Forecast and Warning Improvements

National Severe Storms Laboratory
Forecast and Warning Improvements

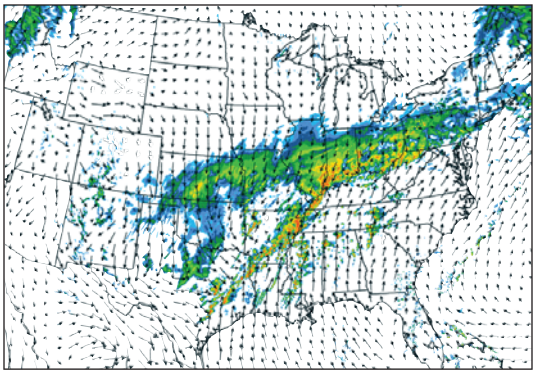
NSSL studies thunderstorms from many different points of view. Research scientists use computer modeling, direct observation through field studies, and past weather data in order to better understand when and where severe weather will occur. This knowledge will improve the accuracy and amount of lead-time of forecasts and warnings issued by the NOAA National Weather Service (NWS).

NOAA Hazardous Weather Testbed

NOAA's Hazardous Weather Testbed (HWT) was formed in Norman to team up severe weather researchers and operational forecasters. The focus of the HWT is the annual spring experiment. From mid-April through early June, researchers and forecasters from around the world gather in Norman to exchange information and experiences. Researchers share new scientific and technological advances, and forecasters evaluate and critique new products on their usefulness in forecast and warning operations. The HWT is managed by NSSL, the Storm Prediction Center and the Norman National Weather Service Forecast Office -- all sharing a commitment to improve severe weather watches and warnings for the public.

Forecast models

Meteorologists rely on computer predictions, or models of the atmosphere, to shape their weather forecasts. NSSL helped develop ensemble prediction–a method that groups weather forecast models, each using slightly different mathematical rules or starting points. When forecasters compare the different results they can see the odds that certain weather conditions will occur and determine the most likely forecast for a location. These efforts will provide more complete information to forecasters, helping them extend warning lead times for high-impact severe weather events.



NSSL is collaborating on the Weather Research and Forecast model that will provide real-time high-resolution guidance for forecasters. (Radar image from Super Tuesday tornado outbreak in February 2008.)

Improved radar scanning strategies

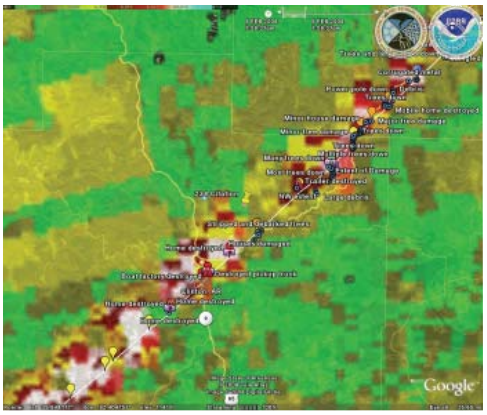
NSSL researchers, together with staff of the National Weather Service's Radar Operations Center, develop radar scanning strategies to provide faster and more detailed Doppler radar data for NWS forecasters. These strategies include plans to lower the beam of the radar–especially for those radars located on mountain tops–so radars can scan closer to the ground where hazardous weather directly affects the public. The new scanning strategies could lead to earlier detections and warnings of threatening weather conditions.

WDSS-II

NSSL's Warning Decision Support System-Integrated Information (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.

NSSL On-Demand

NSSL developed On Demand, a web-based tool to help confirm when and where severe weather occurred by mapping circulations or hail detected by radar on Google Earth satellite images. NWS forecasters can quickly review warnings and check their accuracy with this system. Emergency responders and damage surveyors have also used On-Demand to produce high-resolution street maps of affected areas, so they can more effectively begin rescue and recovery efforts and damage assessments.



The NSSL On-Demand system was used by NWS forecasters to help with damage surveys and to verify warnings following the Super Tuesday tornado outbreak in February 2008. This display corresponds to the damage in the picture below.

Four-dimensional Stormcell Investigator (FSI)

Researchers at NSSL and the University of Oklahoma/Cooperative Institute for Mesoscale Meteorological Studies developed the Four-dimensional Stormcell Investigator, a prototype 3-D/4-D base radar data display tool. FSI, part of NSSL's WDSS-II, allows users to "slice and dice" storms and manipulate dynamic cross-sections of radar images in 3-D and across a time period. Forecasters involved in the initial testing of FSI found the tool to be very useful in the warning decision-making process. FSI has now been implemented at all NWS Forecast Offices.

Understanding severe weather climatology

NSSL researchers developed techniques to determine the average likelihood of when and where severe thunderstorms and tornadoes occur in the U.S. Accurate estimates of the true threats from severe weather are of interest to a wide range of users, including weather forecasters, the emergency management community, the insurance industry, and the general public.

Scientists studying storm electricity get ready to launch a balloon carrying instruments designed to measure the atmosphere near a storm during the TELEX field program.

Field research programs

One of the ways to learn about the nature of severe storms and tornadoes is to observe them – and sometimes that means going out to meet the storms. NSSL is a pioneer in the area of studying storms where they occur, and scientists have developed cutting-edge tools to take special measurements in the field. NSSL uses Doppler radars mounted on trucks, cars with weather instruments on top, special cameras, and weather balloons with instruments attached to measure storm electricity and the atmosphere. Recent field programs include the Thunderstorm Electrification and Lightning Experiment (TELEX), the Bow-Echo and Mesoscale Convective Vortices Experiment (BAMEX), and the International H20 Project (IHOP). Scientists are now preparing for VORTEX2, a National Science Foundation and NOAA-sponsored epic field program to study how tornadoes form and dissipate.

For more information, contact: Keli Tarp, keli.tarp@noaa.gov
On the web: http://www.nssl.noaa.gov/research/forewarn/
1/2009