Spring/Summer 2003 Volume 5 Number 2

NSSL Briefings

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

Installation of the dome

Phased Array Radar: National Weather Radar Testbed at NSSL

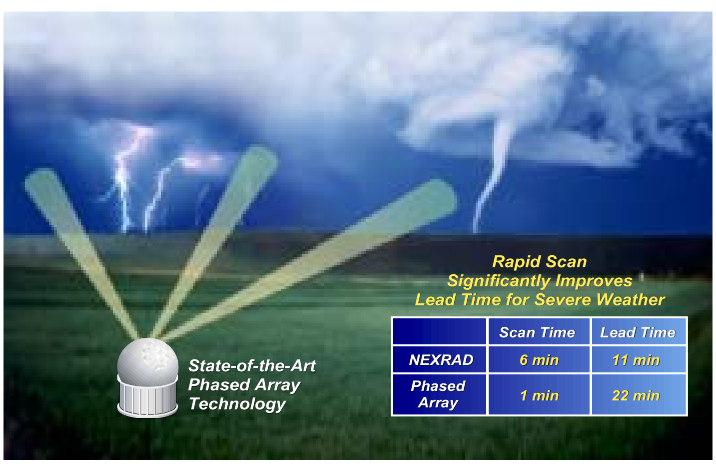
NSSL and its partners celebrated the end of construction and the beginning of installation and checkout of the phased array radar with a ribbon-cutting ceremony on April 25. Doug Forsyth, chief of NSSL's Radar Research and Development Division and executive director of facilities and strategic planning, said, "It started as a dream in 1997...now it's finally coming together."

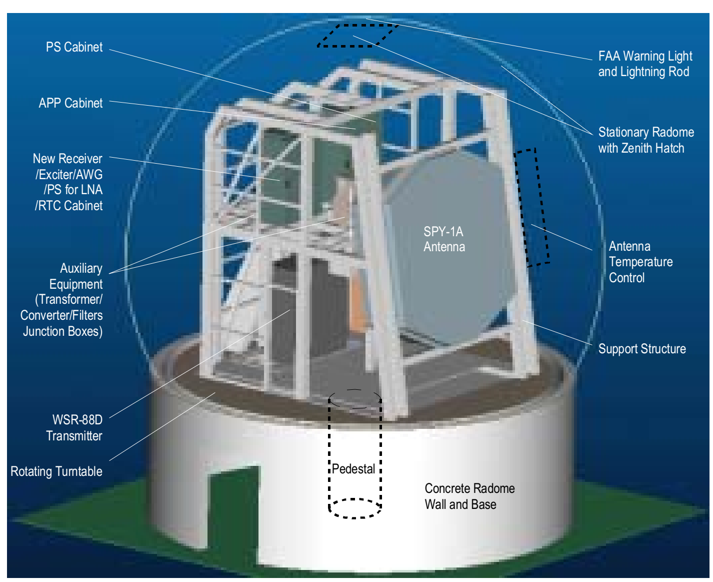
The phased array radar project will begin a new era in NSSL's leadership in the research and development of future generations of weather radar. All aspects of the phased array project are being carried out in a unique federal, private, state and academic partnership that includes NOAA NSSL and NWS, Lockheed Martin (LM), U.S. Navy, Federal Aviation Administration (FAA), Basic Commerce and Industries, Inc., the Oklahoma State Regents for Higher Education (OSRHE), and the University of Oklahoma's (OU) School of Meteorology and College of Engineering. The testbed will enable meteorologists and engineers to determine if phased array radar will become the next significant technology advancement to improve our nation's weather services.

The phased array radar technology was originally used by Navy ships to protect naval battle groups from missile threats. Scientists believe the same technology has great potential for increasing lead time for tornado warnings. In 2000, the Navy agreed to loan an antenna to NSSL and provided $10M in funding to help build the National Weather Radar Testbed (NWRT). The NWS provided the transmitter and additional funding from NOAA, OU, LM, and OSRHE purchased the environmental processor. In addition, the FAA provided initial funding for research, program management and initial upgrades, and the NWS has donated equipment.

The phased array radar has a unique antenna that allows it to collect the same amount of information as the conventional radar, but in about one-sixth the time. The current average lead time for NWS tornado warnings is 10 to 11 minutes. Researchers believe phased array could expand lead times to 18-22 minutes. Scientists will be able to adapt the radar scan to focus on the most important weather features. The new technology will also gather storm information not currently available, such as rapid changes in wind fields, to provide more thorough understanding of storm evolution. Researchers and forecasters can then improve conceptual storm models and use that knowledge to evaluate and improve stormscale computer models.

The project--from research and development to technology transfer and deployment throughout the U.S.-- is expected to take 10 to 15 years. The radar's infrastructure is under construction and is scheduled to be completed by the end of this summer. Research is expected to begin in August. ◆





Above: *The rapid scanning ability of phased array radar has the potential to significantly increase the average lead time of tornado warnings.* ***Right:*** *An illustration of the various components of a phased array radar.*

Spotlight on: Dave Schultz

Separating work and play is difficult for Dave Schultz. There just is not enough time in the day for all the things he wants to do. The white board in his office lists 10 or so projects in blue ink, meaning he is working on them -- not to mention the list in black of 30 other ideas he wants to pursue in the future. He has a 17-foot kayak in the stairwell of his apartment (the only place it will fit), an 11-foot whitewater kayak on his balcony, four bicycles, camping gear, and an eclectic CD and LP collection (about 1600 titles). His favorite place is Zion National Park in Utah, and he wants to develop a project to understand the strong canyon winds that can persist there throughout the night.

Dave grew up in southwestern Pennsylvania where he spent much of his time in the outdoors. His innate curiosity coupled with ample opportunity for observation sparked an interest in the natural sciences, especially the weather. He completed a Bachelor's degree at Massachusetts Institute of Technology (MIT) in Earth, Atmospheric, and Planetary Sciences, specializing in geology, and a Master's degree in atmospheric sciences at the University of Washington in Seattle. He then moved to Albany, NY to pursue doctoral studies at State University of New York (SUNY). At SUNY, he attended a short course on convection taught by Chuck Doswell. After discovering that he and Dave had a common interest in cyclone/frontal structure, Chuck invited Dave to apply for a National Research Council post-doc at NSSL, directed towards understanding cyclone/frontal structure of the western U.S. Dave completed his post-doc in 1998 and has been with NSSL/CIMMS ever since.

Dave specializes in synoptic and mesoscale weather systems, specifically the structure and evolution of low pressure systems and fronts. His current research interests include the structure of cold fronts, the dynamics of mammatus, a climatology of drizzle, and the role of numerical weather prediction in forecasting. Dave was co-chief of the Intermountain Precipitation Experiment in 2000, an investigation of the structure, evolution, dynamics, microphysics, and precipitation associated with orographic precipitation and lake-effect snowbands in northern Utah. That experience paved the way for his participation as a forecaster at the 2002 Olympic Winter Games in Salt Lake City, UT. Dave also enjoys interacting with students, whether it is with the graduate students he advises or the Research Experiences for Undergraduates program. He feels it is his way to give back to those teachers and colleagues who gave him valuable advice through the years.

Dave's mission is to answer weather questions. He is satisfied when his research contributes to improvements in understanding and forecasting weather systems: "By understanding past weather events, we pave the way to prevent future weather forecast failures." But his ultimate meteorological conundrum is: "Does it really rain more on weekends?" ◆

ORPG Software Development Team

Open Systems Radar Product Generator project complete

NSSL/CIMMS finished a major program working with the Department of Commerce, Department of Transportation, and the Department of Defense to upgrade the Radar Product Generator (RPG) to an Open Systems environment (ORPG). NSSL led the system's software architecture, design, and implementation.

The RPG is a part of the NEXRAD WSR-88D that processes Doppler radar data through numerous meteorological and product generation algorithms. The algorithm results and Doppler radar images are distributed to the various

News briefs

Coming and going

Don Burgess

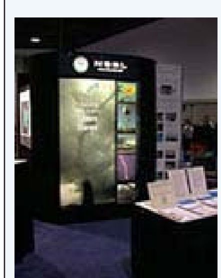
Don Burgess retired from his position as Chief of NSSL's Warning Research and Development Division on July 1, 2003 after 31 years of federal service. Don will join CIMMS on a part time basis and return to his long-time scientific interest of radar data analysis. We are fortunate that Don's scientific talent and expertise will remain in Norman.

Doug Lilly

Doug Lilly, a distinguished senior scientist with NSSL and Emeritus Professor of Meteorology at OU, has retired and moved to Nebraska to spend more time with his grandchildren. Dr. Lilly carried out research at NSSL related to tornadoes and other strong low-level vortices.

John Cortinas

John Cortinas reported to Office of Atmospheric Research (OAR) Headquarters in Silver Spring, MD on May 5 as the new Manager of the NOAA/OAR Joint Institutes. We are fortunate John will remain in the OAR family. His contributions as a scientist and administrator have been invaluable to all of us at NSSL.



NSSL at national AMS meeting in Long Beach, CA

NSSL hosted a booth at the 83rd AMS Annual Meeting in February 2003. NSSL/CIMMS scientists were lead authors on 17 papers presented at the conference. New and advanced algorithm and display applications from the Warning Decision Support System - Integrated Information (WDSS-II) were demonstrated at the NSSL booth.

News briefs, continued

NOAA Weather Radios donated to local schools

NSEA, the NSSL/CIMMS/SPC employee association, donated and delivered 10 NOAA Weather Radios to Norman-area schools during Severe Weather Awareness Week at the beginning of March. Mike Baldwin (CIMMS), NSEA President, said "We encourage everyone to have a NOAA weather radio in their home or business. They should be as common as smoke detectors."

AUITI (Acronyms Used In This Issue)

CIMMS - Cooperative Institute for Mesoscale Meteorological Studies
FAA - Federal Aviation Administration
MIT - Massachusetts Institute of Technology
NCAR - National Center for Atmospheric Research
NOAA - National Oceanic and Atmospheric Administration
NSSL- National Severe Storms Laboratory
NWS - National Weather Service
ORPG - Open Systems Radar Product Generator
OU - University of Oklahoma
ROC - Radar Operations Center
RPG - Radar Product Generator
SPC - Storm Prediction Center
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. Since most of these activities involve collaborations with scientists at the Cooperative Institute for Mesoscale Meteorological Studies (CIMMS), at the University of Oklahoma, this publication contains information about CIMMS employees and various NSSL/CIMMS 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) 366-0429 or by email: kelly.lynn@noaa.gov.

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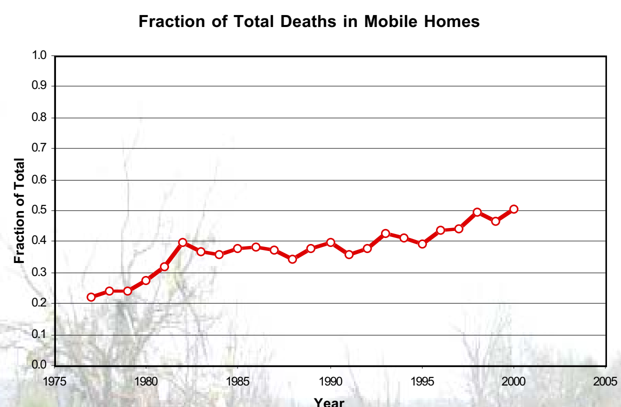
NEXRAD consumers, which include the NWS, FAA, and the Air Force as well as the private sector. The NEXRAD ORPG is the primary source of most of the weather radar images and other meteorological products used by federal agencies and those seen on the Web and on local television broadcasts.

As a result of the NSSL/CIMMS software, the ORPG can now be hosted on inexpensive UNIX workstations and LINUX PC's. Another benefit of the software upgrade is that multiple organizations can develop and test new scientific algorithms and products using the operational software. More importantly, the upgrade streamlined the process for integrating new science and technology into the system, enabling the Radar Operations Center (ROC) to reduce their software build release from the 18-24 months cycle under the legacy system to only a six-month release cycle with the ORPG.

The ORPG Software Development Team was an effective cross-organizational team of very dedicated individuals. The team was composed of NSSL staff (Mike Jain and Doug Forsyth), CIMMS staff (Zhongqi Jing, Eddie Forren, Roc Adams, John Krause, Dan Suppes, John Thompson, Dave Priegnitz, Hoyt Burcham, Jeff Horn, and Josh Guice), NWS/ROC staff (Steve Smith), and ROC Contractors (Gary Gookin, Aamir Nawaz, and Nolita Morgan).

The ORPG Software Development Team members were recognized by NWS and NSSL management for their critical contributions to the project. Zhongqi Jing (CIMMS) was honored by receiving NOAA's Team Member of the Month in September 2002. This award is designed to recognize non-federal employees who made significant contributions to NOAA programs. Mike Jain (NSSL) was awarded the DOC Bronze Medal for his role and contributions to the ORPG Project. ◆



5-year running mean of the fraction of tornado deaths in the United States that occur in mobile homes.

Mobile homes and tornado fatalities

Half of tornado fatalities in the United States now occur in mobile homes, an increase from approximately 25% in the late 1970's, when information on the location of fatalities began to be collected. In 2002, 37 of the 55 total deaths occurred in mobile homes. This is in spite of the fact that only about 7% of the population lives in mobile homes. Using information from the US Census Bureau on the fraction of mobile homes in each state, combined with the number of reported tornadoes since 1985 from the Storm Prediction Center, Harold Brooks of NSSL has estimated that mobile home residents were killed at a rate 15 times higher than permanent home residents.

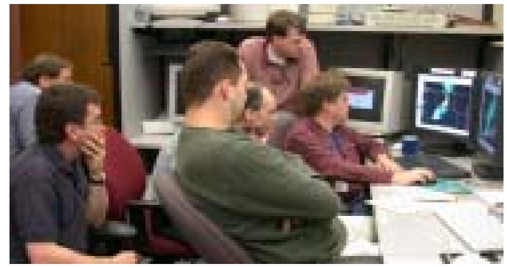
The potential exists for the fraction to continue to increase. Mobile home residency has risen steadily over the past 30 years, particularly in the southeastern U.S. According to the 2000 Census, over 16% of housing units in Alabama and Mississippi were mobile homes and more than 20% in South Carolina. In 1990, those percentages were 13% and 16%, respectively. Mobile home residents tend to have less access to information and fewer shared information systems (e.g., warning sirens). The problem of warning and sheltering mobile home residents has become the biggest obstacle to continuing to reduce death tolls from tornadoes. ◆

Photo courtesy NWS St. Louis

SPC/NSSL Spring Program 2003

The NSSL and SPC were hosts to another collaborative Spring Program in 2003. This year's program explored two promising applications of numerical models in forecasting severe weather: 1) the use of Short-Range Ensemble Forecast (SREF) prediction systems, and 2) the use of high-resolution deterministic models. As in previous years, forecast/research teams were anchored by SPC forecasters and NSSL/CIMMS researchers. The teams were rounded out with visiting scientists from numerous institutions, including the Environmental Modeling Center (NCEP/EMC), the Forecast Systems Laboratory, the Norman, OK and White Lake, MI NWS Forecast Offices, the University of Arizona, OU, the University of Washington, Iowa State University, MIT, the United Kingdom Meteorological Office, and the Meteorological Service of Canada. In addition, bservers from COMET and USWRP participated.

The SREF systems used in the program included two separate ensembles, one from NCEP and one from NSSL. The NCEP ensemble was an operational system that used an automated "regional breeding" method to perturb initial conditions for individual model runs. It was a multi-model ensemble composed of five Eta-model members, five EtaKF members (the EtaKF is a modified version of the Eta model developed at NSSL), and five members using NCEP's regional spectral model. The NSSL ensemble was a newly developed system based on MM5. It utilized forecaster input to identify regions and parameters of meteorological sensitivity, ingesting this information in an adjoint model to produce a spectrum of initial conditions for the ensemble. With this unique interactive method, forecaster judgment modulated the nature of perturbed initial conditions in the ensemble, rather than automated objective procedures.



Members of a forecast team evaluate deterministic model output during the 2003 SPC/NSSL Spring Program. Pictured are (l-r) John Gaynor (USWRP), Dave Sill (Met. Service of Canada), Jim Hansen (MIT), Ken Mylne (UK Met. Office), Greg Mann (White Lake, MI NWSFO), and Harold Brooks (NSSL).

In the second area of focus, participants compared mesoscale model forecasts using parameterized convection to cloud resolving forecasts (i.e., without parameterized convection) from the Weather Research and Forecasting (WRF) model. The goal was to provide a preliminary assessment of the forecast value of high-resolution models compared to the current generation of operational and experimental forecast models, including the WRF, Eta, EtaKF, RUC, and NCEP's new Nonhydrostatic Mesoscale Model (NMM). The program ran weekdays from April 14- June 6. ◆

-- by Jack Kain and Mike Baldwin

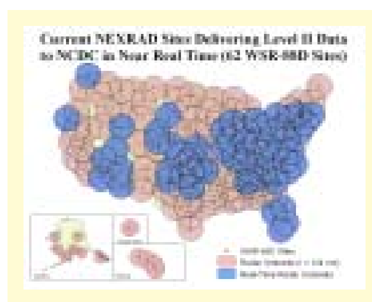
For more information see: http://www.spc.noaa.gov/exper/Spring_2003/

Project CRAFT: transition to operations

Project CRAFT (Collaborative Radar Acquisition Field Test) successfully proved that real-time access to high-resolution data from multiple radars is technically possible and economically viable. As a result, high-resolution radar data from the national network of NEXRAD radars will soon be archived and delivered over the Internet in near real-time to government, university and private sector users. This achievement is the result of previous efforts by NSSL in the early 1990's to use the real-time 88D data for algorithm development in support of warnings decision support workstation systems for NWS forecasters.

Project CRAFT was implemented in 1998 by a coalition of researchers from OU's Center for Analysis and Prediction of Storms (CAPS), NSSL, and the NWS-ROC. They wanted to see if it was possible to access valuable WSR-88D data in real-time for input to high-resolution numerical forecast models by taking advantage of existing high-performance networking capabilities and other recent technological advances. An equally important goal of the research group was to improve archiving of these data. At the time, WSR-88D radar data was being recorded by costly, inefficient, and human resource-intensive 8mm tape cartridge recording systems. CRAFT partners include NOAA National Climatic Data Center (NCDC), University Corporation for Atmospheric Research's (UCAR) UNIDATA program, MIT-Lincoln Laboratory, and the FAA.

The Level-II base data, which includes high-resolution reflectivity, velocity, and spectrum width, will be transported to



users over a combination of the Abilene/Internet2 backbone network and the commodity (commercial) Internet. The initial testbed for CRAFT included six WSR-88D radars in Oklahoma and Texas. During the past three years, the project grew to support 62 radars located across the United States. The NWS plans to expand CRAFT to include all of their WSR-88D radars and 11 Department of Defense WSR-88D radars. The expansion will implement the technology nationwide to electronically collect and transmit the data in realtime to the NCDC for archival and to other users.

NSSL continues its research leading into the next phase of CRAFT, which includes exploring lower-cost connections such as cable modems, DSL and integrated lines from the radar site into the Internet, evaluating the latency characteristics and reliability statistics of the these technologies and looking at a new version of Unidata's Local Data Manager (LDM) software. The NWS has committed to maintaining the existing data distribution system at CAPS in support of ongoing research at universities, government laboratories, and private sector partners during the transition period to an NWS operational system. ◆