



# National Severe Storms Laboratory

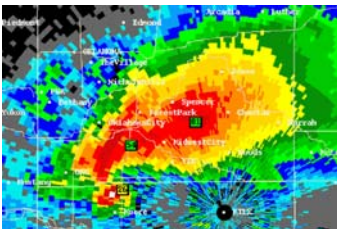
*Studying severe storms in the heart of "tornado alley"*



Experimental weather balloons are used to study the electrical structure of thunderstorms.



NSSL is dedicated to the study of all types of severe weather, including lightning.



NWS forecasters track storms using NSSL technology.



The first of many strong tornadoes strikes central Oklahoma on May 3, 1999.

## What does the National Severe Storms Laboratory do for the nation?

The National Severe Storms Laboratory (NSSL) leads the way in investigations of all aspects of severe and hazardous weather. Headquartered in Norman, Oklahoma, the people of NSSL, in close partnership with the National Weather Service, are dedicated to improving the lead time and accuracy of severe weather warnings and forecasts in order to save lives and reduce property damage.

Severe weather research conducted at NSSL has led to substantial improvements in both severe and hazardous weather forecasting resulting in increased warning lead times to the public. NSSL scientists are exploring new ways to improve our understanding of the causes of severe weather and ways to use weather information to assist National Weather Service (NWS) forecasters, as well as Federal, university and private sector partners.

## Recent Accomplishments:

- NSSL continues to be a pioneer in the development of weather radar. The lab is presently researching the use of dual polarization radar to improve precipitation measurements and hail identification. This upgrade to the current NEXRAD Doppler radar hardware provides more information about precipitation in clouds to better distinguish between rain, ice, hail and mixtures. **Payoffs: Such information will help forecasters provide better warnings for flash floods, the number one severe weather threat to human life.**
- NSSL is committed to incorporating cutting edge scientific understanding of severe weather signatures into tools designed to help National Weather Service forecasters make better and faster warning decisions. The latest tool, NSSL's Warning Decision Support System II, includes automated algorithm detection tools for the NEXRAD Doppler radar and other sensors to identify rotation in storms preceding tornadoes, likelihood and size of hail, as well as simply identifying and tracking storms. This information is presented in an easy to use display including tables, graphs interrogation tools. **Payoffs: Several of these tools have already been integrated into the National Weather Service's systems and have contributed to improved warning lead times with fewer false alarms.**
- NSSL worked directly with the National Weather Service to complete a significant upgrade to the NEXRAD WSR-88D Doppler radar. The Open Radar Product Generator's (ORPG) software and hardware were redesigned using open systems concepts, providing a system that is now capable of growing and adapting to meet the ever increasing demands of its users. NSSL was responsible for the design and implementation of the system software architecture. **Payoffs: The ORPG's redesign allows new science and technology to be transferred to NWS operations more quickly and dramatically lowers maintenance and future upgrade costs.**

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- Scientists from NSSL recently completed several field experiments to study severe and hazardous weather. IPEX, the Intermountain Precipitation Experiment, was designed to improve forecasts of winter weather, especially in the high population growth areas of the western United States. STEPS, the Severe Thunderstorm Electrification and Precipitation Study, focused a number of data gathering tools on thunderstorms in the high plains to better understand how rain and lightning are formed. In 2002, NSSL hosted the International H<sub>2</sub>O Project or IHOP, one of the largest weather-related studies ever conducted in the U.S. Scientists searched for swaths of water vapor and wind convergence bands that can fuel heavy rain across the southern Great Plains. **Payoffs: The knowledge gained through these field programs will lead to better forecasts of deadly weather phenomena including tornadoes, lightning, hail, flash floods, heavy snow, ice and freezing rain.**

### What's next for NSSL?

Phased Array Radar. NSSL researchers will soon begin adapting state-of-the-art radar technology currently deployed on Navy ships for use in spotting severe weather. Phased-array radar reduces the scan or data collection time from five or six minutes to less than one minute, potentially extending the average lead time for tornado warnings beyond the current average of 11 minutes. When combined with other technology being developed at NSSL, warning lead times may be extended even further.

National Weather Center. NSSL has a unique opportunity to combine facilities with the National Weather Service and several key university weather organizations also focused on severe weather research. Construction has begun on the National Weather Center, a new \$67 million facility that will become the premier severe weather research and forecasting complex in the world. The new building will increase collaboration and communication for the weather researchers and forecasters engaged in complimentary efforts toward better forecasts and warnings of severe and hazardous weather.

Improving the state of science. NSSL has also begun working on ways to improve short-term weather forecasting computer models for the National Weather Service, basic tornado research to understand how tornadoes form, and real-time delivery of radar data to the meteorological community and interested partners. In addition, NSSL researchers continue to strive for an improved understanding of tornadoes and other severe weather by creating tools such as mobile Doppler radars employing the latest technology and by deploying radio-controlled aircraft carrying weather instruments into and around storms.

### 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 U.S. Navy, Air Force, Army, Department of Transportation, Federal Aviation Administration, Texas A&M University, Texas Tech University, and several large and small corporations.

### Budget and Staff

The FY 2003 enacted budget for the NSSL budget line totaled \$7.5M, and its request for FY 2004 totaled \$8.1M. NSSL supports approximately 42 Federal employees and 80 university employees, including students.



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