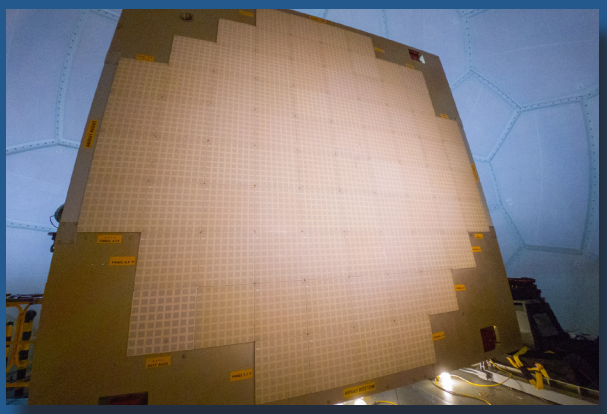
NOAA National Severe Storms Laboratory

the future of weather radar



The nation's radar network continues to be the National Weather Service's prime observation system for acquiring information about tornadoes and severe storms.

The current WSR-88D national radar used to track storms and issue weather warnings became operational in the early 1990s and is undergoing a service life extension program, or SLEP, to preserve the $3.1 billion capital investment. This investment will extend the viability of the aging radar system until around 2040.

NOAA's National Severe Storms Laboratory (NSSL) continues to update the WSR-88D, also known as NEXRAD. NSSL's research efforts include ongoing software and system modifications such as improving radar scan strategies to more thoroughly and frequently gather data from threatening features such as tornadoes, large hail, and high winds. In addition, NSSL is fully exploiting new technologies and data-processing capabilities to improve radar-based estimates of precipitation rate, precipitation type, and even the size of precipitation particles, especially hail.

What comes next?

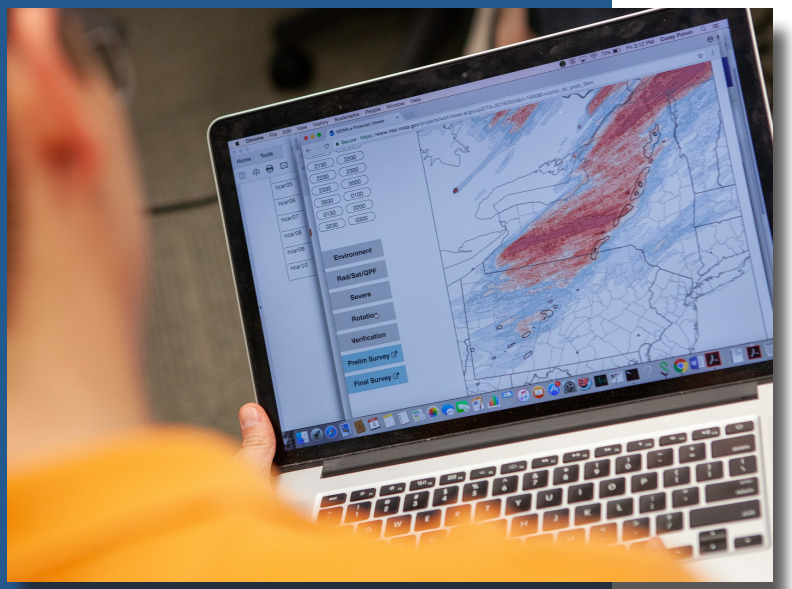
Building on the phenomenal success of NEXRAD, NSSL is leading a longer-term effort to develop the next generation of weather radars. The latest prototype, called the Advanced Technology Demonstrator (ATD), is a first-of-its-kind, dual-polarized, phased-array radar (PAR). PAR technology has long been limited to military applications. The new technology of a PAR can scan the atmosphere more quickly and selectively than NEXRAD radars, enabling earlier and better severe-weather warnings and more accurate initialization of storm-scale features in prediction models. NSSL meteorologists and engineers are currently evaluating the capabilities of the ATD and expect it to be fully tested and calibrated by spring 2021, suitable for intensive evaluation and research. Data collected with the ATD through the next several years will help determine if dual polarization is compatible with PAR technology and could offer a potential replacement for the WSR-88D.

Future advancements

If the ATD testing proves successful, it will move us one step closer to a final decision on a replacement for the remarkably successful NEXRAD radars. In order to allow sufficient time for fine tuning and production of an entire network of next-generation radars by 2040, this decision must be made by 2028. Preliminary indications are very encouraging, sug-

For more information, contact:
Mackenzie Solomon
National Oceanic and Atmospheric Administration
Office of Legislative and Intergovernmental Affairs
14th Street & Constitution Avenue, NW, Room 62012
Washington, DC 20230
Phone: 202.482.2497
Email: Mackenzie.Solomon@noaa.gov

updated 09/2020



In parallel with new radar development, the NOAA National Severe Storms Laboratory (NSSL) is working on high-resolution numerical models, like Warn-on-Forecast, to provide improved warning and forecast lead-times for the public. Models like the Warn-on-Forecast (WoF) System require accurate and frequent updating of radar data as input for forecasts. WoF aims to improve forecasts, warnings, and decision support for high-impact thunderstorm events within the watch-to-warning time frame, 0-6 hours in advance of an event. NOAA's future radar must provide the data needed to drive these improved forecast models.

NSSL's NOXP is a dual-polarized X-Band mobile radar, and is more sensitive to smaller particles than NEXRAD's C-Band radars. It is capable of detecting tiny water droplets or snowflakes. This mobile radar can be driven into position as a storm is developing to rapidly scan the atmosphere at low levels, below the beam of WSR-88D radars. NSSL has used mobile radars to study tornadoes, landfalling hurricanes, dust storms, winter storms, mountain rainfall, and even swarms of bats.

The Advanced Technology Demonstrator is the next advancement in radar research. It was installed in 2018. The ATD is the first experimental radar at NSSL built specifically for weather, shifting the Lab's long history of adapting military radars for weather. A former defense radar led to the discovery of a radar pattern showing tornado formation. This pattern, known as the Tornado Vortex Signature, is still used by NWS to issue tornado warnings. This radar led to the development of NEXRAD. Next to it is the now decommissioned SPY-1A phased array radar. The SPY-1A, a former Navy radar, was modified as a weather radar and used rapid-scanning technology to observe the atmosphere. It was able to provide faster and more accurate warnings for severe and hazardous weather.

updated 09/2020