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NSSL Briefings

A newsletter about the people and activities of the National Severe Storms Laboratory and Cooperative Institute for Mesoscale Meteorological Studies collaborative researchers

NSSL celebrates 40 years!

"'You're going to Oklahoma. Why? Where's that?' my friends in Connecticut would say," recalls Ed Kessler, NSSL's Founding Director. "I said, look, you may not know it, but to be the director of the National Severe Storms Laboratory, the national center of severe storms research, no meteorologist could aspire to more than that."

Kessler served as NSSL's director from its establishment in 1964 until 1986, and was one of nine speakers invited to celebrate NSSL's 40th Anniversary on Friday, October 15 and Saturday, October 16, 2004 in Norman, OK. Bob Maddox, NSSL Director from 1986 through 1996, was also invited to speak but was unable to attend. Jeff Kimpel, current NSSL Director, said, "We want to take this time to savor our accomplishments over these past 40 years and look optimistically toward the future."

Events included tours for middle school groups from across Oklahoma on Friday morning. Friday afternoon, current and former NSSL employees and friends gathered at the Oklahoma Museum of Natural History auditorium to listen to invited speakers highlight NSSL's history, accomplishments, and future direction. Friday evening a dinner was held at the museum to give everyone a chance to reminisce and enjoy a video that included interviews with people representing different areas of NSSL's work. Saturday morning, NSSL co-hosted a public open house with the other NOAA Weather Partners in Norman. The variety of displays and activities included Doppler and phased array radar, forecasting tools, mobile facilities, balloon launches, and winter weather and tornado videos.

In the early years, part of NSSL's initial role was to maximize the use of the WSR-57 surveillance radar for the Weather Bureau. Today NSSL leads the way in investigating all aspects of severe and hazardous weather through dual-polarization, the new phased -array radar, numerical modeling, field projects, and hydrometeorology studies.

"If you had to determine the bottom line on what are the achievements...you'd have to say NSSL has significantly contributed to saving lives," said Kimpel. "Some of the tools and the science that NSSL produced over its 40 years are really core to the reduction in lives lost because of modern forecasting and warning techniques." ◆

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NATIONAL SEVERE STORMS LABORATORY 40TH ANNIVERSARY

Mr. INHOFE. Mr. President, in Oklahoma, we know the importance of predicting and tracking severe weather. Each spring, during tornado season, people in Oklahoma brace themselves for dangerous storms. However, instead of hiding in the dark, like they used to do, today, they can depend on a stellar source for up-to-date, real-time information. The National Severe Storms Labs NSSL has played a vital role in providing research for predicting and tracking this harmful weather. In light of this, I rise today to recognize the 40th anniversary of the vital office of the NSSL within the Department of Commerce/National Oceanic and Atmoheric Administration, in Norman, Oklahoma.

Photo by Robert Coggins

Visit the NSSL 40th Anniversary website:
www.nssl.noaa.gov/40thanniversary/index.html
to view event presentations and photos!

Spotlight on: NSSL Staff

NSSL began with a research meteorologist and a radar engineer in an abandoned WW II barrack on what was known as "North Base" in Norman in 1964. NSSL grew quickly to a staff of about three dozen by 1967 and moved to its current facility in 1972. Today NSSL's employees (federal and CIMMS, and contractors) number over a hundred, and they are looking ahead to a move to new facilities next year.

NSSL has always attracted world-class scientists and engineers, and through the years they have made landmark developments and discoveries--always with the goal to save lives from the impact of severe weather. The real story here is the people.

Dusan Zrnic, NOAA Senior Research Scientist working on dual-polarization techniques, said, "Probably the most important part initially for me was that this high technology, very sophisticated radar equipment would be used for bettering humankind, and that was a very attractive thing that made me decide to come to NSSL. Then, I found out most other people who came here shared this kind of commitment and devotion for bettering the forecasts and helping the public, probably the highest and best reason."

The thread to help others runs through NSSL's employees. Dave Rust, Chief of NSSL's Forecast Research and Development Division, said, "Over the past two decades, being a scientist at the laboratory has allowed me to do research and help others to do research that has not only increased scientific knowledge but has improved forecasting." Dave is usually the one showing school children how to launch a weather balloon during NSSL's open houses.

Terry Schuur, Research Meteorologist with the Cooperative Institute for Mesoscale Meteorological Studies (CIMMS) working at NSSL, says, "This is the place that I think anybody would want to be if they did severe storms work. I think it's a tremendous opportunity because I work with some of the best people in the field and frankly I can't think of any place I'd rather be working." Terry was one of the principal scientists in JPOLE, an operational demonstration that proved that polarimetric data could be valuable in forecasting operations. As a result, the NWS plans to upgrade the national WSR-88D network with polarimetric capabilities.

Dave Stensrud heads NSSL's Models and Assimilation Team, which works to improve forecasts of severe and hazardous events through data assimilation and model techniques. Dave says, "The people here are spectacular, they're talented and dedicated individuals. I enjoy interacting with them and basically working toward a common goal."

What is NSSL's greatest asset? "It's the people," says Jeff Kimpel. "The people are doing such wonderful science, they work so well together, they're doing really important things...It's a privilege for me to be their director." ◆

Severe Thunderstorm Development along the Dryline: A Long-Distance Collaborative Project

It is well known that the dryline is a favored location for the initiation of severe thunderstorms that affect the southern and central Great Plains during spring months. It is not so clear, however, what factors influence the along-line locations where storms form. On days when intensive data collection occurs observational data-sets provide certain clues concerning the reasons for location and timing of storm initiation along the dryline. These data, however, still lack the spatial and temporal resolution necessary to diagnose the details of the initiation process. Harald Richter and Carl Hane have used the MM5 model along with observations from a field program to try to better understand what fac-

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News briefs

Comings and goings

Renee McPherson, NOAA Relations Officer for the past year at NSSL, has returned to the Oklahoma Climatological Survey. Renee is replaced by **Randy Peppler**, CIMMS Associate Director, who will serve in the position for the next year. The NOAA Relations Officer works as a liaison between CIMMS and NOAA for CIMMS employees working at the various NOAA units linked to CIMMS, including NSSL. The NOAA Relations Officer is the first contact for CIMMS employees regarding any work-related issue.

J.J. Gourley, CIMMS, will be in France on a postdoctoral fellowship for the next year to work with MeteoFrance on radars that are being upgraded with dual-pol capabilities on a postdoctoral fellowship.

Dr. Tadashi Fujita is a visiting scientist from the Japanese Meteorological Agency who will be working on ensemble Kalman filters with Dave Stensrud, Lou Wicker and David Dowell.

Christelle Barthe, a Ph.D. student from the University of Toulouse in France, visited the lab for several months as she worked on modeling thunderstorm electrification with Ted Mansell, Conrad Ziegler, and Don MacGorman.

Roel Linssen, a graduate student in Meteorology from Wageningen University in the Netherlands, will work with the NSSL polarimetric radar group as part of his internship. He will work to improve ice classification in the polarimetric Hydrometeor Classification Algorithm.

Awards

Denison University in Granville, Ohio, awarded its Alumni Citation to **Jeff Kimpel**, a Denison graduate. The award is given to Denison graduates who have achieved recognized leadership among their peers through outstanding contributions and services to professional, civic, or religious life of the nation or to the advancement of the University. Jeff was also recognized with the Regents Alumni Award from the University of Oklahoma for exceptional dedication and service to OU.

Kevin Kelleher was one of the recipients of the 2004 NOAA Technology Transfer award as part of a group that developed a national real-time radar data archival and Internet2 delivery system for university, government, and private sectors. CIMMS and contract employees Mark Benner and Karen Cooper also worked on this project.

The NWC REU program, led by **Daphne Zaras** (CIMMS) has been granted a Two-Year Extension for Special Creativity from the National Science Foundation. Under the extension, the program will attempt to increase opportunity for undergraduate research, explore how these

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programs are effective in helping students make career choices, and help participants network with each other and the broader scientific community.

The North American Monsoon Experiment

The North American Monsoon Experiment is a joint U.S. - Mexican program focused on improving monsoon season precipitation forecasts over the U.S. and Mexico. A high point of the 8-year project was the NAME 2004 Field Campaign held this past summer. Scientists had an unprecedented opportunity to collect extensive atmospheric, oceanic, and land-surface observations over northwest Mexico, the southwest U.S. and adjacent oceanic areas--the core region of the North American Monsoon.

Two of the four main projects within NAME involved the expertise of NSSL researcher Mike Douglas. Mike helped coordinate flights of NOAA's P-3 over the Gulf of California to look at the seasonal low-level jet. He also coordinated the second project which studied, through ship measurements, how the monsoon is influenced by the transport of warm water into the Gulf of California.

Mike's long-term mission is to develop an affordable observing system in Latin America. He actively gathers used theodolites, trains locals to record wind profile data, and continues to work to install rain gauges across the area.

NSSL's Web site is at: http://www.nssl.noaa.gov

Since 1995, NSSL Briefings has been published from the National Severe Storms Laboratory to provide federal managers, staff, and other colleagues in the meteorological community with timely information on our activities. This newsletter also contains information about NSSL's scientific collaborations with the OU Cooperative Institute for Mesoscale Meteorological Studies (CIMMS). If you would like to be added to the NSSL Briefings mailing list, or have a change in your address, please forward requests to Kelly Lynn, NSSL, 1313 Halley Circle, Norman OK, 73069; by phone: (405) 366-0429 or by email: kelly.lynn@noaa.gov.

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tors control the location and timing of the dryline storm initiation process. One of the strengths of a numerical model (MM5, in this case) is its ability to provide high resolution information in both time and space. This strength was capitalized upon for the 15 May 1991 case when the dryline produced storms near the western Oklahoma border.

The model was run using a "nested" configuration of three grids with differing point spacings. Using this methodology, grids with progressively finer spacing cover smaller areas and are centered on the area of interest. In this case, the smallest grid (with 2 km grid point spacing) covered most of the Texas Panhandle and a portion of western Oklahoma. The model was initialized at 6 a.m. from larger scale observations and run forward in time for 12 hours.

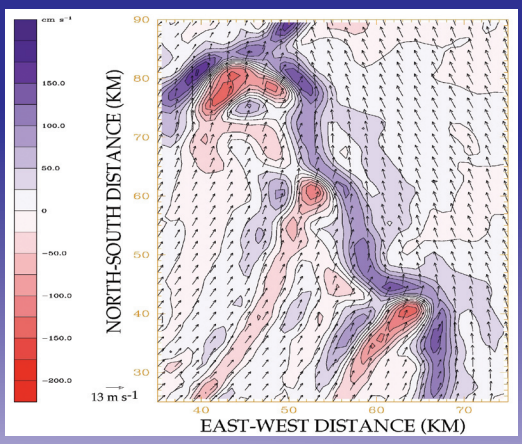


Figure 1: MM5 model output vertical velocity (reds are downward and blues are upward) at 2 km MSL and 2:45 p.m. CST over a portion of the model domain in the eastern Texas Panhandle. The scale at left includes a range from –2 to +2 m s-1. Ground-relative horizontal wind vectors are also plotted (scale at lower left).

The model run resulted in the initiation of convection along the dryline about 90 minutes earlier in the afternoon and about 30 km farther west than was observed in the eastern Texas Panhandle. The deep convection that developed in the model simulation was scattered in nature with similar spacing and line orientation to the observed convection. With this reasonably successful simulation in hand, a logical next step was to diagnose the model results to understand the convective initiation process in more detail. An analysis of the boundary layer vertical velocity field at a time just prior to and during the formation of the first deep convection (Figure 1) shows the vertical motion along the dryline within an extended sinuous band oriented from south-southeast to north-northwest. West of the dryline are alternating bands of upward and downward motion generally oriented along the boundary layer wind direction. These bands resulted from circulations within horizontal convective rolls.

Where these bands intersect the dryline, both the dryline and the horizontal convective roll circulations appear to be changed (Figure 1). Especially evident are small-scale eastward bulges in the dryline that appear to result from enhanced downward transport of westerly momentum by the downward branches of roll circulations at the dryline. It is just ahead of each of these bulges that deep convective clouds first formed in the model, owing at least in part to enhanced low-level convergence and upward motion in the moist air. Local reorientations of the dryline near these bulges may also allow the air that reaches the roots of potential convective clouds to reside in moisture-rich air for a longer period. Current and future research on this project is focusing on the diagnosis of the mechanism that actually produces the development of sustained deep convection just east of the dryline.

This project began when Harald joined NSSL for one year as a National Research Council post-doctoral fellow and brought with him a working knowledge of the MM5 model. It continued by long distance after Harald took a position at the Bureau of Meteorology Research Center in Australia. It has also followed on the heels of a series of observational case studies over the last decade or so by Carl and other collaborators that were made possible by data collected in the COPS-91 field program over Oklahoma, Kansas, and Texas. Other researchers at NSSL, including Conrad Ziegler and collaborators, have also made good use of these data. Persistence in analysis of quality data from a single field program has paid significant dividends. ◆

A NSSL/SPC Spring Program daily map discussion

31 May 2004 - An SPC forecaster sits hunched over a keyboard in the Science Support Area of the Storm Prediction Center (SPC). He is preparing for today's Spring Program map discussion. It is shortly after 1:00 p.m. and many of the attendees are just getting to their lunch. The room is surrounded by workstations and displays and holds about eight people fairly comfortably. Today, however, all the chairs are full, leaving ten more people standing.

It is Monday. The map discussion begins with a briefing on the initial experimental forecast from the previous Friday. This "control" forecast was based on routinely-available observations and model guidance. It contains probability contours for the occurrence of severe convection. In this case the 15 % contour covers a broad swath from northwestern IA into southwestern ND (upper right figure). Steve Weiss, SPC Science and Operations Officer and the PI for the SPC, points out that this forecast captured the dense cluster of reports in southeastern SD, but also contained a lot of "dead area" without any reports. "We gave it a 5 out of 10," Steve notes.

The discussion moves on to the second experimental forecast. This one was made after the forecast team had examined the hi-res WRF output, and it shows a remarkable improvement, including the addition of a 25% probability contour focusing on the region where most of the severe weather was reported and a reduction of the 15% area that eliminated much of the inactive region (lower right figure). "We gave this one an 8," Steve says, "one of the biggest improvements we've seen so far." From here the discussion moves on to comparison of the model forecasts and observations, including satellite and radar images. One look at this data and it is clear to see why there was such a big improvement in the second forecast. Two of the WRF models developed intense convective cells over SE SD in nearly perfect correspondence with the radar loop. "If the models could just do this for us every day, we'd be in great shape," Steve quips.

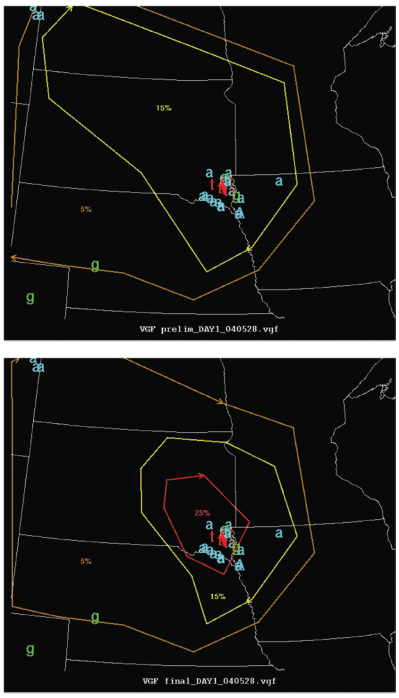
The map discussion moves on to the current weather and areas targeted for severe weather today. "The RUC seems to do well with initiation, but not evolution," says a visiting forecaster. "Each model has its own issues," says another. ◆

The 2004 NSSL/SPC Spring Program

This is the fifth year of the NSSL/SPC Spring Program, an annual event designed to investigate problems of mutual interest to NSSL research scientists and SPC forecasters. Participants from both organizations teamed with a diverse group of scientists and forecasters from across the country to assess the value of near-cloud-resolving versions of the WRF (Weather Research and Forecasting) model in the operational severe weather forecasting environment. Specifically, they wanted to find out if using the WRF model would give them a better idea of how the timing, location, and evolution of afternoon convection would unfold. Plus, they hoped to find that the high-resolution model would provide some guidance on convective morphology, or mode, since certain modes are associated with a disproportionate amount of severe weather.

The WRF is a new numerical weather prediction model designed for research, for operations, and for a broad range of other applications. "It was developed collaboratively by research and operational modelers--a community model with a direct path to operations," says Jack Kain (CIMMS), Spring Program PI for NSSL. "This is the first systematic testing of the hi-res WRF by operational severe weather forecasters." Each day, a map discussion is held to provide an update on the program.

The Spring Program began April 19, 2004, and concluded June 4, 2004. Weekly rotating forecast teams typically included one SPC forecaster, one NSSL scientist, and two visiting scientists or forecasters. In all, there were about 50 participants over the seven-week period, including contributors from numerous NOAA research and forecasting organizations, ten major universities, the Air Force Weather Agency, NCAR, and international visitors from Canada and Finland. The daily map discussion is held year round. It is open to anyone who is interested in operationally relevant science and research. ◆



Probabilistic forecasts like these were issued on a daily basis. The control forecast (upper-left) was based on routine operational data and methods. The experimental forecast (lower-left) was prepared by the forecaster after the normal data stream was supplemented with high-resolution WRF output. The letters indicate actual reports of severe weather for the forecast period: t= tornado, a=hail> 0.75 in., g=wind gusts > 58 mph. The final outlook on the lower-left shows improvement in the forecast due to the use of the hi-res models.