National Severe Storms Laboratory

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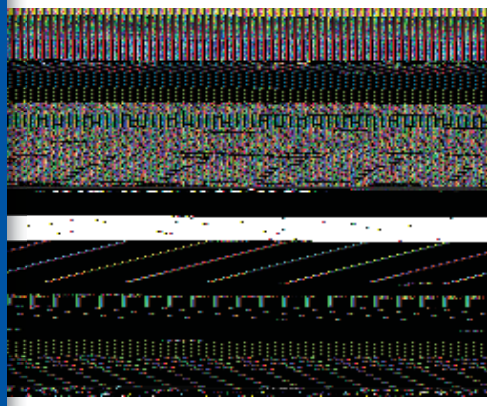
Studying severe storms in the heart of "tornado alley"

The National Severe Storms Laboratory (NSSL) serves the nation by working to improve the lead-time and accuracy of severe weather warnings and forecasts in order to save lives and reduce property damage. NSSL scientists are committed to their mission to understand the causes of severe weather and explore new ways to use weather information to assist National Weather Service (NWS) forecasters and federal, university, and private sector partners.

RADAR RESEARCH AND DEVELOPMENT



MPAR may enable average tornado lead-time to be significantly extended by issuing warnings based on forecasts from earlier precursor conditions.

National Weather Radar Testbed (NWRT) – NSSL researchers believe this proof-of-concept phased array radar located in Norman, OK is the next generation of weather radar. They have already shown the NWRT can detect rotation, hail, microbursts and gust fronts well ahead of other radars due to its rapid scan capability. NSSL is working on the concept of a multi-mission phased array radar (MPAR) specifically tailored to meet the nation's weather, aviation, and homeland security needs.

Dual-polarized Doppler radar – NSSL continues to develop techniques with dual-polarized Doppler radar to provide significant improvements in rainfall estimation, precipitation classification (rain, hail, snow, sleet), and weather hazard detection. Dual-polarization capabilities will be added to all NWS WSR-88D radars beginning in 2010.

Mobile radars – NSSL helped develop a fleet of mobile radars and research vehicles to collect data on tornadoes, microbursts, hurricanes, and lightning in key positions around severe weather. Our newest radar has polarimetric capabilities and has been used to study a hurricane eyewall as it made landfall. Crews also have used the radar data to help improve flood, flash flood, and debris flow warnings in areas unreachable by a regular radar beam.

Radar research payoff: New radar technologies are essential to providing integrated observations, predictions, and warnings of high-impact weather including tornadoes, severe thunderstorms, and flash floods.

HAZARDOUS WEATHER RESEARCH

VORTEX2 – NSSL is gearing up for the largest-ever field program to study tornadoes: VORTEX2 (Verification of the Origins of Rotation in Tornadoes Experiment2, or V2). V2 is set to run from May 10-June 13 of 2009 and 2010, and is a follow-on to the VORTEX project of the mid 1990's. Researchers will use an armada of mobile instruments to investigate how, when, and why tornadoes form, the structure of tornadoes, the relationship of tornadic winds to damage, and how to better forecast tornadoes.

Warning Decision Support System: Integrated Information (WDSS-II) – WDSS-II is a suite of decision making tools that receives, processes, displays, and sorts data in real-time from multiple radars and sensors (satellites, lightning detectors and more). NSSL continually develops and tests these tools to help forecasters handle the vast amounts of data available to them, improving the lead-time and accuracy of forecasts and warnings. WDSS-II is run 24/7 across the continental U.S.

Severe storm investigations – NSSL researchers work to describe the way thunderstorms behave so they can help improve forecasts and warnings. They also look at severe weather trends across the nation to estimate true threats at any time of year.

Hazardous weather research payoff: Improves the accuracy and amount of lead-time of forecasts and warnings issued by the National Weather Service (NWS).

HYDROMETEOROLOGY RESEARCH

NMQ (National Mosaic and Multi-sensor Quantitative Precipitation Estimation) – NSSL developed a community-based national testbed to provide a real-time, around-the-clock, hydrologic applications development and testing environment. The next-generation multiple sensor Quantitative Precipitation Estimation (QPE) known as "Q2" takes the most effective QPE techniques and uses a multi-sensor approach focused on high-resolution integration of radar, satellite, model, and surface observations to produce very high-resolution precipitation estimates.

CI-FLOW (the Coastal and Inland Flood Observation and Warning Project) – NSSL is leading the CI-FLOW Project in North Carolina that will combine existing monitoring technology and develop new techniques to forecast and warn of coastal storm effects such as heavy rainfall, storm surge, and resulting river conditions.

Debris flow warnings – NSSL operates a Shared Mobile Atmospheric Research and Teaching Radar (SMART-R) during winter seasons in California near an area damaged by wildfires. The SMART-R provides real-time close-up radar data during rainstorms in areas not easily scanned by NWS radar due to rugged terrain. The effort is part of the Flash Flood Demonstration and Debris Flow project sponsored by NOAA and the U.S. Geological Survey to help forecasters improve flash flood and debris flow warnings in burn areas.

The SMART-R being used near the Day Fire burn area in California to study debris flows. (photo: NOAA)

Microburst research – NSSL's mobile radar crews collected data in the southwest on microbursts, strong downdrafts of air caused by thunderstorms. Their mission was to observe the lifecycle of strong microbursts and assess their impacts on the Salt River Project's electrical power transmission infrastructure in Phoenix, AZ. NSSL also worked with local NWS forecast offices to assess advance precipitation estimation techniques for use in their Flash Flood Monitoring and Prediction System.

Hydrometeorology research payoff: NSSL hydrometeorology research helps NOAA serve society's needs for weather and water information by developing methods to improve monitoring and prediction of floods and flash floods.

Research Partnerships

NSSL has a research partnership with the Cooperative Institute for Mesoscale Meteorological Studies (CIMMS), a cooperative institute between NOAA and the University of Oklahoma. Additionally, NSSL conducts collaborative research with the NWS, other NOAA Research laboratories, North Carolina Sea Grant, the U.S. Navy, Air Force, Army, Department of Transportation, Federal Aviation Administration, the University of Oklahoma, Texas A&M University, Texas Tech University, the Chickasaw Nation, and several corporations.

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