization?

A record heavy rain event occurred over Mumbai, India, July 26, 2005, with observations showing over 37 inches of rainfall in less than 24 hours. Thirty-seven inches of rainfall is approximately the average rainfall Indiana receives over the entire year! This research studies how changes in land surface characteristics could be an important contributor leading to heavy rain events. Using the Weather Research and Forecasting (WRF) modeling system, we performed land use sensitivity experiments, coupled with a default and an enhanced NOAA land surface model. The experiment was further extended to study whether land/surface changes play a similar role when tropical cyclones (e.g.

depressions, hurricanes) make land fall. Results indicate that even under situations where large scale forcing or synoptic conditions are dominant, the regional rainfall in terms of magnitude, location, and timing is sensitive to the local landuse. Changes in the regional landuse and land cover can therefore affect the intensity of precipitation events and, in many instances, make them more extreme.

EXTENSION

CoCoRaHS (Community Collaborative Rain Hail Snow Network): Because every drop counts

CoCoRaHS data are currently being used by many organizations including the National Weather Service and other meteorologists, hydrologists, emergency managers, city utilities (water supply, water conservation, and storm water), insurance adjusters, and others. The goals of this project are to provide accurate high-quality precipitation data for our many end-users on a timely basis, an increased density of precipitation data available throughout the country, and enrichment of climate studies for students and educators. In 2006, we initiated the Indiana CoCoRaHS project in partnership with the Indianapolis National Weather Service. Currently, there are over 700 CoCoRaHS volunteers across Indiana.

Indiana Climate Atlas

We are presently developing an agricultural weather and climate atlas for the Purdue Agricultural Research Centers (PAC) that will directly benefit agricultural activities. The project objective is to create verifiable and accurate data sets of various aspects of Indiana climate. The Atlas includes quality controlled data records from 1974 to 2003, with average annual and monthly temperature, snowfall, and other climatic variables. A beta version of the Atlas is now available and can be obtained by contacting us. We are currently seeking feedback on the Atlas and the final version will be released both as a CD and as a website. This project benefited from the NCDC State Climatologist Exchange Program.

NOAA Subregional Climate Applications Workshop

Working with Central Regions HQ, in October 2006, IClimate Ceveloped and hosted a NOAA subregional climate applications workshop. Attended by over 100 participants and about 50 National Weather Service partners from 7 states. News story in Journal and Courier and E-Prairie News letter. Formed the development of a Regional Integrated Science Application (RISA) framework.

In addition to those activities mentioned above, the office was responsible for taking part in a variety of extension workshops, and providing climatic information and seasonal climate outlooks to the local, state and national media.

EDUCATION

Junior and Senior High School Program Studies Climate and Climate Change

The Departments of Curriculum and Instruction, Agronomy, and Earth and Atmospheric Sciences at Purdue University have been cooperating to develop an innovative junior and

senior high school level instructional program for helping students conceptualize climate change through data analysis and case studies. The project consists of a series of modules that include data interpretation, visualization activities, and case studies that explore climatic change issues through an analysis of scientific evidence. This project's goal is to teach students the scientific perspective on climate and climate change. The project, funded by the Geosciences Education Program of the National Science Foundation, started in the fall of 2006 and runs to the summer of 2008. Dr. Daniel Shepardson, professor of Earth and Atmospheric Sciences, Geo-Environmental Science Education, and the Department of Curriculum and Instruction, and Dr. Dev Niyogi, Indiana State Climatologist and assistant professor of Earth and Atmospheric Sciences and Agronomy at Purdue University, are spearheading the project. The development team also includes teachers from local and Midwestern regional schools. The climate and climate change activities and alternative forms of assessment will be developed during summer 2007. Teachers will field-test the modules during the 2007-2008 academic year, and the modules will be revised during the summer of 2008. The modules will be made available, free of cost, to teachers in fall 2008. More information is available at www.iclimate.org/ccc/climateedu.

IClimate provided mentoring for:

A minority graduate enhancement program - MARC-AIM program, summer adviser for 1 undergraduate student Ms. Tosha Richardson (worked on impact of urbanization on weather and climate). Tosha gave a presentation to the National Minority Science Conference in Florida and is pursuing graduate school at Illinois.

Mentor for one summer undergraduate student from Penn State University, Jesse Lewis – Steinberg. Jesse is a coauthor on a paper to Journal of Geophysical Research as a result of his summer research.

Research Mentor for four undergraduate students – Dan Bowman on Soil moisture modeling, Shawn Cole on Agriculture Air Quality, Zac Payne on LaPorte Anomaly, Scott Armstrong on Boundary layer modeling

Iclimate is becoming a vibrant component of the Indiana weather and climate discussions. Example of recognition of the State Climate Office is my appointment as an expert adviser to the Indiana Water Shortage Task Force (enacted by the state legislation to create an updated water shortage plan by 2009). This task force has 10 members and 10 advisers. The 10 advisers include members of IDEM, DNR, NWS, Industry, and academia (R. Turco from Purdue is also an adviser to this taskforce).

The initiatives led by the State Climate Office have resulted in a broad range of extension activities that led to a more visible, accessible, and proactive engagement of media, local and state agencies, and the engagement community. This involved routinely making press releases, developing localized studies in anticipation of extreme weather events such as drought, frost and flooding, and integrating classroom education and research activities.

Iowa State Climatologist Office
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The State Climatologist Office (Iowa SC) is a bureau of the Iowa Dept. of Agriculture & Land Stewardship. The State Climatologist is appointed by the Iowa Secretary of Agriculture (an elected state official). The Iowa SC office was founded in Iowa City at the University of Iowa on October 1, 1875 and was initially known as the Iowa Weather Service. In 1890 the Iowa Weather Service operations were moved to Des Moines and came under the supervision of the Iowa Weather & Crop Service. The Iowa SC was co-located with the National Weather Service from 1890 until 2003 and has worked very closely with that agency since its inception. Finally, the Iowa SC was made a division of the newly created Iowa Department of Agriculture in 1923.

Information Services:

The Iowa SC office maintains archives of NWS co-op and first order station data back to the beginning of records. This would include the regular NCDC reports such as *Storm Data*, *Iowa Climatological Data* and *Local Climatological Data*, as well as the original observations. Access to a multitude of federal and state weather and climate data archives are also maintained. With 131 years of continuous operation the Iowa SC Office has an unusually large archive of original federal and state books, reports and manuscripts from the 19th and early 20th Century.

Research:

The Iowa SC office primarily is involved with the acquisition, processing, dissemination and archiving of weather and climate data. However, research activities are performed as funding permits and have been conducted in cooperation with agencies such as the National Climatic Data Center (NWS co-op network metadata), the Midwestern Regional Climate Center (pre-1948 data keying project), the National Science Foundation (crop-hail climatology), U. S. Army Corps of Engineers (evaporation, snow, short-duration precipitation studies) and the Iowa Dept. of Natural Resources (development of more timely temperature data resources).

In the past fiscal year the Iowa SC office has been working with the Midwestern Regional Climate Center (MRCC) to document the quality control methods utilized in creating a serially complete set of daily Iowa temperature, precipitation, snowfall and snow depth data dating to January 1991. These records have been converted by MRCC into the common TD-3200 format for use by other interested researchers. It is hoped that this data set will be useful in evaluating the effectiveness of data QC techniques used by other agencies, as well as in documenting any trends in data completeness and accuracy over the 17 year period of record. Further, the data set

should be of great utility in applications requiring complete time-series of data (i.e., no missing or cumulative data).

Outreach:

The office maintains very open communication with the news media with a total of 460 news media contacts this past fiscal year (July 2005-June 2006). This, combined with preparation of Public Information Statements issued in cooperation with the National Weather Service, and weekly and monthly crop-weather summaries prepared for the USDA provides very wide dissemination of climate products and information. A total of 2,196 inquiries were answered during the past fiscal year. Most inquiries were received from government agencies (31%), the news media (21%), attorneys (11%) and insurance (8%). Virtually every major branch of State government utilizes the Iowa SC Office data on a regular basis.

The office also prepares regular monthly climate reports, the *Preliminary Iowa Monthly Weather Summary* and the *Iowa Climate Review*. The Preliminary Monthly Weather Summary is issued within the first few work days of each month and provides a brief summary of Iowa's weather conditions for the previous month. This report is available on-line and is also sent free of charge via regular mail. The Iowa Climate Review is a monthly report containing daily data for all official Iowa weather stations and is available by subscription. The Climate Review report is not currently on-line; however, the raw data are provided to Iowa State University's Iowa Environmental Mesonet web page and made available at that site.

The Iowa State Climate Office works closely with the National Weather Service in monitoring the co-op and ASOS data networks so as to improve the quantity, quality and timeliness of Iowa climate observations. The State Climatologist has served on several NWS regional and national committees involved with climate and data issues. Finally, the Iowa SC attended the AASC annual meeting in Rapid City, SD in June 2006.

Monitoring and Impact Assessments:

The Iowa State Climate Office is a member of the Governor's Drought Task Force and Flood Task Force. The office provides regular updates of monthly temperature and precipitation data to the USDA Farm Service Agency for their use in evaluating county-by-county eligibility for disaster relief programs. The office also assists the Iowa Emergency Management Division in their operations and occasionally provides guidance for county and regional emergency response offices. The office also provides near real-time rain event maps for the Iowa DOT for their use in evaluating where roadways may be in need of detailed examination of possible flood damage. During the past fiscal year the office was active in supporting applications for drought disaster relief from the USDA for counties in southern and western Iowa in early summer 2006.

Kentucky Climate Center

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The Kentucky Climate Center (KCC) observed its 29th year of operation in 2007. As a member of Western Kentucky University's Applied Research and Technology Program (ARTP), the KCC received funding to support both undergraduate and graduate students and provide opportunities for them to participate in a variety of research and service activities, including presentations at statewide, regional, and nationally prominent meetings. The KCC is recognized by the AASC as the State Climate Office for Kentucky. Efforts within the KCC over the past year have focused on planning and development of the Kentucky Mesonet. Activities relating to the Mesonet and to ARSCO qualifications are highlighted below.

Services

The KCC provides climate data and information through a variety of channels. These include communication via telephone, fax, and e-mail. Our primary source of service delivery is via our website, which includes a variety of narratives, tables, maps, and graphs summarizing Kentucky's historical climate. The website increasingly emphasizes interactive graphics to help users find the data and information they need. The Kentucky Climate Center also provided updated content on weather and climate for publication of the Second Edition of Clark's Kentucky Almanac and Book of Facts. Content included an overview of Kentucky's climate by season, information about natural hazards, summaries of weather and climate for recent years, a compilation of weather records for Kentucky, and a section on weather and climate folklore.

Research

Faculty and students associated with the Kentucky Climate Center are involved in a variety of applied research projects. Many of these projects have been funded through grants and contracts at the state and national level. Work on the *GeoProfiles Initiative* now includes all of Kentucky's USHCN stations, as well as numerous other NWS cooperative observer stations. Using these GeoProfiles, research is underway to evaluate spatial and temporal variations in daily temperature range in an effort to assess local and micro-climate influences on observations. Students also engage in research on flash flooding in Kentucky and Appalachia using a combination of archived reports to

construct a climatology of flash flooding and meso-scale models to analyze individual flash flood events.

Outreach

The KCC expanded outreach activities over the past year by participating in a workshop for land use planners. A presentation was given on the challenges of developing a comprehensive plan that addresses threats associated with climate-related natural hazards. In addition, KCC representatives participated in media interviews, served with statewide committees and organizations, and addressed elementary and middle school students.

Special Topic: A Progress Report on the Kentucky Mesonet

The Kentucky Climate Center received an earmark of \$1.5 million in FY'06 to be administered through the NWS to develop the Kentucky Mesonet. A second year of funding is pending. The Mesonet currently employs a staff of four, including two meteorology/electronics technicians, a systems administrator, and an office assistant. A team of five graduate students conduct site surveys, provide GIS services, and engage in outreach activities. Additional hires are anticipated. Over the past year, the Kentucky Climate Center and representatives from Kentucky's NWSFOs engaged local officials and stakeholders through a series of kickoff meetings held at Kentucky's area development districts. As of March 31, a total of 70 candidate sites have been identified and site license agreements are being pursued at 10 of these. A test site has been installed and is currently logging data, with testing of communications infrastructure imminent. Computing infrastructure is currently being installed and design work to develop a database for storing and retrieving metadata is underway. In addition, an effort is underway to form the Kentucky Mesonet Consortium to build a broad base of support for the Mesonet and to help realize the full potential of the Mesonet for the people of Kentucky. The eight public universities in Kentucky's have been invited to join as charter members and will have access to Mesonet data to support research, service, and education initiatives.

Louisiana Office of the State Climatologist

Barry Keim, State Climatologist

Jay Grymes, Past State Climatologist
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The LOSC is located on the campus of Louisiana State University (LSU) and is housed within the Department of Geography and Anthropology.

Mission

The mission of the Louisiana Office of State Climatology (LOSC) and the LA State Climatologist is to serve as the State focal point for activities pertaining to the climate of Louisiana. Responsibilities include:

- to collect, archive, and make available climate data for the state of Louisiana
- to provide climate education and information to the citizens of the region through various outreach programs including the media
- to maintain an active research program pertaining to the climate of Louisiana and the region.

To achieve these goals, the LOSC cooperates with LSU, the National Weather Service (NWS), Southern Regional Headquarter of the NWS, the Southern Regional Climate Center (SRCC), and the National Climatic Data Center (NCDC). LSU provides the infrastructure for the LOSC, and the National Weather Service Offices maintain the quality of weather observations in the region, with climate data exchanged between the LOSC, NWS, SRCC, and the NCDC.

ARSCO Qualifications

LOSC is designated by the AASC as the official state climate office for Louisiana. The following describes the ways in which LOSC addresses each of the ARSCO qualifications:

Communication Capabilities:

LOSC has full access to internet, email, multiple phone lines, facsimile machines, and regular mail. We maintain a website which updates daily, weekly, and monthly summaries for the State.

Information Services:

A primary role of the LOSC is to collect and archive high quality climate data for Louisiana and then make these data available to the general public, often with some interpretation or forensic application. Users of these data include researchers, attorneys, construction companies, federal and state planning agencies, private consultants, power companies, insurance companies, teachers and students, among others.

Over recent years, the number of data requests have declined, whereby the LOSC averages around 400 to 500 data requests annually, down from between 700-900 data requests annually only 4-5 years ago. We suspect this drop is related to greater availability of data over the internet. We also maintain a list of approximately 50 subscribers that receive updated climate data monthly, which totals to ~600 additional data requests

Research

The LOSC maintains an active research agenda involving the State and region, and sometimes beyond. Over the past year, this research primarily focused on hurricane climatologies, applied climatology involving Probable Maximum Precipitation (PMP), recurrence intervals of extreme events, and human dimensions of climatic change.

Outreach

The LOSC conducts frequent interviews with radio, newspaper, and magazine media. Several hundred media contacts were logged in 2006. We cooperate and coordinate efforts closely with the NWS Offices in the region. We also remain primed and ready to work with Louisiana Office of Emergency Preparedness when needed.

Monitoring and Impact Assessments:

The LOSC has taken on the responsibility of producing a weekly summary of the State's weather and climate in the form of the *Louisiana Weekly Climate Review* available on the LOSC website at the following URL: <www.losc.lsu.edu> . This report is also e-mailed to over 100 recipients across Louisiana, including most television weather-casters in the State, concerned State Office Officials, as well as the National Weather Service Offices that oversee Louisiana. The Office also provides a weekly summary of Louisiana Climate Data to the National Agricultural Statistics Service (NASS) that is published weekly in the *Louisiana Crop Weather Summary*. In addition to these weekly products, the LOSC also produces monthly summaries of the State's Climate data, which is also available on the LOSC website. The office also produces event-based summaries for significant weather events that impact Louisiana. The LOSC is also active on the ad hoc committee of the *U.S. Drought Monitor*.

Maryland Office of the State Climatologist

Kenneth Pickering, State Climatologist

Emily Becker, Assistant State Climatologist



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The Maryland Office of the State Climatologist is the state repository for climate information. We provide climatic data to Maryland state agencies, businesses, students, researchers, and citizens. We maintain links with the many cooperative weather observers in the state, the National Climatic Data Center, the National Weather Service offices, and many other sources of weather and climatic information.

OUR MISSION

The functions of the State Climatologist and its office are to:

- Act as liaison between Maryland weather information users and the National Climatic Data Center
- Maintain a data bank of climatological and hydrological data and information
- Supply data in the most pertinent, useful form for users
- Refer requests for complex analyses to the appropriate person, agency or consulting firm
- Maintain contact with users of climatic and hydrological data to ascertain their needs for data and analyses
- Maintain a bibliography of publications pertinent to Maryland and its surrounding areas

2006 in the Maryland Office of the State Climatologist

In 2006, the Office worked with a wide range of individuals, from members of the public, state government, education, and law enforcement. Activities included working with the Maryland Department of the Environment to understand the causes and effects of drought state-wide, explaining the basic elements of climate in general and Maryland's climate in specific to students ranging from elementary to graduate school, and supplying county police with the necessary data to complete studies linking precipitation and automobile collisions. We provided specific daily weather information to legal offices and state government, and held discussions with representatives of the insurance and construction industries about potential severe weather effects in Maryland. Research projects in 2006 included a study of the historical climate of Maryland, comparing the average climate in 1856 (the year of the University of Maryland's founding) to the average climate in 2006.

Compiled by Emily Becker.

Michigan State Climatology Office

Jeff Andresen, State Climatologist

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The original State Climatology Program in Michigan was established by law on June 1, 1895, under Public Act No. 246 as a part of the Michigan Weather Service (MWS). A Type I transfer made it a part of the Michigan Department of Agriculture (MDA) in 1965. In 1980, Public Act No. 314 placed the program under the the Environmental Bureau of MDA. Through a departmental reorganization, the name MWS was changed to Michigan Climatology Program in January 1982. As part of yet another reorganization in 1997, the program was transferred to Michigan State University, where it operates today as the Michigan Climatological Resources Program (MCRP).

Leadership of MCRP is the responsibility of the State Climatologist (Jeff Andresen), who supervises operational and research activities under the direction of the Chair of the Geography Department. Operational and research support in the program are provided by Peter Kurtz and Aaron Pollyea, while technical and clerical support is provided by Cathy Sernick. Kurtz serves the program as system administrator, with responsibilities including software development and operation, data collection, processing, and archival, and processing some large or unusual data requests. The research support position (Pollyea) is responsible for assisting with the operation and analysis of the program's various research projects. A new position, a professional Geographic Information Systems specialist, Tracy Aichele, was added to the program in 2002 in association with an externally-funded research project. Finally, graduate students and undergraduate students are occasionally hired as hourly workers in the Climate Office for assistance in research, data processing, and other operational duties as allowed by external funding.

ARSCO Qualification

The Michigan State Climatologist's Office is applying for AASC ARSCO status in 2007. The following describe recent and ongoing activities at the climate office.

Communication Capabilities

The majority of public requests for climate data and information are placed via telephone and email exchanges. MCRP also provides information via fax and through dedicated worldwide web sites. Climate data are collected operationally in the program via internet (the Internet Data Distribution system) and dedicated satellite receiver connections, and via internet and telephone through the program's Michigan Automated Weather Network.

Information Services

The total number of formal public requests for climate-related data and information currently numbers about 1000 per year, most of which are received via phone or email. The majority of these requests are from law firms, the insurance industry, and other researchers. MCRP provides a wide variety of data and information via several www sites, including general climate information (climate.geo.msu.edu), agricultural weather information (www.agweather.geo.msu.edu), and weather- and climate-related decision making for agriculture and natural resource management (www.enviro-weather.msu.edu). Besides supplying data from traditional federally-based observation systems, the program operates the Michigan Automated Weather Network (MAWN), a network of 52 automated weather stations across the state which provides detailed weather data on a real-time basis. The number of requests for information via the worldwide web increased rapidly in the past few years, with more than 35,000 individual visits and 700,000 hits collectively received on the program's sites during 2006.

Research

MCRP maintains an active research program addressing climate-related issues in the state and region. Current projects involve agricultural water use research within the state (including operational irrigation scheduling), investigation of past and projected future climate changes in the region, and the impacts of weather and climate on regional agriculture. A new project (Enviro-Weather) began in 2006. The primary objective of the project is the development and implementation of www-based techniques and tools that address weather- and climate-related processes in agricultural and natural resource management in Michigan.

Outreach

MCRP provides a wide variety of outreach activities, ranging from demonstration of climate-related issues to elementary school students to agricultural weather-related columns regularly published in periodicals throughout the state to public seminars on climate-related topics. From 2000-2005, the program provided a yearly average of 17 public speaking events and 30 interviews to print, radio, and television media. Finally, the program maintains an educational element which allows and encourages students to participate in climate research, gain operational job experience (e.g. internships), and provide training in applied use of climate information (e.g. the weather derivative industry).

Funding Support

MCRP is supported by the Michigan Agricultural Experiment Station, Michigan State University Extension, and Michigan State University's Department of Geography. Additional (non-recurring) funding is obtained through external grants and contracts obtained from a variety of U.S. Federal and State of Michigan Departments and Agencies.

Submitted by Jeff Andresen.

Minnesota State Climatology Office

Jim Zandlo, State Climatologist

Greg Spoden, Assistant State Climatologist
Pete Boulay, Assistant State Climatologist



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The Minnesota State Climatology Office (MN_SCO) exists to manage, analyze, and disseminate climate information in service to the citizens of Minnesota. The MN_SCO is funded by the State of Minnesota Department of Natural Resources - Division of Waters, and housed at the University of Minnesota - Department of Soil, Water, and Climate. This partnership was formed in 1973.

The MN_SCO assists its customers in their investigations of the climate's impact on various components of the natural environment, and on socioeconomic activities. The MN_SCO uses its climate monitoring resources to quantify weather conditions and to place these conditions within historical and geographical context. The MN_SCO also provides quantitative summaries of historical climate conditions, allowing users to make informed decisions about future activities.

In order to provide its services, the MN_SCO requires an extensive historical climate data set. The climate database managed by the MN_SCO consists of over 100 million numbers. The database features data collected by Minnesota's high spatial density precipitation monitoring program, formed in the early 1970's. This "network of networks" utilizes the efforts of water-oriented state and local agencies to assemble precipitation data from approximately 1500 observers each year. Additionally, the National Weather Service (formerly the U.S. Weather Bureau) has maintained a large scale, volunteer-based climate monitoring network in Minnesota since 1890. Other, smaller scale climate monitoring efforts extend the historical record earlier into the 19th century. The MN_SCO also archives multi-element hourly weather data gathered at Minnesota's airports.

The MN_SCO provides customers with free access to a comprehensive electronic climate database. The MN_SCO also serves its customers by offering a variety of value-added analyses of climate data in the form of narratives, maps, graphs, and tables. Customers access MN_SCO products and services via a Web site, e-mail, telephone, and office visits.

The customers of the MN_SCO are many and varied. Customers can be grouped in the following categories:

- Minnesota Department of Natural Resources (sponsoring agency)
- State, Federal, and Local Governmental Agencies
- Private Sector Professionals
- Academic Community
- General Public

ARSCO Qualifications: the MN_SCO is designated by the AASC as the official state climate office for Minnesota. The following describes the ways in which the MN_SCO addresses each of the ARSCO qualifications:

Communication Capabilities:

- full-featured web site
- fully staffed information line
- near-immediate response to e-mail inquiries

Information Services:

- Web site – the MN_SCO Web site receives visits from approximately 2000 users per day. The Web site offers users free access to nearly all of Minnesota’s digitized climate data, as well as a host of value-added products such as narratives, maps, and tabular summaries.
- the Web site offers online daily data entry and data maintenance capability to volunteer precipitation observers.
- phone and e-mail – the MN_SCO answers dozens of phone calls and e-mails per week from customers with climate questions.

Research:

- *Watbud for Lakes* is a physically based model capable of optimizing and estimating selected climate-driven water balance parameters by comparing simulated lake level data to known lake level data. It has been useful in identifying causes of level fluctuation, whether natural or artificial, and in quantifying water balance components for use in water quality models. The MN_SCO played a major role in the original development of this model. In 2006, components of the model were significantly redesigned by the MN_SCO.
- in 2006, the MN_SCO became a collaborator in a research project titled “Impacts on Minnesota’s Aquatic Resources from Climate Change”. The research goal of this State of Minnesota-funded project is “to quantify climate, hydrologic, and ecological variability and trends and identify indicators of future climate.”

Outreach:

- staff are commonly requested to attend multi-agency, multi-disciplinary meetings where a climatological perspective is required.
- staff give frequent interviews to the state’s electronic and print media.

Monitoring and Impact Assessments:

- Web site offers a variety of routinely prepared summaries of weekly and monthly temperature, degree day, precipitation, and snow depth data.

- Web site offers a chronological journal of significant weather events, providing a description of the event, impacts, and historical context.
- the MN_SCO utilizes a list server to deliver a monthly electronic newsletter summarizing climate conditions observed during the previous month and the resulting impact on water resources (approximately 500 subscribers).
- The MN_SCO is in frequent communication with authors of the U.S. Drought Monitor.

Compiled by Greg Spoden.

Mississippi Office of the State Climatologist

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The Mississippi State Climatologist was appointed in 1983 and was vested in the Department of Geosciences at Mississippi State University, where the office remains today. The SC is not funded beyond one-quarter time release from teaching in the department. The SC is involved in teaching, research, and service through the university, and has been granted ARSCO status.

The Department of Geosciences has a Climatology Laboratory with access to all NWS products as well as several vendor products such as Baron Radar, Weather Services, Inc., Genesis (Weather Central), Galileo, Digital Atmosphere, and others, all of which provide a wide base of support for the SC to use in filling the climate needs of the people of Mississippi. Additionally, some unique records resulting from research projects conducted over the years are maintained in the SC program. Full access to the South Central and Southeastern Regional Climate Centers has been granted in recent years, and has proved to be the most useful addition to the Mississippi SC program since its inception. These RCCs have made a significant difference in the level of services the SC can provide in a program like Mississippi's. This point should be emphasized strongly when the RCCs need help justifying their budgets.

Service activities of the SC this past year include the routine handling of daily requests for data or information, and provision of data analyses for more complex requests. The same sort of climate data consumers are found in Mississippi as elsewhere—lawyers, engineers, professors, researchers of all types, businessmen, housewives, farmers, teachers, students with science fair projects, and every other imaginable user. Much time is spent providing weather summaries to other government agencies upon request, but no routine publication of this sort is attempted.

Activities this year have continued to be heavily focused on the effects of Hurricane Katrina. The SC office has been overwhelmed with requests for information on the storm and for presentations about hurricanes and potentially changing weather characteristics to groups throughout the state. The insurance industry, lawyers, and engineers have been especially eager to get information for claims payments and for the rebuilding effort. Several companies considering locating plants in Mississippi have requested special information on hurricanes and other severe weather events. The Mississippi public is also manifesting a heightened awareness of the effects of weather and climate on all types of activities, and the global warming alarmism has created a gigantic workload on the program. The SC has been cast in the unwelcome role of “expert” on climate change!

The following outreach activities and presentations on weather and climate were conducted this year:

- Member of Mississippi Mesonet Steering Committee attempting to establish a mesonet in the state.
- Preparation of a distance learning course on “Introduction to Meteorology.” Mississippi State University.
- “Weather Processes and Stability Classes in Mississippi.” Shortcourse for State, County, and Private Foresters on Prescribed Burning. Presented in April and October at different locations in the state to foresters from throughout the southern region. Sponsored by the Mississippi Forestry Commission and the Cooperative Extension Service of Mississippi State University.
- “Effects of Hurricane Katrina in Mississippi” presented to the Civitan and Rotary clubs in Columbus, MS, and to the Aberdeen, MS middle school.
- “Severe Weather in Mississippi.” Mississippi State University Women’s Club, Starkville, MS.
- “Changing Climate Trends and Cycles.” Mississippi Association of Conservation Districts, Inc., Jackson, MS.
- “Mississippi Weather—Is It Changing?” Mississippi Crop College, Mississippi State Extension Service, Starkville, MS.
- “Severe Weather in the S.E. Region of the U.S.” Southeastern Utility Pole Conference, Tunica, MS.
- “Hurricanes in Mississippi.” Ward-Stewart Elementary School, Oktibbeha County, MS.
- “Weather Careers.” Sudduth Elementary School Science Day, Oktibbeha County, MS.
- Hosted visits of dozens of school groups to the Climatology Lab.
- Provided a booth at the Fall Farm Days Exposition, Mississippi State University School of Veterinary Medicine, Mississippi State University.
- Provided a booth at the Careers in Conservation Day, Mississippi State University Cooperative Extensive Service, Mississippi State University.

Research activities this past year included investigating the effects of a management plan to conserve groundwater use in aquaculture in the southern region, development of a climatological model for water supply reservoirs in the state (interestingly, in such a humid state, there are only three municipalities that use surface water supplies--all others use groundwater), effects of physiographic regions on weather in the state, development of a dynamic fire risk model for the southeast, development of a simple method to estimate daily evaporation at inland and coastal locations, climatological influences on occurrences of West Nile Virus in Mississippi, and climatological controls of tick infestations in Mississippi. New funded research includes the environmental potential for growing bio-fuels in Mississippi, and the physical and human impacts on water resources from the shallow alluvial aquifer of the Mississippi Delta region. I am also planning on submitting an article on climatically controlled disposal of large hog farm wastewater in Mississippi to the new AASC Journal of Service Climatology!

In summary, the enormous effects of Hurricane Katrina and the global warming scare have had a big impact on the SC’s operations. The Mississippi SC has a small program, but a viable one that is fairly well-known in the state. It is recognized by a growing number of concerns, both public and private, as a source of weather and climate information. The level of support provided by the state for the SC activities is not nearly commensurate with the output of

the program, and it must be realized this level of activity is heavily dependent upon support from the Department of Geosciences at Mississippi State University.

Missouri Climate Center

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ARSCO Qualifications: The Missouri Climate Center (MCC) is designated by the AASC as the official state climate office for Missouri. The following describes the ways in which MCC addresses each of the ARSCO qualifications:

Communication Capabilities:

- The MCC web site provides easy access to weather and climate information including links to specialized web sites for real-time and historical weather in Missouri. Additionally, a drought and agricultural weather web site exists for the citizens of Missouri;
- An agricultural weather forecast is developed every morning and e-mailed to all the county extension offices in Missouri;
- Over 4000 lines of data arrays are collected daily from a network of 25 automated weather stations. The daily and hourly arrays are posted on a server for free access.
- The Meteorological Assimilation Data Ingest System (MADIS) incorporates 5-minute weather conditions from 13 real-time weather stations in Missouri associated with the Commercial Agriculture Automated Weather Station network.
- Continued development and recruitment for an e-mail delivery agricultural weather product called Horizon Point. Horizon Point is a custom weather analysis system for farmers and provides an opportunity to have specific weather reports sent directly to their e-mail address. Currently over 400 Missouri agricultural producers and agents are enrolled.
- Participated in the NOAA on the Farm initiative which is a two year outreach effort by the National Weather Service Forecast Office in Springfield MO and the University of Missouri Extension Commercial Agriculture Program to discuss current and future weather patterns and their affect on agriculture and fire weather, and to market NWS's products and services to USDA County Extension Agents.

Information Services:

- Submitted numerous press releases and updates to the Extension news service related to weather, climate and the environment;
- Serve as an information source for the media including national, state, and local mediums;

- Provide impending or continuing drought status reports for Missouri to the National Drought Mitigation Center;
- Fulfilled hundreds of requests for climate information and provided climatological expertise to numerous individuals;
- Submit weather and soil information published in a national bulletin **Weekly Weather and Crop Bulletin**: <http://www.usda.gov/oce/waob/jawf/wwcb.html>;
- Run the black cutworm forecasting program over the internet for public utility: <http://agebb.missouri.edu/weather/reports/bcwforecast.htm>;
- Run the rice model program to predict rice growth stages: <http://agebb.missouri.edu/rice/ricemodel.htm>;
- Provide weekly weather information to the Missouri Agricultural Statistics Service: <http://agebb.missouri.edu/mass/crweamen.htm>;
- Provide a weekly climate summary table for the **Integrated Pest and Crop Management** Newsletter: <http://ipm.missouri.edu/ipcm/> ;
- Provide a 2-inch and 6-inch soil temperature table for the Agricultural Electronic Bulletin Board (AgEBB): <http://agebb.missouri.edu/weather/reports/soilTemp2.asp> <http://agebb.missouri.edu/weather/reports/soysoil6.asp>;
- Brought two weather stations online real-time: <http://agebb.missouri.edu/weather/stations/> ;
- Real-time weather data from automated network is made available to local NWS offices;
- Campus weather station linked to main MU web site: <http://www.missouri.edu/> ;
- Campus weather station linked to College of Ag web site: <http://cafnr.missouri.edu/>
- The real-time stations are providing 5-minute weather conditions to the Meteorological Assimilation Data Ingest System (MADIS);
- Writing a monthly weather column for the **Missouri Ruralist** publication;
- Participate in a weekly radio show on KMIZ, Carrollton, MO, featuring Ag Weather.

Research:

- Weather and climate monitoring at Ozark National Scenic Riverways in the context of watershed control;
- Assessing the decline of paper birch stands in the Niobrara River, NE through the interaction of weather, microclimate and genetics;
- Methodology for the retrieval and posting of weather and streamflow data within 80-km of National Park Service units found in the Heartland Network;
- Providing real-time weather status to 13 weather stations in the Commercial Agriculture Automated Weather Station Network for Integrated Pest Management;
- Provide climate data for graduate students and faculty research projects

Outreach: Education, Awareness, and Contact Activities

- Instructor for Atmos Sci 4500 class, Meteorological Instrumentation and Observation, 3 hrs.;
- Guest lecturer for People, Plants, and Environment;
- Guest lecturer for Course 7460, Ag Systems Management, Irrigation and Drainage;
- Guest lecturer for Ozarks Ag 101 Extension class;
- Guest lecturer for Crop Physiology class;
- State Co-Coordinator of the Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) in Missouri and conducted training sessions;

- Weather presentation to various field days across the state;
- Weather presentation at the Farm Planning and Analysis System for Missouri Farmers and Agribusinesses (FINPACK);
- Weather update at the Northwest Missouri Certified Crop Advisors workshop;
- Weather resource presentation at Irrigators Conference in Lamar, MO;
- Regional Climate presentation at the Midwest Grape and Wine conference;
- Weather resource presentation at the Annual Spring Field and Crop conference;
- Weather station presentation to the Director of University of Missouri Extension;
- CAFNR Executive in Residence program: Participated in a climate change discussion panel with Dr. Jan Weaver and Executive in Residence Dr. Tom Dixon;
- Climate presentation to Women in Agriculture Boone/Callaway chapter;
- Bootheel Irrigation Conference and Trade Show;
- Crop Management Conference;
- Computers on the Farm conference;
- In Service Education for Regional Agronomists;
- Missouri Department of Agriculture and Natural Resources;
- Ag-Marketing Teleconferences;
- Integrated Pest Management and Horticulture Teleconferences;
- Missouri Drought Assessment;
- Member of the Plant Protection Programs steering committee;
- Member of the North Central 1018 Regional Climate Committee, Impact of Climate and Soils on Crop Selection and Management;
- Information resource for the following media outlets: Missouri Net, Brownfield Network, Cooperative Video Group, and numerous local television, radio, and newspaper outlets across the state.

Nevada State Climate Office

Dr. Jeffrey Underwood, State Climatologist & Assistant Professor

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Nevada State Climate Office

The Nevada State Climate Office (NVSCO) is located in Reno, Nevada, on the campus of the University of Nevada. The Office operates as a statewide program of the University. The Department of Geography at the University of Nevada hosts the NVSCO. The State Climatologist, Jeffrey Underwood, has a half-time appointment to the NVSCO and a half-time appointment as an assistant professor in the Department of Geography and the Atmospheric Sciences Graduate Program.

This first item is reported with great sorrow—Mr. John James the former State Climatologist for Nevada passed away in January of 2007. John was responsible for bringing the NVSCO to the Department of Geography at the University of Nevada in 1984, was instrumental in getting the Nevada Legislature to fund the office, and personally set up the network of observers that operates today. John was a frequent visitor in the office until just a few months before his death. He was a great resource for the new State Climatologist and a wonderful friend to the NVSCO. He will be greatly missed.

The NVSCO along with the Nevada Bureau of Mines and the Nevada State Seismology Laboratory presented a combined proposal during 2006 to have state funding increased for operations of these three statewide programs. The three program budgets had not seen adjustment in 18 years. The budget process was arduous and complex having to pass through four tiers of state bureaucracy to land on the Governor's desk with the blessing of the Board of Regents of the University System of Nevada. In spite of all the hard work the budget enhancement for the NVSCO was not included in the Governor's budget. In response, Assemblyman Bernie Anderson of Sparks, Nevada introduced the budget as and Assembly Bill during the 2007 legislative session. The State Climatologist and others testified in favor of the bill (AB-189). Unfortunately, at the time of this report the prospects for passage of AB-189 are very poor.

Positive things are happening in at the NVSCO. First, the NVSCO was contracted by the Nevada Division of Emergency Management to produce the first assessment of weather-related hazards for the state of Nevada. This assessment will be a major part of

Emergency Management's proposal to FEMA to request mitigation funding for hazards across the state. The analysis products from the hazard assessment will also be made available to users of the NVSCO via the office web server. This project should be completed by August of 2007.

As usual the NVSCO and the State Climatologist have been very active with statewide media and with outreach. During much of 2006 the State Climatologist was assisting writers at the Reno Gazette-Journal with an upcoming series detailing climate change scenarios for the Sierra Nevada. The NVSCO has also provided data and analysis products to numerous state agencies during the past year.

New Hampshire State Climate Office

David Brown, State Climatologist

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<http://www.unh.edu/stateclimatologist/>

NHSCO Mission

The activities of the NHSCO are centered on (a) gathering, archiving, and disseminating climate data from New Hampshire to interested users; (b) conducting and fostering research regarding the climate of New Hampshire and New England; and (c) educating and informing the citizens of New Hampshire on matters related to climate science and climate policy. The NHSCO has continued to be an active State Climate office and an important part of the climatological community in New Hampshire and northern New England, and was certified as an ARSCO office in 2005. Specific ongoing and planned activities of the NHSCO are outlined below.

Data

The NHSCO is engaged in the collection and distribution of climate data on several fronts. The NHSCO maintains an on-campus weather station at the University of New Hampshire, where it collects sub-hourly meteorological data and archives the data on-line (<http://www.weather.unh.edu>) in a format easily accessible to the public. Additionally, the NHSCO is responsible for ongoing maintenance of two Climate Reference Network (CRN) stations located on UNH property in Durham, NH. In addition to on-site collection and archival of New Hampshire climate data, the NHSCO works closely with the Northeast Regional Climate Center (NRCC) and the National Climatic Data Center (NCDC) to provide climate datasets to stakeholders across New Hampshire and New England as requested. Interested parties can contact the State Climatologist directly with data requests or can utilize an on-line data request interface available on the NHSCO webpage. While the infrastructure and funding needed to establish a state-wide mesonet are not currently in place, the NHSCO is interested in pursuing new data collection and dissemination opportunities associated with the NERON automated cooperative station network in New Hampshire and the implementation of the NIDIS drought program.

Research

The NHSCO is currently involved in several research projects aimed at furthering the understanding of climate variability in New Hampshire and New England on interannual to interdecadal time scales. The NHSCO is a key member of the Atmospheric Investigations, Regional Modeling, and Prediction (AIRMAP) and New England Integrated Sciences and Assessment (NEISA) projects, both funded by the National

Oceanic and Atmospheric Administration (NOAA). The goals of AIRMAP and NEISA are to engage in research on climate change and climate variability across New England, and to address stakeholder vulnerability to the impacts of climate. Current research being conducted by the NHSCO in conjunction with these projects is centered on analyses of interannual linkages between climate, air quality, and human health in New England. The NHSCO is playing an active role in researching interannual climate controls on air quality parameters such as ozone and pollen, and is receiving a portion of the NOAA funding to support faculty and student salary/stipends, professional travel, and equipment. Several peer-reviewed publications with NHSCO staff as primary authors are in preparation from AIRMAP-related work, and multiple professional conference presentations on NEISA activities were given by NHSCO staff in 2006 and 2007.

An expansion of NHSCO research activities is expected during the next year. Internal UNH discussions have led to the initial development of a “New Hampshire Climate Portal”, consisting of current and archived geospatial climate data for the state. Through this product, the NHSCO continues to strengthen on-campus ties to the UNH Institute for the Study of Earth, Oceans, and Space (EOS) and develop new opportunities for undergraduate and graduate research and service.

Outreach

The NHSCO strives to meet a continual demand for educational and outreach activities. Because the NHSCO is currently staffed by only the State Climatologist (the bulk of whose duties are teaching and research in the Department of Geography at UNH) and part-time student help, the amount of outreach the office conducts is somewhat limited. However, every effort is made to address requests for data, media comment, and invited talks and appearances.

The NHSCO web presence at <http://www.unh.edu/stateclimatologist> continues to be a useful tool for both private and public interests across New Hampshire. The website is designed to serve as a “point of first contact” for residents of New Hampshire and other interested users who have a need for climate data or information, and features historical climate summaries and products along with current regional-specific and national climate products such as the U.S. Drought Monitor and 30-day departure-from-normal maps of temperature and precipitation. There are a number of links to external sites with climate information, both regionally and nationally. A CGI interface allows the public to submit requests for climate data on-line via the website.

NHSCO staff maintain a regular presence on local and regional media. Since July 2006, the State Climatologist has conducted a interviews with newspapers such as the *New York Times*, *Boston Globe*, and *New Hampshire Union-Leader*. He has also appeared on New Hampshire Public Radio, New Hampshire Public Television, and WMUR Channel 9 (ABC affiliate) in Manchester, NH. The most prominent topic discussed was the unusually heavy rainfall across much of the Seacoast region in May 2006, resulting in extensive flooding in portions of Maine, New Hampshire, and

Massachusetts. Other interviews focused on specific topics such as regional weather events, climate change impacts, and hurricane variability.

NHSCO staff are routinely called upon to provide presentations on New Hampshire and New England climatology at both professional meetings and for various public and private organizations. Recent invited presentations have included national meetings of the American Geophysical Union as well as regional meetings such as the New Hampshire Tree Fruit Growers Association annual meeting. The State Climatologist also maintains an active role as a participant with the U.S. Drought Monitor and is a member of the New Hampshire Drought Task Force. The NHSCO is active on the UNH campus through its roles with the Energy Task Force and Office of Sustainability Climate Initiative programs.

New Mexico Climate Center

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General Information

The New Mexico Climate Center (NMCC) resides within the Department of Plant and Environmental Science of the Agricultural Experiment Station at New Mexico State University (NMSU) in Las Cruces, New Mexico. The climate center is comprised of two faculty positions, a full-time staff position, and an undergraduate student assistant. By law, the duties of the NMCC are to (1) assess the effect of climate on the natural environment, agricultural production, land and natural resources and human health, (2) coordinate climate impact studies and programs, (3) consult and coordinate with the federal and state agencies government in climate related activities, and (4) disseminate climate data, information, advice and assessments to state and local agencies and the general public.

Information Services

The NMCC collects, archives, and disseminates climate data from official U.S. government and private observing stations throughout New Mexico. Additionally, the NMCC maintains a network of 16 automated weather stations throughout the state that are used primarily for agricultural purposes. In all, daily data from approximately 136 sites is collected, processed, and distributed via the NMCC website. In 2006, the NMCC website had an estimated one million page hits for climate information and data and several hundred requests were answered by phone and email. In addition, the New Mexico Climate Center provides a variety of web based tools for decision support in the areas of agriculture, hydrology, construction, health and economic development. In 2006, the NMCC began the development of a new web page to improve both its usefulness and usability. As 2007 progresses, the new system will slowly be deployed with a new web interface, data access tools, and much more.

Research

Research activities in 2006 consisted primarily of applied research in which climatic information was used for studies involving crop improvement and irrigation/water management. NMCC staff members worked collaboratively with the NMSU Water Task Force, other university researchers, and local stakeholders on the Rio Grande Basin Initiative, a joint Texas A & M University and NMSU effort aimed at improving water conservation through research and education of irrigation efficiency.

In addition, Dr. Ted Sammis was awarded the Jose Fernandez Chair in Field Crop Production in 2006 in recognition for his work with the agricultural community. With this endowment, he provided undergraduate students with real world experience in agricultural meteorology. Students in an introductory horticulture class built hoop-shaped green houses and learned how to use data loggers and instruments to measure temperature, humidity and soil moisture inside and outside the structures.

Outreach

With the addition of two full-time positions in the last two years, the NMCC has significantly enhanced both its service and outreach roles. In 2006, the state climate office actively participated in various state programs including the Drought Monitoring Workgroup of the New Mexico Drought Task Force and a workgroup on the Impact of Climate Change on New Mexico's Water Supply and Ability to Manage Water Resources.

The New Mexico Climate Center also continued to work in cooperation with the Colorado Climate Center on the Community Collaborative Rain, Hail and Snow Network (CoCoRaHS). 2006 marked New Mexico's 2nd year of involvement in the network and included the addition of 177 new volunteers. Nearly half of these volunteers signed up for the program during the record-breaking monsoon season! In the coming year, the NMCC will continue to work with NMSU's Water Task Force, Cooperative Extension Service, and Master Gardener Program as well as the New Mexico Floodplain Managers Association to seek funding to allow us to further expand the network to the more sparsely populated areas of the state.

Further outreach activities included multiple interviews with the media and regular presentations on New Mexico Climate to state and local governments, professional organizations, the general public, and local schools. In conjunction with the New Mexico Floodplain Manager's Association and 4th graders throughout the state, the NMCC helped to develop a Flood Smart Calendar. The NMCC also gave out the first "Student Award for Achievement in Climate Studies" to an elementary school student to reward involvement in science fair projects related to weather and climate.

Goals for 2007

Plans for 2007 include the continued development of our web resources. The NMCC will be working with the Climate Assessment of the Southwest (CLIMAS) program at the University of Arizona to develop and evaluate web resources, to maintain and build stakeholder relationships, and to improve drought monitoring and impact reporting capabilities.

Compiled by Deborah Bathke.

Office of the New Jersey State Climatologist

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Founded in 1979, the Office of the New Jersey State Climatologist (ONJSC) resides within the Rutgers University Center for Environmental Prediction. Our mission is to monitor and understand the diverse weather and climate conditions experienced across the Garden State on various temporal and spatial scales. Included are efforts to inform and educate, thus making the 8.5 million residents of this most densely populated state weather and climate aware.

The ONJSC has established the New Jersey Weather and Climate Network, or NJWxNet. This unique network of new and existing stations will eventually consist of over 100 weather stations throughout the state. Our web site <<http://climate.rutgers.edu/njwxnet>> serves as a one-stop Internet resource for New Jersey weather and climate data. The NJWxNet is a network of networks, including NJDOT and NJ Turnpike RWIS networks, NWS ASOS stations and two networks operated by the ONJSC. Stations operated by ONJSC include 14 NJ Mesonet sites, monitoring a rich suite of atmospheric and surface variables, and 30 NJ SafetyNet stations, monitoring a subset of important variables primarily at public safety agencies. Hourly observations are collected and displayed in real time as colorful maps and tables on the NJWxNet web site, which will have a major upgrade launched publicly by late spring.

In addition to the NJWxNet, the ONJSC maintains a comprehensive archive of historical data, metadata and climatologies from National Weather Service primary and cooperative stations. This is supplemented with data submitted by ONJSC volunteer observers. This information is manually processed and displayed in event, weekly and monthly maps and tables.

Research endeavors within the ONJSC range from student projects on topics such as regional heat islands and snow climatologies to collaborative efforts with Rutgers

colleagues and state and federal agencies. An example is the establishment of the New Jersey Climate Report Card project, a joint effort with the Rutgers Center for Environmental Indicators and the NJ Department of Environmental Protection

Examples of ONJSC outreach activities include participation in the Liberty Science Center teacher training program, the creation of online weather training materials for NJ public safety officials, and a wealth of interviews and presentations. Almost 250 media interviews were given 2006, indicative of a rather tranquil year, devoid of a lengthy drought year, when interviews have climbed over the 500 mark. Not that 2006 didn't provide the driest March, wettest fall and overall 2nd warmest year since 1895.

ARSCO Qualifications: The ONJSC is an American Association of State Climatologists (AASC) Recognized State Climate Office (ARSCO). As such, the office fulfills a number of qualifications outlined below

Communication capabilities

- Ingest, process, archive and disseminate historic and real time climate data.
- Maintain numerous web sites related to the ONJSC mission <<http://climate.rutgers.edu/stateclim>>.

Information Services

- More than 500 specific requests for data and products each year.
- More than 500 unique visits to ONJSC web sites each day.
- Weekly and monthly climate summaries in map and tubular form.

Research

- Collaborate with Rutgers colleagues, as well as state and federal agencies on projects associated with issues such as forest fire management, pest management, agriculture, transportation, water resources, public safety, homeland security.
- Student research on topics such as urban heat islands, state snow cover variability, ocean influences on state weather and climate.

Outreach

- Average more approximately 300 media interviews each year.
- Presentations to schools, civic organizations, Liberty Science Center, etc.
- Conference presentations to the NJ Emergency Preparedness Conference, the NJ Earth Science Teachers Association, the NJ Farm Bureau, the NJ chapter of the American Water Works Association, and many others.
- The NJ State Climatologist is a member of the NOAA Climate Working Group, the NWS StormReady Community Program advisory board, the NOAA Integrated Surface Observing System ad hoc advisory committee, and the AMS Applied Climatology Committee. He also chairs the National Research Council Committee on Archiving and Accessing Environmental and Geospatial Data at NOAA

Monitoring and impact assessment

- Operation of the NJWxNet. <<http://climate.rutgers.edu/njwxnet>>
- Web site updates for significant winter events.
- The NJ State Climatologist is a member of the NJ Drought advisory committee.
- Statewide climate variability and change is being assessed through the NJ Climate Report Card project.
http://climate.rutgers.edu/stateclim_v1/climreportcard/climate_report_card.html
- A shared regional database (with PA and NY in cooperation with the Northeast Regional Climate Center) is being developed, as well as products that bridge state borders.
- 2006 saw a valuable exchange with the Oklahoma Climatological Survey, the focus being each of our mesonets. OK staff visited Rutgers in March and ONJSC staff spent several days in OK in July; the latter supported by an exchange grant from NCDC.

State Climate Office of North Carolina

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The State Climate Office of North Carolina is a public service center for climate-environment interactions at NC State University. It serves the State of North Carolina as the American Association of State Climatologists Recognized State Climate Office (ARSCO) for North Carolina. Its public service mission includes extension, research, and educational components. Highlights of activities and efforts during 2006 in support of the center's mission include:

- Continued public outreach through improved Internet resources, weather forecast applications, and enhancement of the NC ECONet.
- Providing numerous vital information and services related to weather and climate of NC to several state and federal agencies and the private citizens. This covers a wide variety of weather and climate related problems that the state has faced in the recent past and the ones it could experience in future. This includes hurricanes, floods, drought, air quality, and technological disasters such as bio-terrorism.
- External support from NC DENR Division of Water Resources, NC DENR Division of Air Quality, and NC Department of Transportation.

Extension Services

- SCO web site continues to be a leading source of climate information for NC. The site has been expanded significantly to improve navigation, information access, and user feedback. The SCO website is averaging over 9500 unique visitors and 550,000 hits each month, an increase of more than 15% since last year.
- NC CRONOS database allows access to real-time and recent historical observations of hourly, daily, and monthly weather and climate data. Users with SCO accounts

(including state agencies and University faculty) have access to the complete database. Other enhancements include:

- Comprehensive climate summaries for most hourly stations in the CRONOS database to include temperature, cloud, wind, and soil summaries.
 - Map Server technology has been implemented to allow dynamic data viewing of mapping products, including climate observations from the CRONOS database, radar-based precipitation estimates, and real-time radar imagery.
 - Addition of water resource network observations, including stream flow, groundwater, and reservoir data provided by the US Army Corps of Engineers, US Geological Survey, Duke Energy, and NC Division of Water Resources. These have been integrated into the CRONOS database.
 - Dynamic creation of FAO Penman-Monteith potential evapotranspiration estimates for all ECONet, ASOS, and AWOS sites.
 - Preliminary irrigation advisories based on observed precipitation and estimated evapotranspiration.
- NC ECONet continues to expand and improve the quality of environmental observations. There are now 28 stations in this network, including new stations installed and maintained with other University partners. Two more stations are planned for 2007.
 - Development of website for real-time modeling applications. SCO Staff run a high resolution regional weather model in real time, with benefits to many applications including agriculture, emergency response, and air quality interests.
 - Automated fungicide spray advisories for peanut growers (based on previous research effort with Dr. Barbara Shew, NCSU Plant Pathology).
 - SCO provided hundreds of hours of service to federal, state, and local government agencies. These agencies included NC Department of Transportation, US Environmental Protection Agency, NC Division of Air Quality, NC Division of Water Quality, NC Division of Water Resources, NC Division of Forest Resources, NC Division of Emergency Management, NC Department of Justice, NC Department of Agriculture and Consumer Services, US Geological Survey, NC Flood Warning Program, NC Flood Mapping Program, US Army Corps of Engineers, and county economic development agencies.

Educational Outreach

- Last year the SCO hosted five undergraduates, each with individual projects.
- The SCO had more than 200 contact hours of direct outreach to school and community groups.

Research

- Two graduate students worked at the SCO on topics related to weather and climate in NC. Both graduated with PhD in Atmospheric Science.
- SCO collaborated with researchers at Appalachian State University, the University of North Carolina at Asheville, University of North Carolina at Wilmington, the University of North Carolina at Chapel Hill, and NC State University on various research projects and applications.

North Dakota State Climate Office

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Weather affects our daily lives in many ways. Climate information is essential to every citizen of the state of North Dakota. The North Dakota State Climate Office (NDSCO) is part of the Department of Soil Science, in the College of Agriculture, Food Systems, and Natural Resources of the North Dakota State University. As such, the State Climate Office is uniquely positioned to provide information needed for natural resources management and climate assessment to the College of Agriculture, Food Systems, and Natural Resources as well as to the University as a whole, and to the other public and private educational institutions, corporations and government agencies throughout North Dakota and elsewhere. The State Climate Office is in a position to provide linkages and to serve as liaison between the users of weather and climate information in the state of North Dakota and the national and regional climate centers such as National Climatic Data Center (NCDC), National Weather Service (NWS), and High Plains Regional Climate Center (HPRCC).

Our Mission

The mission of the North Dakota State Climate Office is to advance the use of climate information for the economic and environmental benefit of North Dakota and the public safety of its citizens, through climate monitoring, research, education, and extension and information services.

Education

- 2 college courses:
 - Introduction to Meteorology and Climatology: 115
 - Microclimatology: 25-30
- Interact with K-12, community colleges teachers and students, and with other community organizations on different aspects of North Dakota climate.
- Provide high-quality database for use in classroom activities.
- Facilitate graduate student research in the college on aspects of North Dakota weather and climate.

Communication Capabilities:

The State Climate Office operates a state of the art Automated Environmental Weather Monitoring Network called The North Dakota Agricultural Weather Network (NDAWN) which consists of nearly 70 stations distributed across North Dakota, the Red River Valley, and border regions of surrounding states.

Information Services:

North Dakota Agricultural Weather (NDAWN):

<http://ndawn.ndsu.nodak.edu/>

- NDAWN Weather Data
 - Tables and Maps (Hourly, Daily, Weekly, Monthly, Annually, Normals, Departure from Normals)
<http://ndawn.ndsu.nodak.edu/hourly-table-form.html>
- NDAWN Agricultural Applications
 - Barley, Canola, Corn, Potato, Sugar beet, Sunflower, Wheat, Small Grains, Crop Water Use, Insect Development, Degree day for the energy use.
<http://ndawn.ndsu.nodak.edu/applications.html>
- Answers e-mails requesting climate information or asking climate related questions frequently.
- Regularly answers to telephone requests
- Frequent media contacts

Research:

- Wind-driven rainfall loss estimation for the tipping bucket rain gauges of the NDAWN network.
- Time dependence of snow-water equivalence in North Dakota
- Winter temperature and precipitation predictability in North Dakota based on ENSO forecast.

Outreach:

- Legislator's forum on drought and water availability in 4 jurisdictions: North Dakota, South Dakota, Minnesota, Manitoba.
- The Marketplace for entrepreneurs
- Great Plains Agronomics Winter Workshop
- Agriculture Engineering Lab class, in NDAWN lab
- Hettinger County Crop Livestock Improvement Association Annual Meeting
- The 45th Annual International Sugar beet Institute Workshop
- Ag Field Day
- NDSU Science Fair
- Advanced Crop Advisor's Workshop
- Crop Management Conference
- North Dakota Drought Assessment



OKLAHOMA CLIMATOLOGICAL SURVEY

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The Oklahoma Climatological Survey was established in 1980 to provide climatological services to the people of Oklahoma, conduct research on the impacts of climate on human activities, and serve as a support facility for the State Climatologist. OCS has a legislative mandate to acquire, process, and disseminate climate and weather data and information for use by the state's citizens. The Survey maintains an extensive array of climatological information, operates the Oklahoma Mesonet, and hosts a wide variety of educational outreach and scientific research projects. OCS, a research unit of the College of Atmospheric & Geographic Sciences at the University of Oklahoma, employs 39 full-time staff and 26 student employees. In October, Ken Crawford returned from a 2.5-year Intergovernmental Personnel Action with the National Weather Service to lead modernization of the NWS Cooperative Observer Network.

In 2006, OCS moved into new offices within the National Weather Center building on OU's Research Campus. During the move, the Oklahoma Mesonet experienced virtually zero disruption in products and services for customers. The move included an upgrade to the Mesonet calibration laboratory, installation of a demonstration weather station near the building, and establishment of a computer-based learning laboratory. Even as the move took place, OCS staff developed and launched a new website for the AASC, <http://stateclimate.org>.

Oklahoma's drought and wildfires kept our climatologists busy, responding to media requests on a nearly daily basis throughout the year, posting reports to the Drought Monitor, and preparing special publications to support state decision-making. One report, in particular, proved to be the key factor in securing \$5.2M in wildfire assistance for the state. To increase data resolution, particularly for drought monitoring, Oklahoma became the 12th state to join CoCoRaHS (Community Collaborative Rain, Hail & Snow Network). There are currently 115 CoCoRaHS observers in Oklahoma. Additional activities in support of the ARSCO mission follow.

Information Services

OCS servers delivered 96 million data files in 2006. Much of the information was delivered through our WeatherScope visualization software, which allows display and manipulation of multiple data streams, including Mesonet, National Weather Service, NWS Cooperative Observer data, and radar data. New versions of both the stand-alone application and WxScope plugin were released in 2006. Specialized maps compatible for broadcast displays were produced for the Oklahoma Education Television Authority. OCS continued its popular monthly and seasonal climate summaries and produced feature articles for Oklahoma Living, a news magazine distributed to 300,000 rural electric cooperative subscribers statewide.

OCS staff made numerous presentations to local civic organizations, the local chapter of the American Society for Safety Engineers, Comanche Prairie Pool Conservation (Kansas), and USDA-RMA Ag Decision-Making Tools (sponsored by National Drought Mitigation Center). OCS staff also attended and presented at the AMS annual meeting in Atlanta and the Climate Prediction Applications & Sciences Workshop in Tucson. OCS was represented on numerous state education committees and the state Hazard Mitigation Team.

Research

OCS secured more than \$550,000 from federal and other non-state sources to conduct research and development activities supporting major national projects. OCS continued development of a prototype operations system for NOAA's NERON program and partnered with Mixon/Hill, Inc. to design and prototype a national road-weather data ingest, quality control, and dissemination system for the Federal Highway Administration. New initiatives included involvement with the National Integrated Drought Information System (NIDIS) and collaboration with Colorado State University on CoCoRaHS training materials (supported by a grant from NCDC's State Climatologist Exchange Program). OCS researchers also continued monitoring and studying air-soil interaction issues at the Tar Creek Superfund Site in northeastern Oklahoma.

Outreach

State outreach efforts were extended to support development of initiatives in other states this past year. Oklahoma Mesonet experts visited the Kentucky Climate Center to support planning and development of the Kentucky Mesonet. Outreach staff visited New Jersey to support applications of the New Jersey Mesonet and enjoyed a reciprocal visit from the Office of the New Jersey State Climatologist, sponsored by NCDC's State Climatologist Exchange Program. Affiliates of the North Carolina Climate Center attended the OK-FIRST workshop for public safety officials, to discuss development of similar activities in North Carolina. OCS distributed 1000 copies of our severe weather preparedness poster to the American Meteorological Society for distribution to local chapters.

Closer to home, OCS was very visible in the state. Four weather safety classroom activities were published in *The Oklahoman*, with a distribution of 24,850 newspapers to classrooms across Oklahoma. The WeatherWise series was the most successful in the newspaper's history. OCS co-hosted the Climate & Loss Mitigation Conference with the Oklahoma Insurance Department; a second conference is planned for 2007. Workshops for K-12 teachers and public safety officials provided continuing education to 243 individuals. Thousands more were reached

through public activities, including an outdoor day camp for Girl Scouts, school weather programs, and field days.

Monitoring and Impact Assessments

Oklahoma Mesonet data were instrumental in monitoring drought and wildfire conditions in Oklahoma. During 2006, several regions of the state reached D4 designation on the Drought Monitor, with more than 600,000 acres burned by wildfires. To maintain excellent data quality, Oklahoma Mesonet staff upgraded equipment enclosures at all 116 Mesonet sites and prototyped and tested replacement anemometers, rain gauges, and power systems. New soil moisture sensors were installed in the Fort Cobb and Little Washita watersheds for the USDA Agricultural Research Service (ARS). OCS concluded an assessment of weather modification activities in the southern plains for the Oklahoma Water Resources Board and prepared a summary statement for policy-makers.

Oregon Climate Service

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The Oregon Climate Service (OCS), located on the Oregon State University (OSU) campus in Corvallis, Oregon, is the state repository for weather and climate information. OCS is affiliated with OSU's College of Oceanic and Atmospheric Sciences (COAS)

Mission:

- To collect, manage and maintain Oregon weather and climate data.
- To provide weather and climate information to those within and outside the state of Oregon.
- To educate the people of Oregon on current and emerging climate issues.
- To perform independent research related to weather and climate issues.

OCS Staff

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Christopher Daly, Research Professor
Wayne Gibson, Programmer/GIS Manager
Matt Doggett, Research Assistant
Eileen Kaspar, Office Manager
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Cadee Hale, Undergraduate Assistant
Kelsey Kuykendall, Undergraduate Assistant
Sean Daly, Undergraduate Assistant
Sarah Joos, Undergraduate Assistant

Linkages

OCS acts as the liaison with:
National Climatic Data Center
Western Regional Climate Center
National Weather Service
USDA Natural Resources Conservation Service

Climate Prediction Center
American Association of State Climatologists
Other state climate offices

Services

On average, OCS handles about 3,000 telephone or mail data requests per year. OCS' Web site averages about 600,000 "hits" and 125,000 "page views" per week. OCS provides a full range of climate-related services to both the public and private sectors. Services/products include, but are not restricted to:

Site-specific climate reports/summaries.	Climate tables/inventories.
Various statistical analyses, such as means, extremes, probabilities, percentiles, threshold exceedances, etc.	Precipitation maps.
	Customized research.
	Current climate data and information

The PRISM Group

The PRISM Group (TPG) was established at Oregon State University (OSU) to provide spatial climate research, education, analysis and mapping services for public, private, and educational institutions in the United States and abroad. Starting as a research program aligned with the Oregon Climate Service (OCS) in 1993, TPG was formally established in 1999. TPG and OCS continue to operate as sister agencies. Dr. Christopher Daly, OSU Professor, is Director of TPG, which shares office space and staff with OCS.

TPG is committed to producing the most innovative and sophisticated climate maps available anywhere. Many of TPG's mapping activities involve use of the PRISM model, developed by Daly. PRISM is a knowledge-based system that uses point measurements of precipitation, temperature, and other climate elements to produce continuous, digital coverages. PRISM is unique in that it incorporates expert knowledge of rain shadows, temperature inversions, coastal effects, and more. PRISM coverages are used with Geographic Information Systems (GIS) to construct maps and perform many types of analysis.

Applications of TPG products are wide-ranging, and include climatology, agriculture, forestry, hydrology, engineering, recreation, natural resources, global climate change, land use, planning, relocation, education, and geography. TPG is responsible for nearly all major climate mapping efforts at the federal level in the United States. It is also engaged in international modeling and analysis projects. Recent and current projects include:

- High-resolution monthly and annual precipitation and temperature "normals" (1971-2000) for the 48 contiguous states (~ 800 m. resolution)
- Monthly grids of temperature, precipitation and dew point for the period 1895-current for the 48 contiguous states (updated monthly)
- Development of a spatially-based quality control system for SNOTEL sensors, for USDA Natural Resources Conservation Service
- Development of GIS tools for estimating Probable Maximum Precipitation (PMP)
- Creation of a new "Plant Hardiness" map for the U.S., for USDA-ARS



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The Pennsylvania State Climate Office database now incorporates observations from nearly ten separate networks within the Commonwealth. Another 100 new hourly reporting stations have been added into the office's relational database. When combined with reports from the FAA and Pennsylvania's DEP and DOT, there are over 350 observations of temperature, dew-point and wind each hour. The State Climate Office has also improved its interactive data archive and metadata files and we continue to work with state officials on the issue of bringing the non-federal AWOS III sites on-line (about 15 hourly sites).

The vision for a Pennsylvania Mesonet remains a high priority for the State Climate Office. New initiatives within state agencies are being explored. The CoCoRaHS network continues to expand into Pennsylvania under the auspices of the state climate office and with the name FROST. By early 2007, over 130 volunteer observers have been added. The State Climate Office in conjunction with the Center for Environmental Informatics has completed an objective methodology for selecting new sites for an expanded environmental observation network.

Information Technology Capabilities:

- 2,876,232 web data requests have been processed on our web-server since a new web statistics program was installed in November, 2006 (indicating a typical monthly rate of 500,000 requests)
- Primary users are commercial, educational and government organizations
- Typically 6-10 requests per week from public for data
 - Over 500 requests filled and logged in 2006
 - Data Availability for top 3 data networks:
 - FAA archive: 117 Sites from OH, NJ, WV, NY, VA, DE, MD and PA. Current archive contains 8,293,517 records.
 - CWOP archive: 640 sites from OH, NJ, WV, NY, VA, DE, MD and PA. Current archive contains 5,825,364 records .

- COOP archive: 1501 sites from OH, NJ, WV, NY, VA, MD and PA. Current archive contains 4,811,928 records.

Communication Capabilities:

- The web server continues to function well and its databases are backed-up on a College network regularly. The size of the state climate database is expanding rapidly with new digitized data (RTMA and MSP) such that within the coming year, it may be necessary to migrate the database onto a new PC to reduce the strain on the web server component.

Information Services:

- The development of a new Interactive Data Archive (IDA) continues. This archive allows users to easily obtain data as well as metadata from any of the primary data sources. Currently, the IDA is open to visitors to download up to 6 months of data, but the user interface will now allow registered users to access larger chunks of data. A collaborative effort with the Northeast Regional Climate Center continues to bring evapo-transpiration data to the users.

User Base Growth:

- The number of site visits continues to increase from year to year. We anticipate this trend to continue as we work with more state agencies and provide more data products. Currently we have processed 5900 data requests via our development data archive since November, 2005. These data requests include approximately 1900 requests for COOP data, 1000 requests for CWOP data, and 2800 requests for FAA data.

Data Quality Control/Assurance:

- A multi-tiered quality assurance system continues to be developed to process and test the increasing volumes of environmental observations. Standards established by other ARSCO's (particularly the Oklahoma Climate Survey) are being adapted for uniformity of data quality control. Data collection of the PA Cooperative Weather Observer Program (CWOP) takes place from the Forecast Systems Lab (FSL) MADIS system. The PA Climate office takes advantage of the DQ control routines provided by MADIS and is about to add an additional layer of QA.

Climate Office Projects:

- In collaboration with the National Park Service, a climate data inventory project is underway to assess all atmospheric reporting sites within the domain of approximately eight parks stretching from the Delaware River to central West Virginia. Comprehensive metadata for all sites within Pennsylvania are being compiled and will be part of an interface for NPS personnel.

Special Projects:

- Collaboration with experts in the College of Agricultural Sciences continues with the development of environmental data monitoring systems for a Wheat Scab project, and a joint venture with a research business has focused on the Soy Bean Rust challenges. A project with Pennsylvania DOT and Penn State Civil Engineering was completed with a study on crash data and quantifying the weather hazards related to auto crashes. A new opportunity is expected soon.

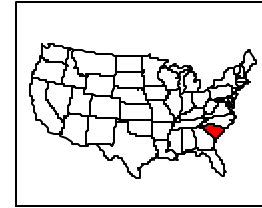
Selected Presentations:

Presentations were given at the Pennsylvania Agronomic Education Society as well as the Central Pennsylvania Crop Conference during the winter of 2006-2007. Global climate change, its causes, and expected effects on Pennsylvania are a routine source of media requests.

South Carolina Office of Climatology

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The Office of State Climatology (SCO) as mandated by the South Carolina General Assembly (Sections 49-25-10 *et seq.*, Code of Laws of South Carolina, 1976, as amended) has represented the State in all climatological and meteorological matters within and outside South Carolina since its creation in 1986. Hazard mitigation for severe weather events, such as hurricanes, droughts, tornadoes, floods, and ice/snow storms, is a critical area of responsibility for the office. The SCO serves as liaison between the National Weather Service and State agencies, such as the Governor's Office, SC Department of Natural Resources (SCDNR), SC Public Safety, and the SC Emergency Management Division. The SCO assists other State and Federal agencies in data acquisition and interpretation before, during, and after periods of severe weather.

The Office provides a unique service to the state by archiving and distributing climatological and meteorological data, reports and research that date back to the early 1700s. The SCO also has the sole responsibility in the State for serving as an expert witness in civil and criminal litigation involving weather and climate, averaging 12-24 cases per year.

The SCO administers the *South Carolina Drought Response Act*, passed in 1986 and amended in 2000, which requires the office to formulate, coordinate, and execute a comprehensive drought response program. When drought occurs, as it has several times in the past 20 years (1986, 1988, 1998-2002), we have reduced its impact by working together with Federal, local, and other State agencies to ameliorate impacts to agriculture and water supply.

The SCO maintains a network of climatological observers throughout the State that supports the National Weather Service's Cooperative Observer Network Program. These observers provide important information that fills gaps in the National Weather Service's network.

ARSCO Qualifications: The following describes the ways in which SCO addresses each of the ARSCO qualifications:

Communication Capabilities:

- Maintains the SCO Web site, adding new products based on recent studies and unusual

weather events.

- Maintains and updates Drought Information Web site that serves as a clearinghouse for information needed for state drought mitigation, declaration, and response.
- Maintains an email notification system focused on severe weather notification and disseminating long-range climate projections.
- Develops specialized products primarily focused on hydrology-drought related topics and extreme event analysis.

Information Services:

- Average 70 monthly phone and email requests for climate data and 20,000 information retrievals from the SCO web site. During significant weather events such as the active hurricane season these numbers triple with 60,000 information web retrievals and 300 email and phone monthly requests.
- Media inquiries average 20 per month and triple during periods of severe weather.
- As a function of the Drought Response Program regular correspondence occurs with over 2,000 water systems. Correspondence includes drought projections, official declarations, and suggested response. During 2005, the SC Drought Response Committee was convened twice to review the drought conditions and impacts. Staff spent significant time working with hydro-electric dam operators and other resource agencies to enhance drought mitigation efforts during the Federal Energy Regulatory Commission's (FERC) dam relicensing.
- Issued Weekly Weather Report that was also provided to the USDA SC Agricultural Statistics Service during the growing season.

Research:

- Cooperating institution in the Carolinas Integrated Sciences and Assessments (CISA) project focused on integrating climate science and water management in North and South Carolina.
- A High Resolution Regional Drought Monitor Application was developed through a partnership between CISA, SCO and the NC State Climate Office (<http://drought.dnr.sc.gov>). Funded by Duke Energy the application is being used to identify drought triggers for their FERC Relicensing Low-Inflow Protocol.

Outreach:

- Staff member serves as commissioned law enforcement officer to assist SCDNR during weather emergencies.
- Provide approximately 50 annual presentations to various governmental, private sector, and civic organizations including the 15th Annual Conference for Applied Climatology, Association of State Climatologists Annual Meeting, the SC Hazard Mitigation Conference, and the Saluda Reedy Water Users Forum.
- Attend state and national conferences such as the National Hurricane Conference.
- The SCO produced the first ever South Carolina Weather Calendar during 2005. The calendar provides a fun and unique medium for educating the public about SC's spectrum of changeable weather and increases visibility for the Office.
- An article highlighting the functions of the SCO was published in the SC Wildlife Magazine.

Monitoring and Impact Assessment:

- Maintains a network of climatological observers.
- Prepare event summaries for significant weather-related events. During 2005, Open File Reports on Hurricane Ophelia and Tropical Storm Tammy were published online.
- As a member of the State's Emergency Operations Team, staff participates in quarterly hurricane task force meetings, annual exercises and trainings. Provided forecast analysis and weather briefings to emergency officials during Hurricane Katrina, Hurricane Opehlia, Tropical Storm Tammy, and the December 15th Winter Storm.
- Issued press releases on Winter Weather Awareness, Severe Weather Awareness, Hurricane Preparedness and Flood Safety Awareness.



Dr. Dennis Todey – State Climatologist (Extension climatologist)

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The South Dakota Office of Climate and Weather is housed in the Agricultural and Biosystems Engineering Department and is part of the Cooperative Extension Service and Agricultural Experiment Station at South Dakota State University. Consequently the mission of the state climate office of providing data and information to the people of the state overlaps the mission of the extension service in providing science-based information to the people of the state. As part of the SD CES, it has connections in every county of the state to communicate with people of the state providing for a direct set of users as well as transfer of information back to the office. We also are charged with doing research on climate applications for the people of the state through the agricultural experiment station.

Drought of 2006

For much of the summer of 2006 the SDOCW was in full scale drought mode responding to requests for data, reporting on record low precipitation amounts, handling media requests and writing drought reports for the state drought task force during probably the most severe drought in South Dakota since the Dust Bowl. The SDOCW was a conduit for information to the state's congressional delegation while they were working on disaster legislation. Regular reports to the governor on conditions and outlooks were used for emergency declarations in the state.

An outgrowth of the drought was a severe fire season in the prairie of western South Dakota as well as the Black Hills. Over 1000 fires occurred during the summer. The governor declared a state of emergency to deal with fire issues. As part of that emergency, the SDOCW led off daily conference calls with outlooks on current conditions as well as looking at potential fire locations.

Another eight stations are now collecting data as part of the South Dakota Automated Weather Network, bringing the total number of stations in the network to 30. The SDOCW expanded its monitoring capability by deploying seven new weather stations in the state during the summer of 2006. Data from the stations is available free of charge at 5-minute intervals via the state climate web site (<http://climate.sdstate.edu>).

This data is also being supplied to users directly via the UNIDATA data stream at hourly intervals for use by National Weather Service office for forecasting and warning verification.

Other special activities

The SDOCW was the host for the American Association of State Climatologists annual meeting in 2006 at the Rushmore Plaza Holiday Inn in Rapid City. Total attendance was around 125 people. A larger than average number of attendees was created by about 20-25 National Weather Service employees from the Central Region.

Dr. Todey was part of the meetings discussing planning for the National Intergrated Drought Information System (NIDIS) during a meeting in Lincoln and subsequent conference calls.

Dr. Todey spoke about drought with the Legislator's Forum, a cross-border regional group of legislators who meet annually to discuss issues of common interest and to try to take common actions to work on problems regionally and internationally.

Student work

One graduate student is currently working on data comparison between AWDN data and nearby coop stations to determine relationships between data from the two types of stations.

Interaction with clientele

Media

The state climate office handled a much larger number of media requests because of the drought. Over 60 media requests for data and interviews from television, radio, newspapers and other media outlets in state, regionally and nationally in response to the drought and other aspects of climate.

Dr. Todey did weekly features for an extension-produced statewide gardening program (Garden Line) and a statewide agriculture program (Today's Ag) both on South Dakota Public Television. Topics covered ranged from current drought status, to ENSO to water use in plants. A special Drought show version of Today's Ag was aired in August.

Data requests and presentations

The state climate office responded to over 125 direct data requests as well as served large amounts of data on its web site. The web site is still introduced as one of the most useful parts of the climate program.

Dr. Todey gave 35 presentations and 2 field day presentations to producer groups, extension meetings, civil groups and school classes pertaining to long range outlooks, weather and climate monitoring, and climate trends.

office of the
state climatologist



TEXAS CLIMATIC BULLETIN

Office of the Texas State Climatologist
College of Geosciences
Department of Atmospheric Sciences
Texas A&M University

Dr. John W. Nielsen-Gammon, Texas State Climatologist

Matt Mosier, Undergraduate Assistant

Physical Location and Funding :

The Office of the State Climatologist is housed in the Department of Atmospheric Sciences, Texas A&M University. Continuing funding for each fiscal year includes: assistance from the Texas A&M Vice President for Research and Graduate Studies, the half-time services of a graduate student during the fall and spring semesters, and an administrative supplement for the State Climatologist. Office space is provided free of charge by the University. The largest out-of-pocket expense for the Office is hourly wages for one part-time undergraduate assistant. Cost recovery is available for large data requests. External funding is provided for sponsored research projects.

Communication and Information Services:

The Office of the Texas State Climatologist utilizes all mainstream forms of communication. The Office has access to electronic mail, telephones, facsimile machines, regular mail, and allows for people to come directly to the office. A website is maintained by Office staff, and it is updated weekly with statewide weather summaries.

The Office's information services can be broken into two parts: personalized information services and general information services. The personalized information services are conducted using all of the previously mentioned forms of communication with outside individuals. These information services consist of a client requesting data from our Office and the Office finding, recovering, and processing the information in a way that is easily understood by the client, and attached in an easily accessible format. In 2006, about 300 electronic climate requests were received, and sent the same amount. The Office has also received approximately 170 phone calls, sent nearly 20 facsimiles, and sent numerous mailings through the postal services.

The general information services consist of regularly produced documents that are made available in publications such as the Texas Almanac, and summaries and forecasts on the office's website. In the Texas Almanac, the Office provides and verifies a significant amount of climatological data for the publication. On the Office website, <http://www.met.tamu.edu/osc>, there are monthly climate summaries for the state and the Bryan/College Station area as well as weekly weather forecasts for Texas. The Texas Monthly summary includes a crop report, precipitation and temperature deviations from normal for the major cities in Texas, and a summary of the previous month's weather.

The weekly summary and forecast for the state includes a general summary of the previous week's weather and significant weather events, if any, and a forecast of the coming week's precipitation and temperatures. Bulletins are also produced whenever the Climate Prediction Center releases its long-lead forecasts. These forecasts are analyzed and the information regarding the state of Texas within the forecast is posted in a bulletin with a short summary and graphics. Occasionally, if severe weather has affected the state or the climate is in an unusual state, a bulletin will be released addressing these issues.

Research:

This year the Office of the State Climatologist received funding from the National Oceanic and Atmospheric Administration (NOAA) and the Texas Water Development Board (TWDB) for participation in three related projects. The NOAA project is directed toward documenting and understanding decade-scale changes in observed climate in Texas and Oklahoma. The TWDB projects included assisting in the development of a high-resolution climate atlas for Texas and making recommendations regarding the best ways to monitor meteorological, hydrological, and water supply drought in Texas.

The Office of the State Climatologist also receives funding under an interagency grant agreement from the Texas Commission on Environmental Quality (TCEQ) for a variety of projects related to air pollution meteorology. These include research activities undertaken locally and weather observations arranged through a subcontractor.

In addition to these funded projects, the Office of the State Climatologist is also investigating the local-scale and large-scale controls on summertime precipitation in Texas, with the eventual objective of developing ways to forecast drought on a monthly and seasonal time scale.

Research Findings:

The NOAA project has found that climate division data are relatively reliable on annual and interannual time scales, but that they do not properly represent long-term climate variations in precipitation prior to about 1950. We tentatively conclude that, despite the lack of a trend in climate division data, overall precipitation has actually been steadily increasing in Texas over the past century. We are presently examining station histories in Texas and New Mexico to more fully document the impact of station locations on the climate record.

The drought index project, under the leadership of Prof. Steven Quiring, has developed two new indices for hydrological drought that show promise. The indices are based on observed precipitation and modeled streamflow and reservoir storage, calibrated against current hydrologic conditions and responses. By using models, we are able to eliminate the effect of changes in water usage patterns and place current hydrological droughts in proper historical perspective.

The climate atlas has been completed and is awaiting review by the TWDB.

The summertime precipitation project is being completed this spring. The study was designed to examine direct relationships between precipitation the factors that control it, using tools developed for convective forecasting. Preliminary results indicate that precipitation on monthly time scales during the summer in Texas is primarily controlled by variations in convective inhibition (CIN) and is almost unaffected by CAPE. Variations in CIN may be approximated by variations in the difference between

the 700 hPa temperature and the surface dewpoint. While the surface dewpoint responds strongly to precipitation and represents a feedback mechanism prolonging drought or wet spells, the 700 hPa temperature is strongly affected by transport of warm air aloft from northern Mexico and the desert Southwest United States.

Outreach:

The Office's primary means of outreach is through data access and publications available on the OSC web site. In addition, the OSC responds regularly to media requests and requests for guest lectures. During the past year, the greatest interest among the public has been with regard to topics related to drought, hurricanes, and climate change.

Monitoring and Impact Assessments:

The State Climatologist is an appointed member of the Texas Drought Preparedness Council, a statewide interagency committee created by the Texas Legislature in 1998 to monitor drought conditions and coordinate drought mitigation activities. The Council meets monthly in Austin. The State Climatologist is also an active participant in the U.S. Drought Monitor mailing list.

Dr. Robert R. Gillies, Director

Alan Moller, Research Technician III / Meteorologist

The Utah Climate Center

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<http://climate.usu.edu>



Introduction

The Utah Climate Center is located within the department of Plants, Soils, and Climate and the Agricultural Experiment Station of Utah State University in Logan. The change of name from Plants, Soils and Biometeorology to that of Plants, Soils, and Climate became effective April 2004. The state climate program for Utah officially resides in the College of Agriculture.

The mission of the Utah Climate Center (UCC) is to facilitate access to climate data and information, and to use expertise in atmospheric science to interpret climate information in an accurate and innovative fashion for the public and various entities. The mission includes the design of new products to meet present and future needs of groups that include agriculture, natural resources, government, industry, tourism, and educational organizations in Utah and the intermountain region.

Overview / Logistics

Dr Gillies took the position of Director in June of 2006. In early July, the UCC relocated to the Janet Quinney Lawson Building from the basement of the Agricultural Sciences Building. Tess Davis left the UCC in early July to enter graduate school and pursue a degree in law – her successor Alan Moller, a recent graduate from the University of Utah program in Meteorology, accepted the position in late August 2007.



Left: The Janet Quinney Lawson Building at Utah State University.

In addition, the weather station site (5SW) that consisted of a COOP station, National Atmospheric Deposition Program (NADP) and UVB equipment was moved in late September, to a nearby location to

accommodate new building construction for the Veterinary Science program at USU.



The new site for the COOP, NADP, and UVB stations at 5SW in Logan. Left-hand picture (looking North) shows NADP, COOP (MMTS, rain-gauge), while right-hand picture (looking Southwest) shows the UVB instrumentation.

Communication Capabilities / Information Services

The Utah Climate Center continues to advance the website (<http://climate.usu.edu>). Phase 2 scheduled for release in late May of 2007 adds functionality that includes (a) a visualization page, (b) a climate conversions page, (c) a dynamic reports page as well as (d) an informational research page for the climate and biometeorology program. Moreover, considerable time was spent in exporting COOP data from the existing lightning program for dates that precedes the 1948 NCDC digital archive. In such endeavors, the UCC, with the benefit of the scientific steering committee, ensures innovative and scientifically valid products. The steering committee is comprised of scientists from a wide variety of relevant disciplines that are willing to offer their expertise to the UCC. In this context, the products page is focused on the provision of data products and services to further benefit of educational organizations, private industry, the research community, and all other data users within the state, and inner mountain region.

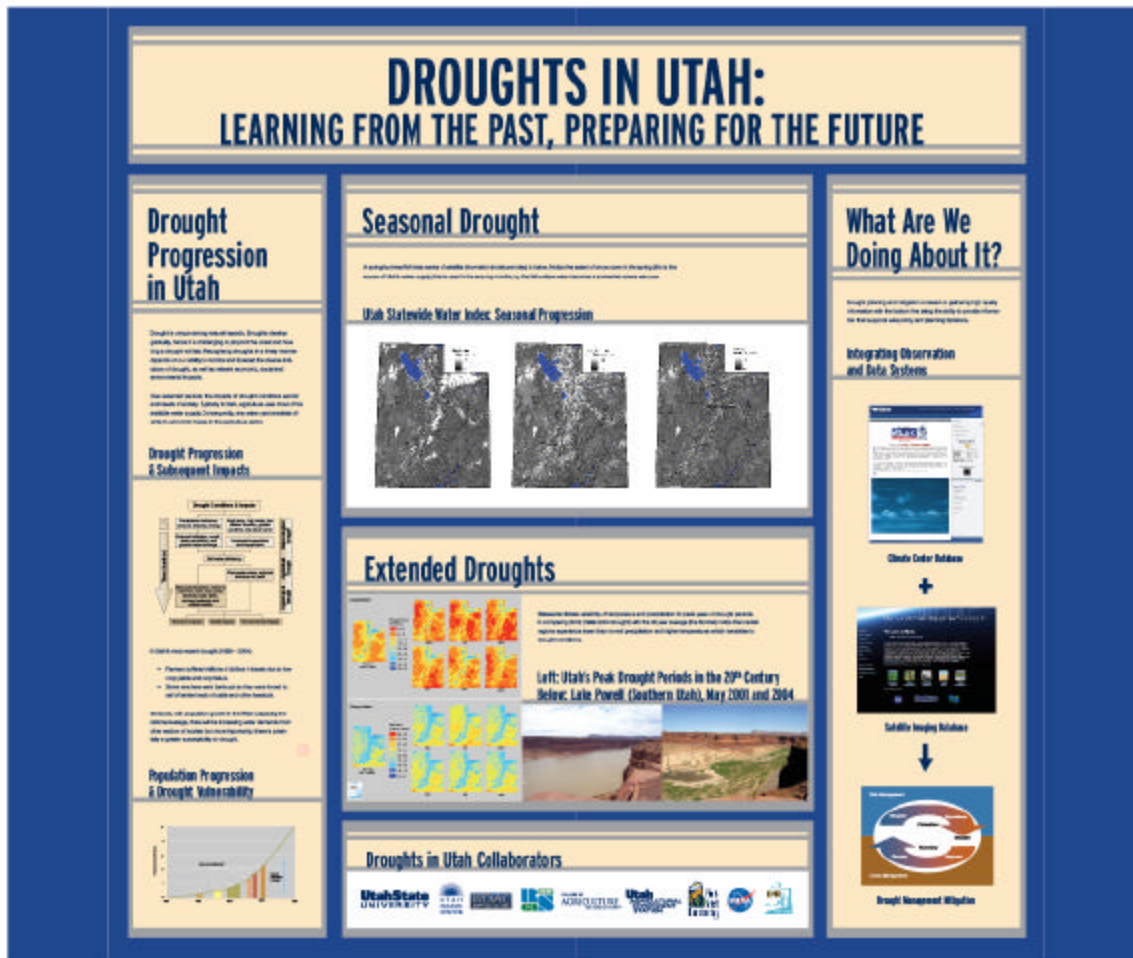
Presentations & Research

1. The Utah Climate Center was asked to submit a proposal for participation in the annual National Association of State Universities and Land-Grant Colleges Exhibition / Reception on Capitol Hill, the details of which are given below.

Gillies, R. R. 2007. Droughts in Utah: Learning from the Past, Preparing for the Future. A University Science and Education Exhibition and Reception of Capitol Hill. *National Association of State Universities and Land-Grant Colleges (NASULGC)*, February 28, 2007. Washington D.C.

2. The Utah Climate Center has started to investigate the meteorology of droughts in Utah. An initial study into the phenomenon of drought onset in Utah was presented at the Spring Runoff Conference at Utah State University:

Lawrence Hips and **Robert Gillies**. 2007. Investigating the Wet Dry Cycles in Utah. (Poster). Spring Runoff Conference – Utah State University. April 5-6, 2007. Logan, Utah.



The poster given at the NASULGC reception – February 28, 2007, Washington D.C.

The Utah Climate Center also continued to operate several research endeavors for outside institutions including weekly precipitation sampling for the National Atmospheric Deposition Program (NADP), and equipment maintenance for the University of Colorado’s UVB program.

Outreach

The Utah Climate Center performs ongoing community outreach. In this capacity, the Utah Climate Center accommodates requests for visitors to the Center’s Office on campus, and even to COOP weather stations. Many different groups such as Boy Scouts, graduate students, and media personnel take advantage of this opportunity.

Monitoring and Assessments

The Utah Climate Center continues to provide annual assessment of precipitation in the form of water year tables. These annual tables are now available on the new website under *static reports*. The Freeze-Free season for the state of Utah was also updated through 2006, and posted (*static reports*) on the website for the public. The Utah Climate Center continued in its responsibility for daily weather observations at two local National Weather Service COOP weather stations and the NADP station.

Goals for 2008

Now that the COOP database extends before 1948 for the State of Utah, the Utah Climate Center plans to update the previously published book Utah Climate. Former UCC directors Gaylen Ashcroft

and Donald Jensen first published it in 1992. The book will be available on the website as a free pdf file download, and in hard copy format for a small fee.

The Utah Natural Resources Conservation Service (NRCS) received a congressional earmark to install 15 Soil Climate Analysis Network (SCAN) Sites in Utah. The actual installation is scheduled for the period May 7-25, 2007. Some of the preferred sites are on USU research farms and the UCC is working and will work with NRCS to facilitate this effort.

The UCC is offering a 2-year post-doc for research into drought in the Southwest and, in particular, Utah. In addition, 'Jobie' Carlisle will be joining the climate center part time to assist with various projects at USU. Jobie was a senior research technician who managed various research projects at the Konza Prairie Biological Station.

Web development will continue in line with the mission of the Utah Climate Center. In particular, the focus for 2008 will be on spatial products. The climate center will also be working with State and agricultural entities to use information technologies to facilitate information transfer towards

Now that the UCC is establishing itself after a three-year period of inactivity it is hoped that to direct some resources, starting in a small but definitive way, towards Utah implementing COCORAHS.

Vermont State Climate Office

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The Vermont State Climate Office (VTSCO) received its ARSCO recognition in June 2005. The office is housed within the Department of Geography at the University of Vermont (UVM) & State Agricultural College, a land-grant institution that emphasises outreach as one of its core missions. In July 200, the VTSCO moved to new a laboratory setting donated by the Geography department. Climate Database Modernization Program (CDMP)-funded equipment, archival publications and documents are housed there, with adequate facilities for the undergraduate and graduate assistants.

The core mission of the VTSCO is to provide climate research and services to Vermonters and other constituents (university researchers, policy makers, state agencies, legal firms or school children) in a timely and efficient manner. This is facilitated via a dedicated website and e-mail address.

Over the course of the AY 2006-2007, the VTSCO continued to support two undergraduate Geography interns via federal work-study funding and NCDC/CDMP funding. A new M.Sc. student was recently admitted to UVM to begin her research duties and assisting with outreach in the Fall 2007.

ARSCO Qualifications : The VTSCO is the AASC-designated state climate office for Vermont. The following activities address each of the Office's ARSCO qualifications.

Communications capabilities:

? continued enhancement of the VTSCO website (<http://www.uvm.edu/~ldupigny/sc>) with access to both hydrometeorological and geospatial data; ongoing CDMP historical data collection; mitigation awareness resources; data access and; a streamlining of the most commonly requested NCDC datasets

? provide free data, expert opinions and recommendations via the telephone, facsimile, electronic mail and regular mail

Information services:

? provided seven interviews on climate change issues and fall foliage to the Wall Street Journal, Omaha World-Herald and local newspapers.

? handled over 65 non-CDMP related email, mail and telephone requests.

Research:

? CDMP-related data collection of weather and climate data in personal diaries from the 1700s to early 1900s in the Library Research Annex of the UVM's Bailey/Howe Library. These were imaged and forwarded to the CDMP for uploading to WSSRD. Databases of the contacts, findings and progress of visits around the state were updated.

? the manuscript outlining CDMP activities went to press at the Bulletin of the American Meteorological Society. Co-authors were Tom Ross, Joe D. Elms, Rod Truesdell and Steve Doty. SCEP (State Climatologist Exchange Program) funding facilitated this collaboration.

? book chapter on the use of bioindicators as a proxy for climate, as part of a co-edited book manuscript with Cary Mock entitled Historical climate variability and impacts in the United States. Manuscript was solicited by Springer Publishers.

Outreach:

? worked with high school transportation interns on the role of climate and geospatial technologies

? presentations at libraries, The Nature Conservancy, Osher Lifelong Learning Institute about Vermont in a changing climate.

? liaise with the Vermont Department of Agriculture, Food and Markets on drought, flooding and nonpoint source pollution issues.

State Climatology Office for Virginia

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The Office of the State Climatologist is a Research and Public Service Center at University of Virginia, in the Department of Environmental Sciences. The office is also an integral member of the Southeast Regional Climate Center.

The office provides information and conducts research on the atmospheric environment and the impact of weather and climate on economic and ecologic systems to government, education, industry, the media and individuals. Its on-line, "Climate Advisories" feature current climate research and/or educational material, and its web site offers an extensive array of climatic information and guidance to climatic data services.

ARSCO Qualifications: The AASC has designated the Office of the State Climatologist at the University of Virginia as the state climate office for Virginia. The following describes the ways in which the office addresses each of the ARSCO qualifications:

Communication Capabilities

The Virginia Office of the State Climatologist has phone, fax, and email services with high-speed Internet service for the rapid transfer of data. The office maintains a web site devoted to a variety of its educational, informational, data provision and outreach goals.

Information Services

The Office of the State Climatologist serves as the official repository and provider of climatic records within the Virginia, and handles thousands of direct requests for information annually, as well as more general guidance on climate issues of all spatial and temporal scales. Its web-based information services are accessed tens of thousands of times a year, with an estimated total download of information in the hundreds of thousands of pages. These inquiries come from individuals, industry, the media and hundreds of governmental and educational entities, worldwide. In addition, the office's monthly "Video Climate Advisory" is televised statewide as a PSA on Public Television and Public Access Channels.

Research

The office is an integral participant in the SHENAIR research program, which is designed to expand our understanding of the atmospheric environment of the Shenandoah Valley region. Under this program, the office is involved with two projects:

- Air Quality Climatology for the Shenandoah Valley
- Asthma Alert System for Shenandoah Valley

In addition, major research efforts of the office include:

- Examination of the relationships between U.S. climatic regimes and exacerbation of respiratory distress — in collaboration with the U.Va. Health Sciences Center.
- Drought impact monitoring research and data system development.

Outreach

- Provides data and expertise to dozens of state, federal and local government entities, and educational institutions each year.
- The office distributes information via hundreds of contacts with the print, radio and television media.
- The office serves as a lead scientific contributor to the Virginia Drought Monitoring Task Force, with periodic drought reports.
- Virginia Climate Advisories have been created and published on-line and Video Advisories are produced monthly for television distribution — both are linked from the office web site.
- The office has been increasing emphasis on its web site as a vehicle for making information available to potential users. This has been successful in reaching more individuals and organizations in a more cost-effective fashion.

Monitoring and Impact Assessment

- Development of a web-based interactive system for ready access to short-range forecasts of human health related atmospheric information.
- Provision of data and impact assessment for and service as a member of the Virginia Drought Monitoring Task Force
- Work in collaboration with James Madison University to provide detailed, long-term atmospheric monitoring in the Shenandoah Valley.



Office of the Washington State Climatologist

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The last twelve months have seen tremendous developments in the Office of Washington State Climatologist (OWSC), in personnel, funding, state recognition, and development of new services. In September 2006 OWSC received enough funding from the WA Department of Ecology to hire, for the first time in its history, a full-time employee. The job went to Josiah Mault, the newly graduated student assistant, who will continue to support and enhance the operations of OWSC. In March 2007 we welcomed Professor Gary Grove of Washington State University as Associate State Climatologist. Gary runs the AgWeatherNet in addition to conducting research in plant pathology.

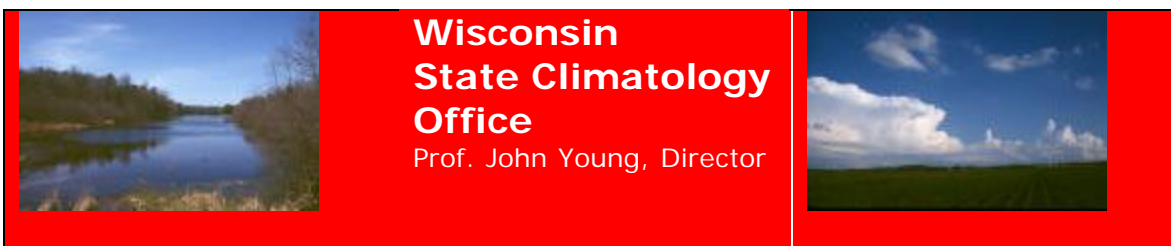
Through our agreement with Ecology, OWSC has been improving upon existing data services and developing new tools to assist in the dissemination and interpretation of climate data. These include the ability to rank precipitation totals, an interactive streamflow map that incorporates both the Ecology and USGS networks, a utility to generate a more user-friendly NCDC daily and monthly data file that is easily imported into a variety of applications, and more recently a tool to analyze trends in Northwest temperature, precipitation, and snow water equivalent interactively with plots using Google Maps. OWSC also advised the governor's office in late summer 2006 because three very dry months caused spotty water shortages, including a water supply crisis in the normally rain-drenched town of Neah Bay at the northwest tip of the Olympic Peninsula.

Further raising our visibility, OWSC now sends a monthly newsletter for the purpose of providing information on state climate including monthly climate summaries, seasonal outlooks, and information regarding notable climate and weather events. Assistant SC Josiah Mault presented a talk entitled "Top ten weather and climate events of 2006" at the March 2007 Pacific Northwest weather workshop.

The last few months have seen legislative action as well. A bill, modeled loosely on Oklahoma's enabling legislation, was drafted and introduced in the State Senate in January; the bill passed the senate in March by a comfortable margin and at the time of writing is awaiting action in the state House. With the state's biennial budget for 2007-09 up for approval in the 2007 legislative session, the governor for the first time included in the budget sufficient funds to permit OWSC to continue at the current level.

As mentioned in last year's report, OWSC is continuing to pursue the implementation of an improved hydro-climate network in Washington while at the same time maintaining close contact with NOAA and other partners on implementing NERON and NIDIS. Despite the governor's early receptiveness with our original proposal, funding for the project was not accepted as part of the 2007 biennial budget. Currently, a task force is being set up that will provide recommendations to the governor and other stake-holders about achievable priorities and the funding required, by beginning the selection of sites and implementation of the programs once some initial funding is secured. This process will begin with a scoping workshop that will take place in June of 2007, for which we enthusiastically thank Ken Crawford and Kelly Redmond for serving as advisory members.

Finally, along with Idaho SC, Russ Qualls, we enthusiastically welcome the AASC annual meeting back to the Northwest in summer 2007.



Contact Information –

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Meteorology and Space Science Building, on UW-Madison campus, home of Wisconsin State Climatology Office (photo by Hopkins)

The Wisconsin State Climatology Office (SCO) is affiliated with the Department of Atmospheric and Oceanic Sciences at the University of Wisconsin-Madison. As a partner with the Midwestern Regional Climate Center, the SCO collects data and information for climate monitoring, provides climate information and interpretation to residents of Wisconsin, demonstrates the value of climate information in the decision making process to the user community, and conducts applied climate research.

The office contains an extensive collection of original manuscript records for Wisconsin weather stations, some dating back to the 19th century.

The mission of the SCO includes:

- acquisition and archiving weather observations from nearly 200 weather stations throughout the state.
- summarization and dissemination of the information to users and for SCO climate monitoring.
- demonstration of the value of climate information in the decision making process, and advice to the government on droughts, temperature extremes, and climate change.
- conducting applied climate research on climate trends and interdecadal oscillations.

INFORMATION SERVICES

Website: The SCO maintains its website <http://www.aos.wisc.edu/~sco> which provides an expanding variety of graphical climate information and data to citizens, scientists and various interested parties. The number of entries to this website continued to increase during 2006, with 800 requests made per day. Some of the special features appearing on the site include:

- **Season Pages.** The winter page for snow and lake ice information, and the autumn page for fall color continue to be popular pages.
- **Climate Watch:** A section with extensive graphics of contemporary conditions.
- **Climate History:** Graphics that demonstrate observed climate variability by year and locations through the state are routinely updated. The records allow inspection of interannual fluctuations, interdecadal oscillations, and recent climate trends.

Data Services

The staff at the Office provides advice on web links to climate data and maps from regional and national centers. In addition, they also answer questions and fill data requests made by telephone, fax, email and office visits. The public, the media, industry (e.g., legal, insurance), and governmental agencies made approximately 60 data requests per month via these traditional means.

While most of the requests made by the public are answered without charge, a minimal service charge plus costs is assessed for special data requests that require significant time, labor or photocopying.

OUTREACH – The SCO continues to make its presence more widely known to University colleagues and residents of the state of Wisconsin. In addition to interviews with the electronic and print media in the state, the staff gives lectures at service groups, universities and business conferences. A presentation was made at the Governor’s High School Conference on the Environment. The Office informally collaborates with the National Weather Service offices in Wisconsin, and has agreed to become one of the sponsors for the CoCoRaHS (Community Collaborative Rain, Hail and Snow Network) network in Wisconsin. Prof. Young has spoken on “Regional Climate Change in a Chaotic Climate” to researchers in physics and civil & environmental engineering departments.

RESEARCH—The Assistant State Climatologist is continuing his work checking the weather extremes reported at individual stations throughout the state. He is coauthoring an article on early weather observations in the state that will appear in an edited book on the early instrumental record and climate variability in North America. In addition, he assisted in research into the history of weather observations in Milwaukee for the Climate Database Modernization Program. The office is also collaborating in a climate research project with the Center for Climatic Research at the University of Wisconsin-Madison.

FUTURE –

- Create a more formal relation of the SCO with the University

- Formally define all staff positions and develop funding for them
- Establish ARSCO status
- Partner with local, state and federal government agencies on matters relating to long-term climate change
- Continue expansion of website information and smoothed graphics
- Expand outreach
- Continue contacts with media and issue timely press releases.
- Develop small applied research projects & collaborations with AOS researchers.



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Tony Bergantino	Assistant State Climatologist
Tom Dietrich	Hydrologist
Barbara Muller	Librarian and Archivist
Judy Nelson	Database Programmer
Jodi Preston	Office Administrator and Data Manager

The **Wyoming Water Resources Data System** (WRDS; <http://www.wrds.uwyo.edu/>) and its **State Climate Office** branch (SCO; <http://www.wrds.uwyo.edu/wrds/wsc/wsc.html>) are the single largest providers of water and climate-related data in the state. Housed within the Department of Civil and Architectural Engineering at the University of Wyoming, WRDS and the SCO are funded primarily through contracts with the Wyoming Water Development Commission.

The WRDS-SCO office provides a variety of services, ranging from the development of enhanced drought-monitoring products to the online dissemination of water and climate data. WRDS and the SCO also support a wide range of groups by assisting in the development of the State Water Plan and helping to coordinate climate- and hydrologic-monitoring efforts throughout Wyoming.

Activities Related to the ARSCO Mission

Information Services

Data and information services at the Wyoming SCO are provided primarily via the World Wide Web. The links below provide a sampling of related products:

- <http://www.wrds.uwyo.edu/>
- <http://library.wrds.uwyo.edu/>
- <http://www.wrds.uwyo.edu/wrds/wsc/dtf/drought.html>
- <http://www.wrds.uwyo.edu/wrds/coop.html>

Over the course of 2006 our websites handled over 1.8 million page views and 1.1 terabytes of data downloads (both numbers exclude web-crawlers, internal accesses, etc.). Despite the move towards electronic transfer of data and information, we responded to > 300 direct (i.e. via phone, mail, or other personal contact) requests in 2006. We are also working with a variety of State agencies to ensure that their needs for climate-related data and information are met in the most timely and efficient manner possible. In addition, during 2006 the WRDS-SCO library

embarked on a program to greatly enhance our holdings related to climate change and climate change impacts, and we continued to our efforts to make content from our paper collections available online.

Outreach

Outreach, both through traditional and electronic means, continues to be a centerpiece of the Wyoming SCO's activities. Dry conditions continue to affect our state, and providing drought information to state officials, the media, various stakeholders, and the public at-large featured prominently in 2006. Drought-related activities last year included:

- Co-organized and hosted a workshop on drought for over 80 invited guests drawn from key stakeholder groups along with state, local and federal agencies
- Co-organized a university-wide distinguished speakers series on drought, climate change and water resources in the West
- Co-organized a drought forum for State Legislators that was attended by over 40 members of the House and Senate
- Issued 4 seasonal drought-status updates and frequently updated a variety of drought-related products
- Continued strong participation in the Wyoming Governor's Drought Task Force

Likewise climate change and water resources continued to be major issues in Wyoming. The SCO made public presentations on these topics in a variety of forums, ranging from high school science classes to large meetings of trade groups and Wyoming professionals.

Developing Improved Communications Capabilities

Work continues on the development of an Internet Map Server that would supplement existing methods of data retrieval. In 2006 we worked with a series of consultants on issues related to IMS development, and secured permission to hire a new staff member that will further assist us in developing these capabilities. We began work on a variety of map-based products that will summarize data that were formerly available in tabular form only. We also began to pursue additional technologies that will permit us to better track the use of our internet resources and, in turn, allow us to better tailor our approach to online information- and data-transfers.

Research

In 2006 the Wyoming SCO was directly involved in a variety of research projects, including work related to:

- Impacts of climate variability/climate change on water resources
- Design of climate monitoring systems for high-mountain areas
- Long-term history of Wyoming and western U.S. climate
- Tree-ring based reconstructions of river flow
- Glacial dynamics in the Central and Northern Rockies
- Ecosystem impacts of drought

Research highlights for 2006 include:

- Mentoring of four graduate students
- Shared in over \$300,000 of competitive federal-grant funding
- Continued participation in the CoCoRAHS program (<http://www.cocorahs.org/>)

American Association of State Climatologists
2006 Annual Meeting in Rapid City

June 20, 2006
Registration and 'ice breaker'.

June 21, 2006
Ken Crawford: 'welcome'

Dennis Todey (SD) introduced the Mayor of Rapid City, Jim Shaw.

Jim Shaw (from radio-TV in Rapid City - was a 'weather man', not meteorologist)
On June 9, 1972 the Rapid City flood took 238 lives and caused \$10 billion (in today's dollars) damage. Effects lasted for years and years. The '2012' ½ cent sales tax which generates \$8M/year started because of the '72 flood. 1992 was a big memorial event (20 years) that asked 'what would we like to see in the next 20 years (2012)? It was asked 'did cloud seeding contribute?' and answered 'probably not'. In late May into early June heavy rains are typical so some flooding is no surprise. In 1972 no warning system existed - officials went door-to-door. Today a close working relationship exists with the NWS and a warning system for high water exists.

Dennis Todey (SD) gave descriptions of South Dakota climate.

Ken Crawford (pres. AASC) talked about the 'State of the AASC'. Thanks to Tim Owen for support. New AASC web page will have past presidents and a map of past meeting locations. 'The State Climatologist' edited by Laura Edwards is now over 100 pages. Two new SCs started last year bring the total to 48 active offices. Since Crawford started there have been 7 new SCs, 5 new pending, and 3 departed (32% turnover). Rob Gillies (UT) and Don Potts (MT) are new. Challenges include remaining financially sound and technically advanced, awarding the dissertation medal, and other issues. Ken gave a few housekeeping notes. Ken previewed a suggestion for location for the 2007 meeting.

Deke Arndt (OK) talked about the new AASC website at xwww.stateclimate.org (ultimately starting with www. - no leading 'x'). He asked that changes, suggestions, etc. be emailed to him at darndt@ou.edu (send him the feedback form as included in the handout). The web page gives an overview of the AASC on the opening screen. 'Permanent info' such as ARSCO definition, publications, constitution, etc. (items of a national scale). The news tab will be derived from state level news as chosen by the executive board. Only the most recent 3 or 4 stories will appear on the front page list. In an example Deke chose the NECC page which showed contact info, SC picture, web site reference, and overview of the office. Using New Jersey as the example, he showed how to edit the profile and/or news stories using 'cut & paste' and a provided 'rich text editor'. Other log-ins are possible for alternate authors (log-in ID is used automatically as 'author' for stories). Contact the webmaster to request additional authors (log-in IDs). He also pointed out the utility of 'rss feeds' which allow other news vendors to use the news stories that are hosted on the AASC webpage.

Livezey (NWS) asked if links to NOAA, etc. partners would be provided. Answer: yes.

Arndt said that several teleconference calls for training will be set up by Tim Owen.

Ryan Boyles (NC) asked if an rss feed from somewhere else can be shown on a state page? Answer: no.

Next steps such as when to launch were to be discussed at the upcoming Friday business meeting.

<break>

Laura Edwards (DRI, laura.Edwards@dri.edu) talked briefly about 'The State Climatologist'. It can be downloaded from <ftp://ftp.wrcc.dri.edu/laurae/AASC2006TheStateClimatologist.pdf> or contact her for a paper copy.

Crawford pointed out that the 'soft version' will be on the AASC web page.

Tim Owen (NCDC, Tim.Owen@noaa.gov) talked about tools for data and information that are used for interactions between the partners [NCDC, NWS, SCs, RCCs]. NCDC activities: archive, access, assess. The Climate Reference Network (CRN) deployment has been going well. The Health of the Networks (HON) product for COOP stations and more is maintained by Tim Kearns. Data modernization/rescue continues. An integrated surface data system is being developed. Many tools were mentioned. xmACIS is a complete historical database with near-real-time (NRT). A limited public version is now available. ThreadEx for all 260 LCD sites threads together disparate data segments. Datzilla allows info about data quality to be communicated between partners. The data discrepancy reporting will be acted on by NCDC. The Climate Data Modernization Program (CDMP) overcomes the old pre-1948 data limitation. Recommendations for further work are welcome. A new form of Web Search Store Retrieve Display (WSSRD) available at <http://www7.ncdc.noaa.gov/IPS/> is 'user friendly'. Web-based COOP data entry, WxCODER II, will be easy to use, timely, have near-real-time QC/QA, and will be paperless. RCCs' 5-yr contracts are expiring and need renewal. The National Integrated Drought Information System (NIDIS) will have a drought portal (web interface) Observations will include more soil moisture.

Dev Niyogi (IN) asked what is soil moisture plan? Answer: modularly at CRN sites.

Jim Zandlo (MN) asked about the status of the update of homogenized data? Answer: finishing touches are being done.

Jay Albrecht (NWSFO, Seattle) talked about the 'Historical Weather Viewer (1950-2003)' that he developed to simultaneously display and map climate data with upper-air charts. The 5gb system can be used for case studies or training of operational forecasters. It covers the entire US except Hawaii (NCEP reanalysis data not available there). He has downloaded Canadian data back to the 1870s for future inclusion. DVDs were provided at the meeting. He would also like to add Daily Weather Maps in future versions.

Mark Shafer (OK) asked if the program could be 'hooked up' to xmACIS. Answer: would like to.

Bob Livezey (NWS Headquarters) handed off to Bob Leffler to give a Climate Services Division report.

Bob Leffler (NWS) as the Weather Service liaison for the integrity of data talked about data stewardship. He said that data policy is an ongoing effort. The COOP transition plan needs to consider how remedial action can be applied, e.g. for inadequate exposure, if at all. Working to manage data coordination. Data availability will be enhanced by the national support for web (WxCODER) and phone-based data input. Funding for backup power to ASOS in hurricane areas and new data tools will improve availability. Data QA/QC will be ensured by NWS Headquarters team. Training is being supplied. The NOWdata data query tool for direct public use of the most recent 2 years of data is available at each local forecast Office. Priorities include partnerships, continued training, paperless (WxCODER) COOP, Fisher-Porter upgrades (replace paper puncher with electronics), higher quality COOP (weed out or improve), automated snow measurements, more integrated QC/QA, and policy.

Mike Brewer (NWS) talked briefly about easy access to NOWdata, CLI, CLM, etc. He showed a graphical (pie chart) representation of a local 3-month temperature outlook (L3MTO). Training includes the Professional Development Series (PDS) at <http://www.nws.noaa.gov/om/csd/pds/index.html> and residence

training in operational climate services and a climate variability symposium. Distance training is also available as the climate data infrastructure series. Training and outreach for interpreting the L3MTO product is being offered. Additional training includes a Climate Predictions Applied Science (?title) workshop, sub-regional (Central) meetings, and fact sheets.

Paul Knight: contact? Answer: Bob Leffler will contact you.

Ken Hubbard (HPRCC) gave a Regional Climate Centers Report 'Partnering for Climate Services'. The Regional Decision Support Program is an element of the NCDC/NOAA program. RCCs have a wide array of personnel but not all the same at all RCCs. The centers now have a mature ACIS system with over 100 million web hits. The centers have also published over 3 dozen peer-reviewed papers. A data discrepancy system (Datzilla) has been established. Many climate maps are produced daily. ACIS has become xmACIS/NOWdata. ThreadEx, Datzilla (including 'is good' or 'do not edit' flags), and WxCODER lead-up by Kelly Redmond (WRCC, DRI) are all current projects. The 'drought portal' concept is being developed. The RCCs are looking for SC involvement in WxCODER review, more ACIS data resources, and review/test of a QC interface for expert validations.

Pam Knox (GA): want Datzilla for historical data too (not just NRT). Answer: working on it.

Shafer (OK): is xmACIS available for SCs too? Answer: Yes, CLIMOD actually does more. Livezey (NWS) said they will continue to support RCC development efforts.

Redmond (WRCC) indicated that QC is being done in so many ways. Need to look for commonalities and structure to handle and document - a 'test bed' is needed.

Crawford indicated that Greg Mann wants to convene a QA/QC summit.

Jan Curtis (USDA/NRCS) talked about several activities of NRCS to provide water and climate information in support of Natural Resource conservation. They do extensive data collection in western states (water runoff potential). They run the Soil Climate Analysis Network (SCAN) at 116 sites in 39 states at 2 to 40 inch depths. They are working on NIDIS data 'building blocks'. They have worked on Google Earth applications. AgACIS (ala xmACIS) has been developed for USDA field offices. Work is proceeding with NRCS to produce a new plant hardiness prototype via PRISM. New normals via PRISM maps are at 800-meter resolution. Statewide average/totals have been produced by month and annually. The SNOTEL QC website can check missing and suspected data via confidence interval modeling on short term time series to avoid potential problems in neighboring data.

Zandlo (MN) asked if the confidence scheme being used was tied to the homogenization process used by NCDC? Answer: No, it was Chris Daly derived.

Leffler (NWS): when SD available? [? nature of question] Answer by Nolan Doesken (CO): last 5 years or so.

Doesken (CO) asked how many NRCS offices were being served? Answer: 7 in west. County offices have less direct support.

<lunch>

George Taylor (OR) talked about mapping extreme precipitation using PRISM grids. He started with a brief discussion of some extreme measures such as precipitation frequency-intensity analyses and probable maximum precipitation (PMP). He pointed out that PMP is no longer supported by the Office of Hydrology.

He talked briefly about mapping actual daily extreme events and extreme loading. He discussed a 'surprising new finding' in precipitation measurement: comparing GEM6 (spatial) output to real data revealed lots of errors in real measurements. Some histograms, instead of showing a maximum at zero (good), show few or no zeros and a maximum above zero (bad). Some observers also tend to favor multiples of 0.05. He points out that automated instruments tend to be much more consistent. In a comparison of stations with surrounding stations, many stations fail.

Redmond (WRCC): precip and snow measurement intermingling can cause problems.

John Christy (AL): What about temperature. He has seen 5 deg multiples a lot.

Nolan Doesken (CO) talked about 'Ultrasonic Snow Depth Sensors for Snow in U.S.'. He emails instructions to about traditional 3000 observers every winter. For automated sites Campbell Scientific and Judd instruments are used. There is a very good correlation of manual to automated readings when both measurements are taken on the same snowboard. Certain conditions cause errors. Converting the change of depth over time to snowfall is complicated - noise reduction is critical. They will collaborate with Canada to standardize site installations, get better geographical representation, and display data in NRT. There are many benefits for NWS including knowledge of snowfall uncertainty (versus manual uncertainty). They hope to have the current evaluation network running by 11-1-2006 with online reports. They hope to have the info required for implementation of the technology in 2 years.

Leffler (NWS) suggested that a briefing for NWS be added to 2 year schedule.

Redmond (WRCC) warned about 'user contamination'. Manual observations must be done without first seeing auto results.

Leffler (NWS) indicated that published values will follow WMD, i.e. '1 cm' vs. '0.1 inch' resolution as currently observed.

Doesken (CO) indicated that it was more likely that a '1 cm' standard would be met.

Roger Pielke Sr (CO) Surface Temperature Trends and Conflict with the Climate Change Science Program (CCSP). NCDC has seemed confident in the adequacy of existing data sets. Studying surface land temperature is an attempt to get the change in heat. Strong lapse rates at night lead to enhanced nighttime minimums - that is, the height of temperature measurements affects the bias (to warm). Trends of air moisture content affects the heat content trends also. Uncertainties in the homogenization of surface temperature data are due to time-of-observation bias, and instruments, siting, and miscellaneous changes. Land use change also affect temperature change. The CCSP review is essentially a 'self review' - wrong! Climate assessments should be done by those without a vested interest. For publications see <http://blue.atmos.colostate.edu> and <http://climatesci.atmos.colostate.edu> for blogs. Roger also announces that Nolan Doesken will be taking over as CO SC.

Curtis (USDA) points to 95% is biased to warm and asks 'what is cooling?'.

Jim O'Brien (FL) mentions a think tank invite to Montreal to consider 'models, data tell us what?' And aside he says NCEP reanalysis is better.

Livezey (NWS) says that the GCMs are doing well with global annual temperature but cooling in the Southeast, for instance, is not shown by any. Most recent IPCC review is thin on evidence in places. Drought trend (increasing) is built entirely on one of the review papers.

Christy (AL) points out that IPCC has a record of ignoring papers not fitting in.

Redmond (WRCC) says that heat content as a diagnostic may be good for climate change but temperature itself may be more important for impacts.

Pielke responds that biology is affected by humidity too.

Renee McPherson (?name, AMS committee) asks 'Please submit Applied Climate papers.'

Crawford (OK) points out that having an NWS regional director in attendance is unusual (Bill Proenza from the Southern Region).

Livezey (NWS) talks about 'Most of What a Climatologist Should Know About Correlations'. A single measure is inadequate; at least several are necessary. Statistical significance does not imply practical correlation. Correlation says nothing about cause-effect. If there is any non-linearity in a series correlation will mask it. If a serial (auto)correlation exists the significance of the correlation is reduced. The types of correlation are auto, cross, and spatial anomaly correlation. A correlation of less than 0.5 means that a forecast, for instance, is no better than normal (for which the standard deviation is 1). Also note that variance explained for a correlation of 0.5 is only 0.25%. Practically is required to be useful. Small but statistically significant correlations may be useful diagnostically. A linear regression will dilute or mask non-linear effects; 'look at scatter before slapping on a linear regression' or just look at the time series. A scatter is shown with one straight line and with two straight lines joined at a breakpoint which looks like it represents the data better to point out that you really need a basis for just one slope throughout. Autocorrelation is a measure of 'memory'. Persistence is simply a perfect lag 1 correlation. (see Statistical Methods in Atmospheric Science, Wilks) A 1st-order Markov process is 'damped persistence' or 'red noise' where power increases with low frequency. Such a 'drunkard's walk' occurs because of internal memory. Unless a physical cause can be demonstrated a trend should not be removed.

Doug Kluck (NWS Central Region) talked about Regional Climate Service Partnerships and Stakeholder Meetings. The meeting were held to reintroduce climate services, build awareness, and promote feedback. Enhancing services means building partnerships and basic communication. 6 sub-regional meeting have been held or are about to be held so far (one is left in July in IN). There are many partners: SCs, MRCC/HPRCC, CPC/NCDC/CDC/CSD, GLERL/CPO/NERON, WFOs, Academia, NDMC, RISA, other federal (UDDA, USGS), University Extension Service, Emergency Management. Stakeholders include energy, agricultural banking, commodities, private weather providers, water resources, livestock, media, crop consultants,

Tim Kearns (Timothy.Kearns@ncdc.gov) talked about Datzilla (<http://datzilla.srcc.lsu.edu/datzilla>) and 'Health of the Network' (www.ncdc.noaa.gov/oa/hofn/coop/coop-opt.html). In Datzilla a user can enter an error, track it, and generate a report on it. Tim gave an example of fixing a daily temperature report. To get an account request a login on the main page; Kev Robbins will reply in a few days.

Dave Robinson (NJ) talked about 'Issues and identification of Trends in 20th Century Snowfall'. Want representative good stations. Are there long-term trends? Are there climate records of sufficient quality to address question? Are time series features real or inhomogeneities? To answer station histories, observing practices, and spatial coherence can be examined. Various inter-station time series comparisons were shown. A station was compared to several neighbors; differences should be zero. Other issues include the infamous 10:1 conversion of snow to estimate precip (observer handbooks said you could). Graphs show that the use of 10:1 changes through time along with changes in observational practices. Attempts to correct for overestimation of moisture in snow pack tends to increase long-term trends.

Maury Roos (CA) asked if snow course records were used? Answer: no.

Niyogi (IN) asked whether mixed precip and temperature correlations were used?
Answer: no.

Mark Shafer (OK) talked about 'Forging Partnerships'. He noted that AASC has credibility but lacks visibility. We can easily be spread too thinly. He briefly described the potential for AASC partnerships with the Western Governors' Association (NIDIS), NASULGC, Cooperative State Research and Extension, and Extension Service, Extension Climatologists (Elwin Taylor says there are about 20 now and are considering forming their own organization), Natural Hazards Caucus, National Farmers' Union,

Western Association of Agricultural Experiment Station Directors, Structural Engineers Association, The Weather Channel, National Interagency Fire Center, and the NRCS National Water and Climate Center.

O'Brien (FL) says that NASULGC is a good opportunity; any weather-related program can be at board meetings and have access to information about legislation, etc.

Owens (NCDC) points out that an experts list would be useful.

Zandlo (MN) points out that a special membership status for Extension Climatologist (as Service Climatologists) would be good for AASC.

Niyogi (IN) says a contacts list for media would be good.

Paul Knight (PA) notes that media requests must be responded to.

Crawford (OK) closes the first day of the meeting.

<Chuckwagon dinner followed by visit to lighting ceremony at Mount Rushmore National Monument. No AASC presentations.>

June 22, 2006

Crawford (OK) opens the 2nd day of meetings. Notes from Curtis (USDA).

John Enz (ND) notes that only 2 persons have applied for the agricultural climatologist position in the North Dakota State Climatology Office. He invites more. John is retiring.

Dev Niyogi (IN) has just become an ARSCO in the last year. A website is being developed. A climate atlas has been assembled. Many other ongoing activities include an evapotranspiration database for the last 50 years and a climate calendar. They are studying urban area effects on thunderstorm characteristics. CoCoRaHS observing has been started; 219 observers currently. The LaPorte anomaly which has disappeared or moved westward is being studied.

Jeff Underwood (NV) is the new SC. He is modernizing the office; a PC was introduced in 2004. When making presentations he labels himself as the 'State Climatology Office'. He does outreach. Research is done on lightning and solar radiation. A proposal has been made to update the statewide hazard assessment. There is a high density automated data system in the Las Vegas area.

Doesken (CO) pointed out that the plastic tube in his hand was ... a raingage. The driest spring is 18 years has just occurred. There are 2500 CoCoRaHS gages in Colorado. He asks of the NWS: how is AWPG (All Weather Precipitation Gage) doing?

Leffler (NWS) answers 'OK' in the Southern areas, and OK with snowfall generally but not OK for light snowfall.

O'Brien (FL) announces that he will retire but will continue to work. David Zierden (FL) starts on July 1 as the new Florida SC.

Rob Gillies (UT) has been at Utah for 10 years (Soils, Plants, Biomet, and Geography). Recently has got SC position 'put into law'. A presentation was made to the legislature. The legislature keyed on data availability on the web site which resulted in one-time money. Went back a year later with new and improved website and got permanent funding.

Steve Gray (WY) has been on the job for 3 weeks. He started work as a paleohydrologist. Tree rings were studied to estimate long-term flow records and to get long-term climate effects on 'disturbances'. The SCO is a part of the Water Resources Data System (WRDS, SC is the director). The office also includes assistant SC Tony Bergantino, and a librarian, hydrologist, and data request personnel. WRDS has become primarily a web delivery system but traditional outreach is made as well. Currently many streams have very low flows. In the future will want to better anticipate state data needs. The WRDS/SCO is used as a 'hub' for water-related research.

Don Potts (MT) indicated that their name has settled (from 'center') to 'Montana Climate Office'. The web site with many references to others' data is maturing. A budget from the state is being sought. Don pointed out several web site features. He has looked at other SC sites for ideas. Drought has practically disappeared in Montana.

A question was asked about wind power siting. Answer: found wind data in various places.

Michael Anderson (CA, www.climate.water.ca.gov) said that State Climatology has spun off from the position combined with the State Meteorologist (Mork). The Governor proclaimed that the state will pursue climate change. Data has been assembled from multiple sources. The office is co-located with the Sacramento WFO/RFC. The office works with WRCC and Laura Edwards. They partner with academic research. They are updating precipitation frequency curves. Land use practices impact study.

Dennis Todey (SD) indicated that he is working to improve the status of the SD SCO. A South Dakota advisory board has been assembled. The Ag sector is an important player. There are drought issues.

Chirag Shukla (SD) talked about on-line mapping testing. LINUX is better than Microsoft for speed. GEMPAK was best followed by MapServer, ARCIMS, GMP, and GMT (in that order).

Todey talked about drought issues. EROS greenness and SPI (Standardized Precipitation Index) used in a hybrid Drought Response Index. AWDN stations being worked on. Automated stations use an RF link to live Internet sites; schools with T1. Record temperature change: 49F in 2 minutes at Spearfish.

<break>

Renee McPherson (OK) indicated that the Oklahoma Climatological Survey averages about 44 employees. 65 million data files have been served in 2005. The Univ. of OK has been renewed for another 5 years by the Governor and state agency. Renee introduced OCS Climatologists at the meeting. Several services were described including new services such as micronet deployment and displays of network data for the media.

Sethu Raman (NC) said that 13 graduate students were involved in their program since 1996. They are doing research on winter storms, sea and mountain breeze precipitation, evapotranspiration, etc. Data services are provided mostly through the web and they continue to increase. He described extension activities. The web site was shown. Real-time monitoring was described. The NC SCOMET expanded by 2 sites last year to 28 units. The progress of the office in the last 10 years was described. During that time, for example, enhanced rain gages with auto-clean devices were introduced. Sethu is retiring. Hopefully Ryan Boyles will be the next SC by July 1.

David Robinson (NJ) talked about the Goings on in the Office of the New Jersey State Climatologist. They have done special analyses such as a map of days less than 32F. Graphs of monthly precipitation and temperature departures for the state for last year were made. They have worked on quality assessments of monthly COOP data. An 'observer steward' concept was noted. He showed a wide variety of products. NJ wants to become a part of CoCoRaHS. He talked about 'The Climate Where You Live': climate books online.

Stu Foster (KY) is developing the Kentucky MesoNet. The Kentucky Climate Center (KCC) is a charter member of the Applied Research and Tech Program (a collection of centers) at Western Kentucky University. The university invited 'white papers' for center ideas. The KCC proposal for a Mesonet was viewed favorably and funding was pursued. Funding for the 1st year, a \$25k pilot project, was secured after a 3 year effort.

It was emphasized that the project would have university-wide impacts. Media fact sheets were prepared. The Governor and legislature made KCC the official Mesonet host. Being an ARSCO was leveraged. They are working with NOAA partners to ensure NERON compatibility.

John Christy (AL) talked about NERON and CRN in Alabama. The AL SCO was removed from state funding a couple of years ago. John showed bad COOP siting (for temperature) examples. Funding for 15 NERON stations has been achieved. 99% of effort is in site selection/survey. Small airport off-runway areas tend to be good; they are open and maintained. The southeast US temperature trend is decreasing but all models show increasing.

Pat Guinan (MO) has talked with various agencies to increase support to more than one person. Their weather network has expanded to 25; 12 are real-time with 5-minute data. The sponsorship of stations (\$2-3k/year) is the key to success. Among other sponsors are school districts. Real-time weather pages for each station include most recent radar. www.agebb.Missouri.edu/horizonpoint is a weather analysis system for farmers which uses NWS grid data to produce products for ag support; specialized reports are emailed. Soil temperatures are available. Over 200 have enrolled. Missouri has enrolled in CoCoRaHS. Pat showed large hail damage.

Paul Knight (PA) indicated that money has become extremely tight. He showed web use statistics. They hosted a Climate Diagnostics Workshop. They have a wheat scab effort and provide soybean rust support. They are using pattern recognition to find weather impacts on crash patterns using reanalyses of other data. PA is in CoCoRaHS; they will emphasize FROST observations and optical phenomenon. They are using NATGRID for Mesonet data.

David Legates (DE) noted that they are now an official State Climate 'Office'. Their \$1000 budget has been eliminated. The DEOS (Delaware Environmental Observing System) is a real-time system for weather and other environmental data such as hydro and ocean data. They are moving 'News Journal' observers to CoCoRaHS. Many products of the office were shown. Several systems were briefly described (computer services for various needs).

Hope Mizzell (SC) talked of the strong involvement with state emergency management especially on matters of tropical weather; they have a meteorologist on staff. The South Carolina weather calendar was produced again. Many tropical storm/ hurricane efforts have been made including the widely distributed 'hurricane warning'. They have been doing high-resolution drought monitoring. They have worked on a dam relicensing update which includes low inflow protocols with drought triggers. Many indices are computed with data from ACIS in conjunction with NERCC personnel. Flexible area aggregations can be defined by a user to create area-wide graphs of results. A blending of various indices is possible.

<luncheon>

Paul Knight noted that the 'Dissertation Medal' was first proposed by Stookesbury in 2002 at Asheville. The award pays meeting registration and pays meeting expenses plus \$500. An ad-hoc committee of the Executive board makes the decision. This year it is awarded to Chris Daly for his paper on An Alternative Measure of Heat Content.

Randy Julander talked about An Examination of External Influences in Utah's Historical Snow Data. He notes that most important for melting snow is longwave radiation, then shortwave, then temperature. He gave examples of snow pillow changes which can cause a 0 to 25% drop in SWE (snow water equivalent) per season. Topographical and vegetative changes were also discussed. Aspen has been converted to conifers on 6 million acres in the last 40 (?) years. Conifers are a major source of longwave radiation. Vegetative effects have a major influence. 64 sites (48%) have vegetative, physical, or pollution impacts.

Hal Klieforth (DRI) showed slides depicting snow monitoring and wind studies of Owens valley and surrounding areas. He talked about defining wind patterns including rotors on the downslopes.

060622 afternoon

Ed Hopkins (WI, www.aos.wisc.edu/~sco) said that they are located in the Space Science Center. John Young is the SCO director. They are planning new graphical web products. Lyle Anderson is the office/data manager. Ed Hopkins is the Assistant SC (also education specialist for the AMS). They maintain a basic web service. The Center for Climatic Research is examining Great Lakes changes (e.g. the Union of Concerned Scientists report). Several examinations were shown including ice duration on Lake Mendota which may be affected by the heating plant on its shore.

Jim Angel (IL) (back after 2 year absence) talked about the 2005 drought in Illinois. It was the 4th driest spring followed by a dry summer in northern Illinois. Dryness persisted in much of the state through fall and winter but near normal to wet this spring. In spite of the dryness with cooler conditions than 1930s or 1988 crops came in better than expected. 4 tropical storms came into the Ohio River Valley (unusual) and kept even more serious statewide impacts from occurring.

David Brown (NH) started with a comment on Bob Livezey's Pearson Correlation of the day before: he showed a scatterplot and linear fit-line of Livezey's age to the 'frequency of exceedance of time limits' - it was a positive correlation. NH became a new ARSCO last year. New physical space was needed - and now they have it. They have responsibility for 2 CRN stations. A lot of flooding last year dominated activities. Some record October and annual totals occurred. More floods occurred in March.

Phil Mote (WA) said the he is SC only 10% of the time but when he is, you can tell: he wears a bow tie. He showed a station selection map for various parameters and time resolutions. New permanent funding from the state has been achieved.

Greg Suhler (Dynamic Predictables) mentioned the role of the private sector in drought can be expressed in monthly drought meetings: better responses require better information such as NERON, etc.

<break>

Klaus Wolter (NOAA, CIRES-CDC) talked about Potential New Climate Divisions. Philosophically averaging stations together reduces unrepresentative station impact - a single station is too noisy. Climate divisions, for all its deficiencies, are used to depict climate change! With fewer but optimized divisions at least 50% of variance can be explained. Correlation at a given distance varies by location; e.g. Great Plains winter temperature has a high correlation over large distances. Geographically contiguous regions of highly correlated stations tend to emerge. Some stations remain unclassified. He asks that SCs become 'beta testers': time series for 120 (reduced from 344) climate divisions will be available from their web site in the next couple of weeks. He will be defining the boundaries which can be further subdivided along political divisions.

Angel (IL) points out the new divisions appear to line up pretty well with NWS warning areas.

O'Brien asks what about political ramifications? Answer: subdivisions to political boundaries are possible.

Tim Owen on NIDIS hands off to Josh Foster.

Josh Foster (Climate Program Office, NOAA) talks about the transition to Climate Service. They coordinate 'all things climate' in NOAA. Foster is on the social side. Their budget in a NOAA estimate is \$10M/year not including indirect costs nor NIDIS. request includes a \$6M increase for 'coping with drought'. House bill 5136 has passed the Science Committee and the overall vote is on a fast track. The Senate bill is still in the Commerce Committee. The bills have a similar emphasis on the NIDIS system and the coordination of Federal-Regional-State cooperation. The NIDIS office is being developed; guided by a coordination group it will likely be established in the West. There was a job announcement and a person has been selected to start July 10.

Bill Proenza (NWS Southern Region, www.weather.noaa.gov, www.crh.noaa.gov - the most used dynamically updated .gov websites) indicated that the NWS is committed to climate services through partnerships with SCs and RCCs. While NOAA funding has been cut by 1/4, the NWS has had much less severe cuts. Each region and WFO has a climate service focal point and obs/data program leader (in 122 warning forecast offices). Flood warning lead time has tripled since the early 1990s with Doppler radar and modernized local WFOs with 12 meteorologists each. The National Precipitation Analysis tool for radar-based precipitation was mentioned. "Government closest to the people serves best."

Pete Boulay (MN) asked about availability of hi-res (1 km) radar? Answer: it is available but no funding is available. Would also like provide faster volume scans (1 minute vs. 5 min.) for greater lead times. Bill went on to say the NWS has 4700 FT employees (3100 in field, 800 for centers). He stated that mission delivery justifies existence.

'CLIMATE NETWORKS'

Ken Crawford (OK) talked about 'Climate Networks: An Uncertain Future?'. Every time a coherent move forward was attempted there came a distraction. COOP Modernization became building a Mesonet became a weather reference network became NERON will become ??? Hard times for (a day in the life of) the NERON team: you can't see where you're going in a dust storm. The end of a productive day looks like dust covered farm equipment. Approaching upper level management feels like an approaching menacing dust storm. Being a non-NOAA employee was a negative. Communications were not effective enough; gaps

existed. NERON status today was spelled out. The HCN (Historical Climate Network; about 1000 of about 5000 published COOP) will be modernized. FY08-12 is funded at \$4M/year. Modernization will start in Southwest. It may proceed at about 1/3 at a time across the U.S. What does 'incorporate CRN' mean? by NWS? by NCDC? other? Available funds for the legacy COOP network are very limited. The 9 NWS regions will be done by assigned priority (NIDIS guidance, sort of) - not politically ranked. Automatic temperature and precipitation will be updated via GOES. Hardware will be expandable and adaptable (but not yet funded). There is silence on NERON partnerships (today). Budget plans tend to 'play out' at about 20%.

'CLIMATE NETWORKS discussion'

Livezey (NWS) mentioned partnerships that have already been established such as equipment bought by Alabama/Christy and turned over to NOAA for operation. Is OM (operation and maintenance) sustainable with just \$4M/year? - NOAA can't accept many more sites with that budget. Crawford (OK) indicated that at about 500 sites that budget would be chewed up by OM leaving no money left for establishing new sites.

Boyles (NC) asked where does money go?

Curtis (USDA) points out that the war takes about \$1000M/day.

Someone indicated that short money was already happening before the war.

Another person said that the modernization concept never was accepted by top leadership in NOAA.

Knight (PA) surmised that we are coming into a trough in impetus but that we will rebound.

Christy (AL) asked what is the OM per site? Crawford (OK) replied about \$2500/year/site. Christy (AL) asked if WFOs could each adopt local stations for OM (an average of about 8/WFO). Crawford (OK) surmised the answer to be 'sorry, we don't have the manpower' - we don't have COOP zealots. Christy (AL) asked 'who would that be?'

Someone observed that in Washington DC, NOAA's interest has been driven by ocean then (?) then recent events such as hurricanes.

Zandlo (MN) asked what about the climate change community as a constituency?

Crawford (OK) points out that at headquarters (some think) that fewer stations (80 instead of 1000) could be sufficient to depict change.

O'Brien (FL) points out that ocean defines climate to a large degree. Need to know what is being proposed in the budget in order to garner support (before budget is released). Climate change is polarized but climate data should have critical interest to both sides.

Julander (?) asked 'how does anyone get funds (USGS, etc.). He also points out that \$2500/year/site for OM is too low. A unifying advocate (an independent agent) to carry the idea forward is needed.

Foster (KY) indicates that like AL, they are negotiating with NOAA. NOAA wants to know what will happen to the system in Kentucky. An AASC certified Mesonet could be useful: networks could be guided to compatibility with NOAA standards but also the status could be a leveraging with NOAA.

Boyles (NC) commented 'fantastic idea' - an AASC 'seal of approval' at every station.

Robinson (NJ) points out that standards are a moving target. AASC should develop its own target rather than following NWS.

John Nielson-Gammon (TX) proclaims that with no powerful force in NOAA we shouldn't do nothing!

Knight (PA) follows on by saying that we 'can't shame NOAA into action'.

Taylor (OR) comments that with no modernization we lose energy modeling, etc. The focus becomes real-time services rather than research.

Harry Hillaker (IA) says: plan, partners, and lobby. Don't want a hodge podge of dozens of networks. And, what about the existing COOP regardless of an ultimate modernization?

Livezey (NWS) points out that Leffler spelled out that NWS has a requirement for daily max and min temperature and precipitation at about 8000 sites. So the need to maintain the COOP health is clear. Real-time from existing systems is quite different from the modernization of the network. Higher time resolution in real-time has a huge potential impact on real-time products.

(it's 5:29 and ticking ...)

Crawford (OK) tries to wrap up by delineating what choices we have: do nothing, get your own 'earmark', write letters to delegation (must have), collective lobbying in Congress, say to NOAA 'you must insist on partnerships', make a committee to recommend a solution (groan), ask the leadership of AMS, AWA to 'join us'.

Owens (NCDC) comments that it is time for a distinction between real-time and near-real-time - need care to have succession.

Some comments about partnerships, multiple MOUs flared for a moment.

<adjournment for the day>

<no organized evening events (except bowling - details/high/low scores unknown)>

June 23, 2006 morning

Gregg Suhler (Dynamic Predictables) showed graphed predictions of an 'el Niño' index that he had show at the 1998 AASC meeting. 7 predictor components were explained. Correlations with Oregon coastal precipitation pattern was shown. A predicted North Dakota cold spell was shown. Equations/techniques were also discussed. Gregg points out that cycles in powers of 2 are present in climate variables.

Karen Andsager (MCC) talked about CDMP: Forts 1820-1890s and Station Histories. Last year 28 and this year 26 station histories were put on WSSRD. An image of an 1856 form was shown to depict the number of variables available for digitizing. 600 rolls of microfilm were scanned and indexed (station-year-month) on WSSRD. Detailed keying instructions were created to guide keyers (e.g which parameters to punch). Several QC tests were noted. A graph of the number of stations through time was shown. A time-of-observation (TOB) chart was shown (e.g. an annual cycle in TOB was shown for one observer). Two thermometer readings are used to find keying and other errors. Cloud observation idiosyncrasies were shown. 125 or 150 priority stations have been keyed. She asks: What other best stations should be keyed?

Time issues were discussed. Conner (KY) out that solar times (from sundials) were best (you know when they really observed).

Lesley-Ann Dupigny-Giroux (VT) pointed out that since they became an ARSCO in 2005 they have moved into new space, and had many public interactions including interviews on such topics as global warming and hurricanes. Her SC exchange resulted in a paper (submitted) in BAMS (Bulletin of the American Meteorological Society). An internship program has been started (uses CDMP, federal work-study, and SCEP monies). Climate diaries work has been ongoing. A North American Climate Variability book with several authors is being thematically organized. Lesley-Ann welcomes the AASC to Vermont in 2008.

Zandlo (MN): showed the repeatable snowfall patterns along the North Shore of Lake Superior as revealed by the new dense network of volunteer snow observers there. Nighttime temperatures in a transect away from Superior were shown on the average to vary adiabatically in the summer but air was warmer near the lake than expected adiabatically in the winter (warm water exposed nearby). The high spatial density of a 30-year long set of volunteer observations in Minnesota was shown. Online data entry and maintenance capabilities (for any daily data) were very briefly shown. A new map selection application that supports time series and maps with conditions was briefly shown. The ability to estimate time-of-observation for daily records from HPD (Hourly Precipitation Data) was briefly shown.

Hillaker (IA) discussed a few station histories. Harry QCs COOP data regularly. There is an effort to put data into 3200 format. He has worked to depict a difference in bias in LiG (liquid-in-glass) between Max and min temperatures. Station inspection forms, available for 1917-1977, indicate plenty of problems/biases (e.g. separations in the liquid). Min thermometers typically read 1F cooler than max thermometers before adjustment but still 0.6F after adjustment for an overall average difference of 0.8F. Separations in the min temp thermometers caused them to read low. In a CRS (Cotton Region Shelter) vs. MMTS (minimum-maximum temperature system) comparison CRS was 0.3F warmer but study is biased by alcohol (min temp) separations. MMTS installation and use history was discussed.

Nielson-Gammon (TX) talked about several projects: drought and monitoring techniques, drought predictions (by surface dewpoint temperature and capping temperature as found to be the most significant predictors), and a decade-scale climate atlas. Climate change in Texas and New Mexico was mentioned. He talked about statistics of hurricanes crossing 28degN between 87 and 97degW. Half of Texas hurricanes formed over the Gulf of Mexico (rather than Cuba/Florida or the Caribbean).

060623 Business Meeting

OLD business

Crawford indicated that a streamlined format for the new/old business would be tried to speed up what can be a very lengthy process. The Executive Committee pre-discussed the old business and has recommendations on each item.

The 1st item was to elect a new Sec.Tres. Since Jan Curtis has moved on (is no longer an SC). The nomination is Hope Mizzell (SC).

Mizzell commented that it was an honor and a privilege to be nominated. She regretted having to leave the meeting early. She said that she will work hard for the AASC. She has been with the SC SCO for 12 years and has helped to improve services there.

Crawford moved on with his list of items of old business to be voted on one-at-a-time (all recommended for approval by the membership).

a) Approval of 2005 minutes as published in 'The State Climatologist' by Laura Edwards (DRI) Robinson's (NJ) move to approve was 2nded. There was no discussion. A vote of 'ayes' carried the motion. PASSED

b) Accept the Report of 'The State Climatologist' for 2005. Knight's (PA) move to approve was 2nded. There was no discussion. A vote of 'ayes' carried the motion.

PASSED

c) Appoint Jan Curtis as the coordinator for 'The State Climatologist' for 2006.

About \$150 is required for costs. Today's (SD) move to approve was 2nded.

Discussion about who will help pay for next year was answered with 'NCDC will help'. A vote of 'ayes' carried the motion. PASSED

d) Accept Treasurer's Report for 2005-2006 and consider 2006-2007 budget. Jan

Curtis (current Tres.) said that not many checks were written. This year's meeting expenses which totaled about \$8500 were detailed. Costs for the dissertation award and travel for new SCs were pointed out. He commented that AASC should pretty much break even for meeting. \$1000 went to OU for web design. A final budget will be emailed to membership. Jan will stay on as Sec.-Tres. Until the end of 2006. 2006-2007 costs were projected to be pretty much the same as this year. On web page maintenance, Knight (PA) recommended that OU be asked to continue and be paid \$1000 again.

[An aside discussion ensued. Some members are not on email - let Jan know who by email. Boyle (NC) asked if OU had a bulletin board capability? Owens (NCDC) that the list-serve should reside at least another year 'as is' in Nebraska. Today (SD) asked 'for non-AASC members, how do we communicate what's going on?' Robinson replied that non-members can be on the list. A 'members only' list does exist but needs work (Al Dutcher in NE needs to do things). Curtis (USDA) commented that we need a mechanism to remove people from the list also.]

d) (cont.) Raman's (NC) move to approve was 2nded. There was no further discussion. A vote of 'ayes' carried the motion. PASSED

e) Appoint New Nominating Committee Nolan Doesken and David Robinson. The committee was asked to have a nomination for President at the next meeting. Enz' (ND) move to approve was 2nded. There was no discussion. A vote of 'ayes' carried the motion. PASSED

f) Appoint Jan Curtis (USDA), Mike Brewer (NWS), and Ken Crawford (OK) to the

Dissertation Medal Committee to review manuscripts. Robinson's (NJ) move to approve was 2nded. Today (SD) volunteered to be a substitute in needed. There was no further discussion. A vote of 'ayes' carried the motion. PASSED

g) Appoint [??? not recorded] as the ARSCO coordinator for 2007. Owens commented that the original applications go to Asheville but the full history should be maintained by the coordinator. Neilson-Gammon's (TX) move to approve was 2nded. There was no further discussion. A vote of 'ayes' carried the motion.

PASSED

h) NRCS is recommended as new ex-Officio member. Knight indicated that a tweak was needed to include

NRCS as a possible member. A discussion ensued on who/what is 'ex-officio?' Is it an organizational membership that someone represents? By-laws spell out voting status. Proxies were discussed. Angel (IL)

pointed out that another ex-officio on the Executive Committee would mean that the number of full members would equal the number of non-voting/advisory members. Crawford (OK) commented that we don't want to fix later blunders made now. To resolve the issue with an email vote was recommended.

Robinson (NJ) pointed out that period of discussion would be needed. Neilson-Gammon (TX) recommended that the Executive Committee draft an amendment to the constitution. Brown (NH) asked about a 'member-at-large' added to the Executive Committee; for instance, the ARSCO coordinator? Motion was made

(TX?): 1) Direct the Executive Committee to draft an amendment that grants NRCS a non-voting Executive Committee membership, and 2) the ARSCO coordinator be added to the Executive Committee. (2nd ???) . A

vote of 'ayes' carried that motion. PASSED The draft will be considered by the membership as a by-law change later.

NEW Business

- a) New SC/full members recommended: Steve Gray (WY), Rob Gillies (UT), Ryan Boyles (NC), Nolan Doesken (CO), David Zierden (FL). Associate Members recommended: Bill Proenza (NWS Southern Region), Tom Dietrich (WY SCO), Chris Daly (PRISM group), Michael Anderson (CA SCO), Klaus Wolter (CO), Pete Boulay (MN SCO), Christopher Davy (WRCC). Neilson-Gammon's (TX) move to approve was 2nded. There was no further discussion. A vote of 'ayes' carried the motion. PASSED
- b) Discuss (/possible vote) on membership amendment(s) (dues, types of membership, duration of non-payment of dues, etc.). Jan Curtis (USDA) handed out a full page amendment suggestion. Curtis points out that his amendment proposal is for a systematic way of keeping track of membership. Dues are not being paid. Need criterion to drop a member based on dues delinquency. What special categories should exist? Student, honorary, etc? He recommended that his amendment (as distributed on paper) should be adopted. Enz (ND) asked if an invoice could be sent out? Curtis replied that it can be done - it will be done - but what if there is no response? Boyles (NC) asked if a constitutional change was required? Crawford suggested that the new President prepare suggested changes. After more discussion Knight (PA) suggested that the proposal be packaged with other suggested membership changes but be dealt with by a separate 2nd vote. Neilson-Gammon (TX) suggested that the basic content be approved at the meeting and reworded by the Executive Committee as an amendment for later action. Livezey (NWS) commented that it was time to get this done - decide: collect dues or not! Scott Archer (BLM) recommended that the fee structure be extracted from the by-laws as a separate vote. Redmond (WRCC) asked what is 'the year'? - clarify 'year'. Mike Palecki (MCC) pointed out that a 6-month limit is mentioned. He asks 'are RCC members still \$100?' He continues that dues should be to the office not to the person. Crawford offered that next week the wording would be cleaned up. Niyogi intoned 'yes, the office' - tighten wording: the ARSCO must pay dues. Russell Qualls (ID) asked if a membership gets repealed would the office/person have to be restarted from the start? Knight (PA) recommended that there be a less severe, sustained grace period. Heather Kemp (?) (NV) commented that AASC needs to have a hard line. Crawford (OK) said a 'firmer' set of words was needed. Boyles (NC) asked If ARSCO and SC are the same? Hillaker (IA) suggested that a person would lose list-server membership at a dues lapse - how should reinstatement proceed? Owens (NCDC) noted that an ARSCO designation overrides an SC MOU. Knight (PA) suggested that the amendment proposal be worked on for 2 weeks, distributed to membership in July, then be voted on in late July. Owens (NCDC) suggested that a specific target date be set for the vote. Angel (IL) added the ARSCO document needs work. Crawford suggested that it would be offered to full membership by summer's end.
- c) Next Steps for AASC Web Page. Arndt (OK) recommended that October 1 be the start date. Crawford (OK) commented that that leaves about 90 days for training, etc. Arndt (OK) asked, 'please return the feedback forms'. He also commented that the more complicated the page gets the harder is to maintain (and more costly). Knight (PA) asked if a compilation of doable changes/suggestions will be made? Arndt (OK) replied Yes, and the list will be annotated with doability and priority and be ready in July 2006. Work can be done on the 'Xwww.' version until the release of the 'www.' version on Oct. 1. McPherson (OK) commented that there may be times (during their move) when the page will be down. Heather Kemp (?) (NV) recommended that the list-serve be collocated with the web page. Edwards (WRCC) asked if this issue will be visited later (if OK doesn't want it anymore)? Answer: easy to hand-off if needed. Knight (PA) noted that content watching will be needed - the Executive Committee will recommend how.
- d) New Publicity for AASC: PowerPoint and brochure. Knight (PA) offered that in coming year he (?) will work on both.
- e) [Report of nominating committee was done at the top of the Business Meeting.]
- f) Vote on new Sec./Treas. Jeffrey Andresen's (MI) move to approve was 2nded. There was no further discussion. A vote of 'ayes' carried the motion. PASSED

g) [Vote on budget was done earlier.]

h) Update on Proposed On-Line Journal of the AASC. Knight (PA) started with: let's go ahead with the framework. A Stookesbury message was relayed: Associate editors with experience are needed. Whatever gets done needs to be of the highest quality content, appearance, etc. A copy editor would help make that happen - need to assess the cost of free lance. Curtis (USDA) suggested states could publish abstracts or shortened versions of their work. Arndt (OK) suggested it should be able to contain documents, pictures, etc. Zandlo (MN) suggested that it could contain news articles about research. Boyles (NC) noted that the AASC web page can handle that type of news - let's do a journal - not 'baby steps' He volunteered to do work to get it going. Leffler (NWS) suggested that it was quite an opportunity - page costs could be used to support the effort. Knight (PA) said that \$10/page for members, \$25/page for non-members had been suggested. Shafer (OK) noted that competition was in the works within the AMS. Niyogi (IN) said that a need still exists ala the Cooperative Extension online Journal (joe.org) as an example of a service orientation.

i) Proposed meeting location in 2007. The proposed locations are 1) Louisiana, Baton Rouge or New Orleans - infrastructure IS ready, 2) Washington-Idaho, e.g. in the Coeur d'Alene, ID, 3) Norman, OK - OK is 100 years old next year - new National Weather Center, 4) Florida. Someone mentioned that the meeting had been east or central (not west) 4-5 years in a row. The 2008 AMS Applied Climatology meeting is not yet decided but maybe Utah. Angel (IL) suggested as in the past that the site proposers could put together proposals. Crawford (OK) said that he has air costs for Oklahoma as well as a registration proposal, hotel, etc. Hopkins (WI) asked about dates. Taylor (OR) noted that, yes, OR and PR competed - proposed dates, costs, features are needed very soon. Qualls (ID) suggested that their proposal could be put together in 3 weeks. Barry Keim (LA) said his proposal could be ready in about a week. Knight (PA) said that by July 14 proposals will be assembled and provided by him. One week later membership will vote by ranking. Someone pointed out that in early August early school starts and the hurricane season is prime. Someone else pointed out that some schools go into late June.

j) Potential new policy statements for 2007

i. Policy or action on COOP modernization. Niyogi (IN) said the importance of the COOP must be stressed. Leffler (NWS) said that a statement of the AASC should state how strong a requirement is the granularity of COOP data and that NOAA has to maintain that granularity. Redmond (WRCC) said that there is a need for climate data everywhere but will we have anything if old system is less viable and a new one is not emerging? Crawford (OK) asked who would be the target of the statement? Redmond (WRCC) replied NOAA primarily. Crawford (OK) asked if a statement of concern should blanket the U.S.? Redmond (WRCC) said statement should be clear and unambiguous. McPherson (OK) asked if a statement is enough? - waiting for NOAA may be long. Zandlo (MN) asked of Livezey (NWS) where is the NWS's own requirement for daily temp and precip stated? Livezey (NWS) stated that it is the client requirements that must be stated. Doesken (CO) asked of Crawford (OK) what is the health of the Oklahoma COOP network? Livezey responded that a Mesonet CAN provide continuity. Shafer (OK) said that the value of data continuity for the likes of USGS and USDA included. Livezey (NWS) said to point to network specifics, not generalities. Crawford (OK) suggested we state 'what does COOP mean to us?' and 'what should be done beyond that?'. He went on to suggest that the NERON specs could be adopted by the AASC. Zandlo (MN) recommended that AASC take Crawford's (OK) suggestion and adopt NERON specifications. Boyle (NC) said that a committee could add details for other network needs such as streamgage standards. Someone stated that this is really necessary for AASC. AWS, for instance, has standards for siting, etc. We need climate [rather than weather] standards. Crawford (OK) stated that volunteers would be needed. He asked if we should go it alone or with other groups? Neison-Gammon (TX) asked if Crawford on the committee would be a problem? Boyle (NC) suggested that Crawford could be advisory. Owens (NCDC) suggested that a 'do no harm' [to the COOP] letter was needed now. A letter stating need for regularity and quality should be sent to NOAA, state delegations, Congress, WGA, etc. Robinson (NJ) said we should speak to legacy and standards as a separate issue. Owens (NCDC) stated that there are requirements not being lived up to. Someone pointed out the representative one-per-state nature of SCs. Nancy Selover (?) (AZ) pointed out that climate modelers are visible but climate data is not. Doesken concurred that the public thinks we have got it down. Livezey (NWS) suggested that NOAA has not decided if HCN (or was it CRN?) is

sufficient for climate change monitoring. Crawford (OK) asked of Taylor (OR) how would you go forward? Taylor (OR) responded by 'grabbing participants in a dialog'. Crawford (OK) asked for a committee of 5-8 members to deal with these issues in the next 6 months. Crawford (OK), Redmond (WRCC), Klieford (DRI), Gray (WY), Hillaker (IA), Doesken (CO), Arndt (OK), Foster (KY), and Boyles (NC) volunteered.

ii. NIDIS. Owens (NCDC) said that NIDIS legislative items in motion should be fostered. SCs have a role to play. The development of the drought portal and soil moisture monitoring are topics. A statement would help. Livezey (NWS) said that members on the Climate Working Group (CWG) and the Science Advisory Board are needed. Demand of Chet Kabinski representation for high-level advisory on NIDIS. Redmond (WRCC) said that we don't have enough information on smaller scales including impacts. A way is needed to provide help to SC offices. Robinson (NJ) pointed out that the NIDIS Steering Committee had good SC representation (e.g Robinson-NJ, Mizzell-SC) but that an AASC statement would be good. Shafer (OK) said that current bills are appropriation only - a statement could help funding potential. Knight (PA) / Shafer (OK) (not clear which) will make a draft in support for current legislation that any SC could send to a representative. Todey (SD) said that at the NIDIS meeting NOAA was dominant - there was no evidence of partnerships. Foster (KY) said we should nominate now for CWG. Livezey (NWS) pointed out that Robinson recommended that a while ago (but nothing). Robinson (NJ), Nielson-Gammon (TX), and Angel (IL) volunteered to make a CWG recommendation.

iii. Climate Change statement revision? Hopkins (WI) pointed out that AASC statement has no indication of why climate is changing. Yes, it should be revised with processes that cause change identified. Crawford (OK) said that he would work with Knight (PA) to revise the statement. Arndt (OK) said that station loss would have a profound effect on climate change certainty.

iv. Curtis (USDA) asked how should dissertation awardee be advertised? Knight (PA) said that the Sec.-Tres. Should write an article. Various people suggested BAMS, EOS, and WRCC as outlets. Crawford (OK) asked for a summary or an edit of a summary. Knight (PA) said that he will work with Curtis (USDA) and the awardee. Edwards (WRCC) noted that DRI has a press release capability.

Crawford (OK) in closing said that a 2-year term is better than a one year term (his was the first). In the first year you 'find your way'. Executive teleconference meetings were effective. Crawford (OK) turned the meeting and presidency over to Paul Knight (PA).

Knight (PA) thanked Ken and showed a picture of Mount Crawford (Mount Rushmore with Roosevelt's picture replaced by Ken's). Crawford (OK) said that he has been known as 'a rethreaded synoptician'. Various other 'roast' type items were shown. Knight (PA) stated that he hoped to advance the AASC in 2007 by enhancing climate monitoring, establishing an Applied Climate eJournal, advancing dialog with partners, and advancing membership types.

The meeting was closed.