Field Research Projects

National Severe Storms Laboratory
Field Research Projects

NSSL researchers know the best way to learn about the nature of severe storms and their hazards is to observe them when and where they happen. NSSL field teams use radars mounted on trucks, cars with weather instruments on top, special cameras, and vehicles for launching weather balloons to observe and record the atmosphere in and around storms. Field research gives scientists a way to test new technology, check their theories, and propose new ideas. Most field observing programs require collaborating with other scientists and organizations, sharing costly instruments and equipment, and sharing the collected data. While analyzing the research may take years, every contribution is targeted towards improving hazardous weather forecasts and warnings.

NSSL's recent radar field projects

As NSSL develops radar technology, scientists go out into the field to verify that the radar is really seeing what is happening on the ground. They also evaluate and verify forecasts and warnings based on new radar technology. The **Joint Polarization Experiment (J-POLE)** in 2002 tested the capabilities of NSSL's experimental polarized Doppler radar. Intercept vehicles verified precipitation in the field and a T-28 research aircraft collected cloud microphysics data to help assess radar data and product quality. The **Phased Array SMART-R Spring Experiment (PASSE)** collected data in 2007 with a mobile radar for comparison with phased array radar data. The **Smart Adaptive Scanning Strategy Experiments (SASSE)** will be held spring 2009 to look for better ways to predict when storms will develop.

STEPS – SEVERE THUNDERSTORM ELECTRIFICATION AND PRECIPITATION STUDY (2000)
During STEPS, scientists collected data on low-precipitation supercell thunderstorms. One of their goals was to investigate how polarimetric radars can be used to estimate the type and amount of precipitation in storms.

Recent thunderstorm hazard field projects

Scientists collect data in the field to create a clearer picture of the thunderstorm process and to understand thunderstorm hazards better. Lightning, damaging winds, and tornadoes are all under intense study. The **Bow Echo and MCV Experiment (BAMEX)** was held in 2003 to collect data on bow echoes and mesoscale convective vortices using instrumented aircraft and mobile ground-based instruments. **The Thunderstorm Electrification and Lightning Experiment (TELEX 2003-2004)** launched instrumented balloons into thunderstorms to learn how lightning and other electrical storm properties are dependent on storm structure, updrafts and precipitation. NSSL researchers are now preparing for the **Verification of the Origins of Rotation in Tornadoes Experiment-2 (VORTEX2)**. The original VORTEX project was held 1994-1995. VORTEX2 is the largest field project ever to study how, when, and why tornadoes form, why some thunderstorms produce tornadoes and other do not, the structure of tornadoes, and the relationship of tornadic

TELEX – THUNDERSTORM ELECTRIFICATION AND LIGHTNING EXPERIMENT (2003-04)
The TELEX team made balloon soundings from a mobile laboratory to measure the electric field profile of thunderstorms. Scientists believe research like this will point to new ways for the National Weather Service to use lightning observations to improve forecasts and warnings of hazardous weather.

winds to damage. Up to ten mobile radars, dozens of instrumented vehicles, and a field command vehicle will all be deployed to the central plains during the spring of 2009 and 2010.

Recent precipitation field research

NSSL's hydrometeorology field research focuses on ways to pinpoint what precipitation will fall where, and how much there will be. The goal is to use this information to improve estimates of rainfall amounts to make flood and flash flood warnings better. NSSL has used a mobile Doppler radar to support the **USGS Debris Flow Early Warning System Demonstration Project** during winters in California since 2005. Researchers are looking for ways to improve warnings of debris flows, or mudslides, in California, especially in areas recently damaged by wildfires. **PUFFS, the Phoenix Urban Flash Flood Study** combined measurements from five radars, including NSSL's shared mobile radar, to see if more detailed measurements improved flash flood forecasts and warnings in urban areas. The public has been involved in a field research project by reporting what precipitation is falling at their location for the **Winter Precipitation Identification Near the Ground (W-PING)** project. W-PING started in 2006 and has had thousands of volunteers call in reports of hail, snow, rain, freezing rain, or sleet in central Oklahoma. Radars cannot see close to the ground, so the information is compared with what the radars can see at higher levels.

History

NSSL scientists have a long history of studying some of the most challenging and threatening weather events. The Tornado Intercept Project during the 1970's marked the beginning of NSSL's efforts to study storms in the field. The storm intercept team observed and documented the entire life cycle of a tornado on film, and compared their observations with NSSL's experimental Doppler radar data. During the 1980's scientists began to collect data using instruments carried in storm intercept vehicles. The 1990's ushered in a new era of using mobile Doppler radars and instrumented vehicles together to document the near-ground weather conditions close to tornadoes.

The benefits of field research are many and successful results include the creation of the NEXRAD Doppler radar network, the pending dual-polarization upgrade to the network, and improved National Weather Service severe weather and tornado warning statistics.

IPEX–INTERMOUNTAIN PRECIPITATION EXPERIMENT (2000)
Scientists studied winter weather in Utah to better understand the structure and evolution of winter storms. Researchers used the data to validate precipitation estimates from radars located at high elevations and to improve forecast models used in mountainous regions.

VORTEX – VERIFICATION OF THE ORIGIN OF ROTATION IN TORNADOES EXPERIMENT (1994-1995)
The project was the first to use mobile Doppler radars and mobile mesonets to collect extensive data on the complete lifecycle of supercell thunderstorms.

TORNADO INTERCEPT PROJECT (1970s)
The Union City tornado in 1973 had a significant impact on the history of severe weather research and the development of Doppler weather radar.

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