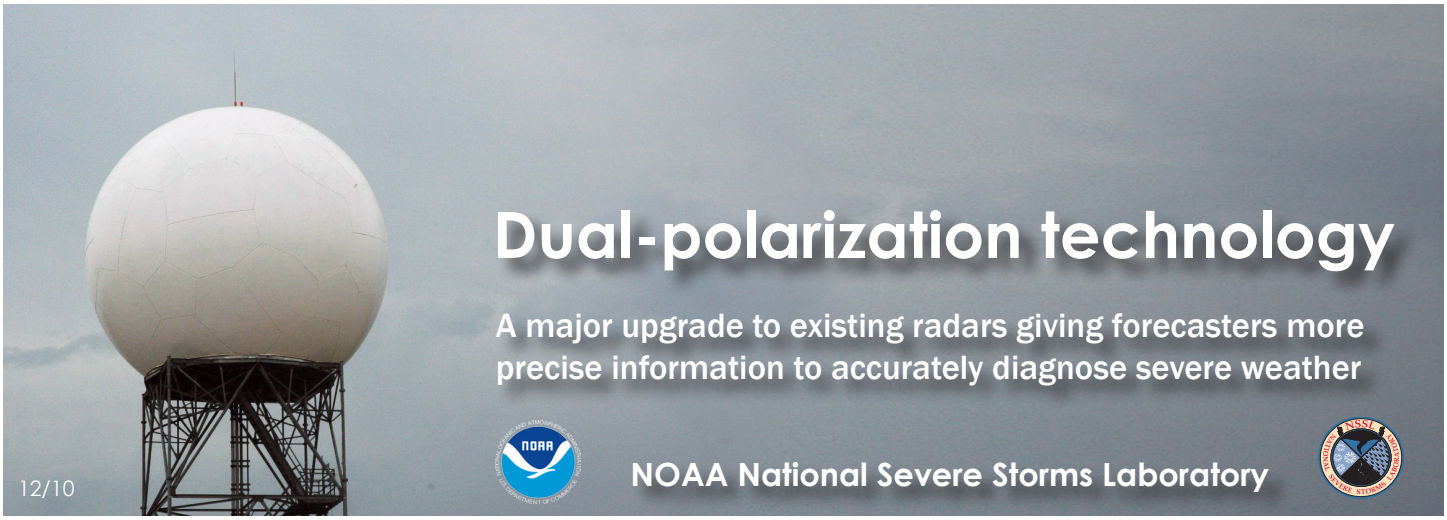


Dual-polarization technology

A major upgrade to existing radars giving forecasters more precise information to accurately diagnose severe weather

12/10

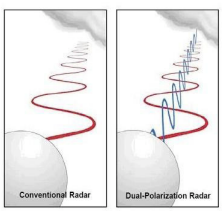
NOAA National Severe Storms Laboratory

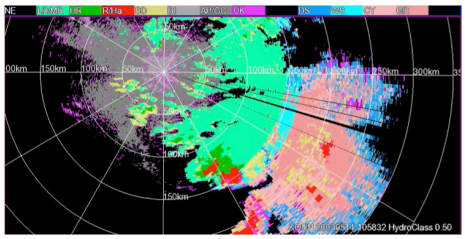
NSSL leads the way

For over 25 years, NSSL has been a leader and major contributor to the scientific and engineering development of dual-polarized weather radar. This long history of accomplishment will be rewarded in early 2011 as the NOAA National Weather Service (NWS) begins a major upgrade to all of their weather radars using this technology.

How does it work?

Current NOAA NWS radars give forecasters an idea of how intense precipitation is, which way it is moving and how and how fast. The radars send a horizontal electromagnetic wave field into the sky. When the wave field bounces off an object in its path, the energy is reflected back to the radar and gives a measurement of the horizontal size of that object. The picture becomes much clearer when electromagnetic wave fields are sent at a 45° angle. As these angled fields bounce of an object and are received back at the radar, a computer program separates the fields into horizontal and vertical information. This 2-D snapshot now gives forecasters a measure of the size and shape of the object, and is called dual-polarization technology.





Each color in this dual-polarized radar display indicates a different kind of precipitation occurring.

Weather or not?

With dual-polarization technology, forecasters will be able to clearly identify rain, hail, snow, or ice pellets like never before. This will give forecasters more confidence to accurately assess weather events because they will have more information to forecast what kind of precipitation there will be and how much to expect.

A better weather picture

Radar energy fields bounce off anything in its path, including weather, birds, bats, bugs, and ground targets. It is difficult to address and clean-up these issues using current radar technology. Dual-polarization radar technology can tell the difference between these targets and provides efficient ways to improve data quality. Forecasters will have a much cleaner radar display, allowing them to focus on the weather.

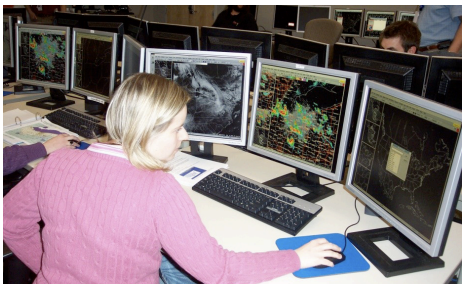
Tornado debris detection

Dual-polarization radar technology can also easily detect the presence of random shaped and sized targets like leaves, insulation or other debris, giving the forecaster a high degree of confidence that a damaging tornado is on the ground. This is especially helpful at nighttime when tornadoes are difficult to see with the human eye.

NSSL's fingerprints

Dual-polarization weather radar data and products from the research dual-polarized radar was first delivered to the Norman Weather Forecast Office in 2001 and 2002. The following spring, NSSL conducted the Joint POLarization Experiment (JPOLE) to test the added value of real-time dual-polarized data and products in the forecasting environment. NSSL's effort was rewarded in 2003 when the NWS approved taking the first step towards upgrading the current operational weather radar network to include dual-polarization capabilities. After many years of preparation, the NWS is now ready to begin the national upgrade of all its radars.

Dual-polarization technology will benefit:



Meteorologists

- Dual-polarization radar can significantly improve the accuracy of the estimates of rainfall amounts
- Dual-polarization radar can tell the difference between very heavy rain and hail, improving the accuracy of flash flood watches and warnings
- Dual-polarization radar can identify types of precipitation in winter weather events, providing up-to-the-minute information on where it is snowing, raining, sleeting, or icing
- Dual polarization radars can reduce the effects of non-weather targets on radar data displays
- Dual-polarization radars have the ability to identify debris from a damaging tornado, providing confirmation in the location and danger of an ongoing tornado, even when storm spotter reports are not possible due to night time or low visibility near the tornado
- Increased confidence in the understanding of what kind of precipitation or non-precipitation targets are out there may contribute to increased lead time in flash flood, winter, and severe weather events

Hydrologists

- Dual-polarization radar provides vastly improved rainfall estimation information for stream flow forecasts and river flooding
- Dual-polarization radar could be useful in water management

Aviation users

- Dual-polarization radar detects aviation hazards such as birds
- Dual-polarization radar can detect aircraft icing conditions
- Dual-polarization radar provides accurate, up to the minute information about the type of precipitation occurring at and around an airport, and is able to provide vital lead time on when conditions might change

Society

- Dual-polarization radar has the potential to save the public $690 million annually by improving precipitation estimation
- Dual-polarization radar can improve forecasts and warnings and reduce the impact of hazardous weather on our national transportation
- Dual-polarization radar better equips forecasters to issue accurate warnings and in turn helps the public make wiser decisions about our safety

On the horizon

Dual-polarization technology extends the lifetime of existing NWS radars. On the horizon, NSSL is developing an accurate way to estimate hail size from dual-polarized data, ways to identify when and where freezing rain will occur, and how to measure snow.

Key dates

2002-2003
National Severe Storms Laboratory conducted the Joint Polarization Experiment (JPOLE) to demonstrate and evaluate dual-pol technology

January-March 2011
Beta Test installs in:

- Wichita, Kansas
- Phoenix, Arizona
- Ft. Polk, Louisiana
- Newport, North Carolina
- Chicago, Illinois

April 2011-March 2013 Deployment to remaining sites

For more information:

NOAA National Weather Service Warning Decision Training Branch
www.wdtb.noaa.gov/modules/dualpol

NOAA National Weather Service
www.weather.gov

NOAA National Severe Storms Laboratory
www.nssl.noaa.gov/research/radar/dualpol.php