Winter/Spring 2002 Volume 4 Number 3

NSSL Briefings

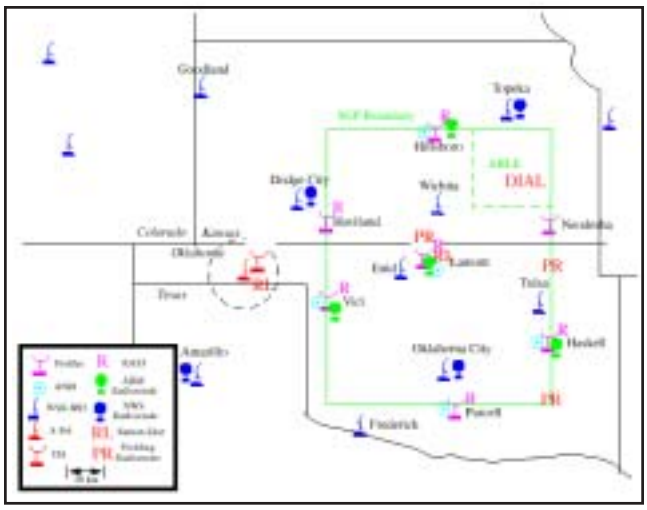
A newsletter about the people and activities of the National Severe Storms Laboratory and Cooperative Institute for Mesoscale Meteorological Studies collaborative researchers

International H_2O Project

Drylines and fronts will be a key focus of the largest-ever weather field experiment in North America--the International H_2O Project (IHOP_2002). Scientists from Canada, France, Germany and the U.S. will study weather over the Southern Great Plains from May 13 to June 25, 2002. They hope to enhance their understanding of the process of convection initiation and boundary evolution, and learn what types of data are needed to make forecasts of thunderstorms and rainfall amounts more specific.

NSSL scientist Conrad Ziegler, in collaboration with CIMMS scientist Erik Rasmussen and Penn State scientist Paul Markowski, will lead NSSL's contribution to IHOP through the ground-based mobile data collection effort. NSSL will provide a SMART radar, nine mobile mesonet vehicles, one mobile sounding system, a photography vehicle, and the field coordination vehicle. This contribution has received significant external support from the National Science Foundation (NSF), the NOAA United States Weather Research Program (USWRP), the NOAA High Performance Computing and Communications (HPCC) program, and the NSSL Director's Discretionary Fund.

The number of mobile facilities involved in IHOP and the coordination of their movement is unprecedented. To investigate the atmosphere, IHOP will use up to six research aircraft carrying in-situ and remote sensors, including an array of airborne Doppler and water-vapor sensing lidars. A large ground-based array of mobile mesonet vehicles, mobile sounding systems, profilers, and radiometers will nest within the aircraft sampling areas. Four mobile radars, never before used in concert with each other, will spend many hours scanning the atmosphere. A field coordination (FC) vehicle will be located in the center of the target area and serve as the hub of the mobile digital network. Weather data from remote probes will be transmitted to the FC by radio frequencies, and for the first time, the FC will be able to communicate with the Norman Operations Center by satellite broadband Internet and satellite phone.



IHOP_2002 domain area

Predicting rainfall amounts continues to be a mystery -- flash floods caused by heavy thunderstorm rainfall are responsible for more deaths than hurricanes, tornadoes, windstorms or lightning.

One of nine mobile mesonet vehicles

Annual property damage from flash floods alone exceeds $5 billion. Data gathered from IHOP will detail the thunderstorm initiation process and provide the groundwork for new forecast rules in the prediction of heavy rainfall. u

Support for IHOP_ 2002

NSSL is working hard to provide support for IHOP_2002. Trailers have been rented to house additional computers needed for field coordination and data management. NSSL, CIMMS scientists, graduate students, undergraduate and other paid assistants and volunteers, and REU students visiting for the summer will get the chance of a lifetime to participate in the project. Media relations will be handled by Keli Tarp, NOAA Weather Partners Public Affairs.

NSSL, SPC, CIMMS and NWSFO will provide critical forecasting support. A morning outlook will be issued each day around 9 a.m. in the Science Support Area of NSSL/SPC facilities. An early afternoon briefing will follow including a forecast for the remainder of the day and the forecast for Day 2. Long-range guidance will be used to forecast out to ten days. Nowcasting (0-3 hours) operations will run during the day until early evening. u

Spotlight on: J. J. Gourley

Native Oklahomans that become meteorologists frequently have had a traumatic tornado event that helped define their career. For J.J. Gourley, it was no different. J.J. was too young to remember details, but he has a vague recollection of people rushing around in the streets. He learned later that this memory is from when he was about a year old -- a tornado had come near his home town of Broken Arrow, OK. He has been interested in the weather as long as he can remember.

The mountains of Colorado diverted J.J. from his plan to attend Penn State as a meteorology major. He went to Colorado University instead, majoring in physics. After two years he wanted to get back into meteorology and came to OU. He immediately began looking for a weather-related job and started knocking on doors, beginning with the Doppler trailer at NSSL. Ken Howard answered the knock, interviewed him on the spot, and gave him a job. J.J. maintained his interest in meteorology and went on to earn his M.S. at OU. He began his Ph.D. work at the University of Arizona in hydrology, but felt he was getting too out-of-touch with meteorology and came back to OU. He has finished all his Ph.D. coursework and hopes to finish his dissertation by December 2002.

J.J. (CIMMS) studies techniques to improve estimates of rainfall in real-time using multiple data sources -- a project called QPE-SUMS (Quantitative Precipitation Estimation and Segregation Using Multiple Sensors). QPE-SUMS utilizes WSR-88D data, GOES satellite imagery, gauge rainfall, numerical model output, and lightning and sounding data to produce rainfall maps that can be fed into a distributed runoff model for accurate river flow predictions. His current project tries to determine what specific road and bridge will become flooded. (This is important work since flash floods are the number-one killer in the U.S.) Much of his work is done in cooperation with Arizona's Salt River Project and with the Sea Grant Program in North Carolina.

During his work-related travelling he has gained the reputation as an adventurous eater. He has tried sea cucumbers and the eyeball of a red snapper (which he says is not that bad). He enjoys exploring the outdoors with his wife Karen and his dog Charlie through hiking, cycling, biking, and flyfishing. J.J. tries to not go to the same place twice, and says his favorite place is somewhere not yet discovered. u

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NSSL's Kevin Kelleher receives NOAA awards

Kevin Kelleher, Deputy Director of NSSL, has been honored with three NOAA awards. Most recently he was recognized as one of eleven 2002 NOAA Research Employees of the Year. Kevin was honored for his leadership in developing the NSSL fire recovery plan, for significant improvements created with the Joint Institute Agreement between CIMMS/NSSL, and for facilitating the Internet2 connections for the NOAA Norman Weather Partners.

He also received NOAA's highest honorary award, the Bronze Medal. Kevin was recognized for his outstanding work over the past several years in obtaining grant funding and leading the high performance networking enhancements for the NOAA Weather Partners in Norman. He also worked to foster a strong collaboration between OU, the NOAA Weather Partners, and the NOAA Advanced Research Network.

Kevin was given an award for the Best Use of High Performance Networking at the NOAATECH 2002 Workshop. This award was given for his work to make the NWS's WSR-88D radar data available over the Internet in real-time for research and archival use by the National Climatic Data Center (NCDC). The radar data project is a collaboration between the NWS, OU CAPS, OU School of Computer Science, and NCDC. u

News briefs

Comings and goings

Pankaij Agrawal (CIMMS) will work with NSSL scientists studying algorithms used to analyze lightning mapping data. He is a first year graduate student.

Linda Foster has joined NSSL as a new Administrative Service Assistant.

Kristin Kuhlman (CIMMS) will be working with Conrad Ziegler, Jerry Straka (OU), Ted Mansell, and Don MacGorman on the storm electrification model. She is working toward her master's degree at OU.

Tracy Reinke is the new CIMMS Financial Associate and is managing all funding related to CIMMS activities at all NOAA units.

International visitors

Dr. Pao-Liang Chang from Taiwan will be working with NSSL to help refine QPE-SUMS so that it is better suited for tropical environment. He has experience with the automated detection and estimation of rainfall rates associated with typhoons.

Dr. Nikolai Dotzek from Germany will be visiting for three months working with Bob Rabin using QPE-SUMS as a framework for their research. His previous work focused on the variability of vertical profiles of reflectivity from a modeling perspective.

Clair Thomas is doing an internship through the University of France working with Bob Rabin and V. Lakshmanan on radar filtering.

John Freddy Mejia from Medellin, Colombia is working on PACS-SONET related activities this summer with Mike Douglas. He has a M.S. in Water Resources from the Universidad Nacional de Colombia (Medellin).

National Severe Weather Workshop

Severe weather experts from around the U.S. gathered in Norman, OK, to discuss their latest research and forecasting techniques during the National Severe Weather Workshop held March 1-3, 2002.

Last year the workshop was an overwhelming success, attracting more than 200 attendees from 20 different states. During the 2002 workshop, severe weather experts from across the nation presented the latest techniques for severe weather preparedness and response. Speakers included National Weather Service leadership, broadcast meteorologists and emergency managers, as well as forecasters and

(continued on next page)

News briefs, continued

National Severe Weather Workshop (cont.)

researchers from NWS offices and the NOAA Weather Partners in Norman.

The workshop was designed for emergency managers, storm spotters and other weather enthusiasts and was sponsored by NOAA, SPC, the Central Oklahoma Chapter of the AMS/National Weather Association and the Oklahoma Emergency Managers Association. The workshop will be held next year from March 2-4, 2003.

AUITI (Acronyms Used In This Issue)

CIMMS - Cooperative Institute for Mesoscale Meteorological Studies
FAA - Federal Aviation Administration
GOES - Geostationary Operational Environmental Satellite
NOAA - National Oceanic and Atmospheric Administration
NSF - National Science Foundation
NSSL- National Severe Storms Laboratory
NWS - National Weather Service
OU - University of Oklahoma
QPE-SUMS - Quantitative Precipitation Estimation Using Multiple Sensors
REU - Research Experience for Undergraduates
SPC - Storm Prediction Center
SMART-R- Shared Mobile Atmospheric Research and Teaching Radar
WSR-88D - Weather Surveillance Radar - 88 Doppler, same as NEXRAD

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

NSSL Briefings *is a publication from the National Severe Storms Laboratory intended to provide federal managers, staff, and other colleagues in the meteorological community with timely information on our activities. 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) 360-3620; or by email: kelly.lynn@noaa.gov.*

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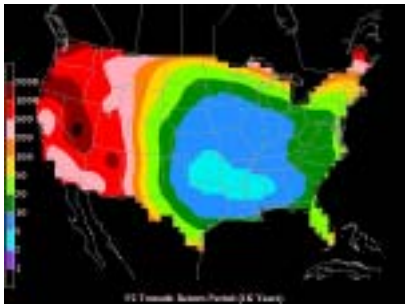
SMART radar intercepts T.S. Gabrielle

Tropical Storm Gabrielle was successfully intercepted by one of the Shared Mobile Atmospheric Research and Teaching Radars (SMART-R) as it came onshore near Venice, Florida in September 2001. This was the first time a mobile 5 cm Doppler radar intercepted a land-falling tropical cyclone. The radar, a shared facility jointly owned and maintained by NSSL, Texas A&M, Texas Tech, and OU, was being operated at the time by Texas A&M scientists.

With an unobstructed view of the ocean, the SMART radar was set up on a concrete slab just west of the Venice airport. Data collection began as Gabrielle was approximately 100 miles southwest of the site. The eye of the tropical storm passed directly over the SMART radar position. Dr. Mike Biggerstaff and his students from Texas A&M measured 40 knot east winds, 20 minutes of calm wind, followed by 40 knots of northwest wind. Maximum observed Doppler velocities were 33 m/s, putting Gabrielle close to hurricane strength. Data was collected continuously for at least 13 hours. Images can be found on the SMART-R website at nssl.noaa.gov/smartradars. u



A new hazard model for tornadoes

Hazard models for disasters (earthquakes, volcanoes, etc.) are designed to estimate how often a particular place will be affected by a disaster and how intense the event will be. Traditionally, tornado hazard models have relied on how often a tornado has hit close to a location to estimate how often that location will get hit. Since tornadoes are rare events at any location, the estimates are difficult to verify and can be very sensitive to the length of the record. Recently, Harold Brooks of NSSL has been working on a new approach to making these estimates, using a combination of statistical models of the frequency of occurrence and path length and width of tornadoes to produce “artificial” tornado data. Most of the models take advantage of data from larger areas of the country than traditional approaches.

The average length of time between successive events at a place is known as the return period. The new hazard model estimates that the shortest return period for a location getting hit by an F2 or stronger tornado is a little less than 4,000 years. For an F4 or stronger tornado, it’s about 18,000 years. The most likely location in the contiguous United States to be struck by strong or violent tornadoes is in south central Oklahoma. The least likely location is in central Nevada, where an F2 or stronger tornado is only predicted to occur once every 2 million years.

The research was done in collaboration with Michael Kay of the Storm Prediction Center and summer students at the Oklahoma Weather Center’s Research Experience for Undergraduates program from 1999 to 2001. u

Olympic forecaster

CIMMS's David Schultz was a forecaster on the Olympic Weather Support Group in Salt Lake City during the Olympic Winter Games of 2002. David was part of an NWS group that forecast the weather for transportation corridors, park-and-rides, and avalanche zones. The NWS group also lead the coordination among various groups providing weather support. The weather was cooperative during much of the Olympics, with below normal precipitation and above normal temperatures at the mountain venues. The most exciting time for David was the last day of the Olympics as a cold front was bearing down on the venue of the closing ceremonies, almost forcing the fireworks to be cancelled. He said that seeing how his research on Utah weather systems impacts operational weather forecasting was a satisfying part of his Olympic experience. u

National Weather Center plans progressing

The National Weather Center in Norman is a joint venture between the University of Oklahoma (OU) and NOAA. This unique opportunity to strengthen the government-university science partnership will result in a world-class weather center with academia, research and operations under one roof.

The state-of-the-art facility will house five NOAA components and seven OU components. The NOAA components include the National Severe Storms Laboratory, the Storm Prediction Center, the Weather Forecast Office, the Radar Operations Center's Application Branch, and the Warning Decision Training Branch, for a total of 263 staff. The OU components include the School of Meteorology, the Oklahoma Climatological Survey, the Center for Analysis and Prediction of Storms, the Cooperative Institute for Mesoscale Meteorological Studies, the Environmental Verification and Analysis Center, the Center for Spatial Analysis and the International Center for Natural Hazards and Disaster Research for a total of 224 staff and over 350 graduate and undergraduate students. Consolidating staff and students will help facilitate some of the most advanced and cutting-edge research in the world.

The current status of the project is that we have completed the scoping phase of the project and provided OU with our design requirements. In addition, we have completed the schematic design for the National Weather Center. We are currently awaiting Department of Commerce approval to proceed to full design. Based on the current schedule, the ground breaking may occur later this year with completion of the National Weather Center scheduled for February 2006. u

Rapid surveillance of weather

A scheme to speed up the processing of weather radar data has been developed by CIMMS scientist Sebastian Torres. In the project, partly funded by the FAA, Torres learned that by sampling weather radar signals more frequently one could potentially increase severe weather warning lead-times. Igor Ivic, CIMMS engineer, has experimentally verified these results on the NSSL research radar and documented these in his M.S. thesis.

The method of estimating Doppler spectral moments and polarimetric variables on pulsed radars using a whitening transformation was the subject of Torres' Ph.D. thesis. The scheme takes samples of echoes at rates several times larger than the reciprocal of the transmitted pulse length. The scheme works best on strong echoes: weak echoes would still require standard filtering.

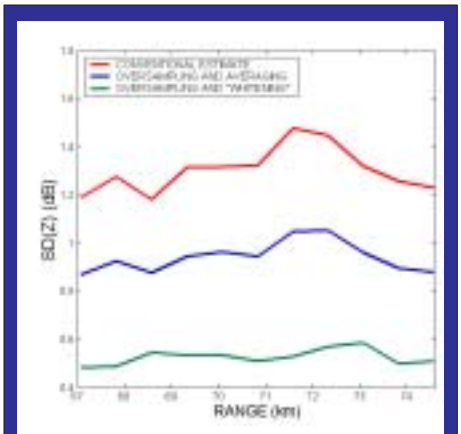


Figure 1. Standard deviation of reflectivity factor for three estimation methods.

This new development applies to any weather radar and has exciting implications for the weather forecasting and research community. Observations at minute intervals are required to understand the details of a vortex as it forms and dissipates near the ground. Even faster rates of volumetric data are required to determine the presence of transverse winds. And, most importantly, fast update rates would also yield more timely warnings of impending severe weather phenomena such as tornadoes and strong winds. u

Norman Doppler Radar comes down

After 30 years of service the Norman Doppler Radar was dismantled. Researchers used the radar from 1971 to 1992 to conduct severe weather research and to create NEXRAD. A new phased array radar will begin to be built in its place this summer.

A celebration was held on April 12, 2002 to honor the work and the people who were a part of the research connected with the radar. u

A crane lifts the radar dome off its base.

The radar dish comes off.