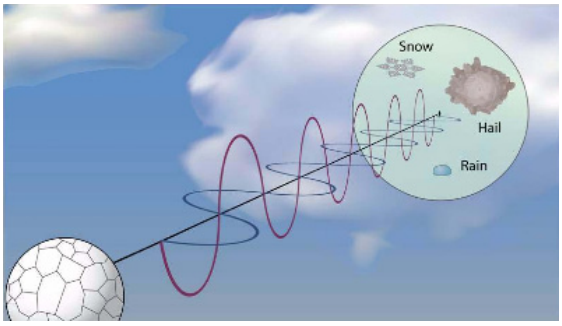
NOAA National Severe Storms Laboratory

Dual-pol radar technology

NSSL has invested nearly 30 years to research and develop dual-polarization radar technology now installed on all NOAA National Weather Service (NWS) radars, ahead of schedule and under budget. The NSSL dual-pol team has been nominated for a Department of Commerce Gold Medal for their achievement. NSSL now works on algorithms that can sort dual-pol radar data into types of liquid or frozen precipitation, and more accurately estimate precipitation amounts. Dual-pol can also detect and map debris balls caused by tornadoes producing damage on the ground.

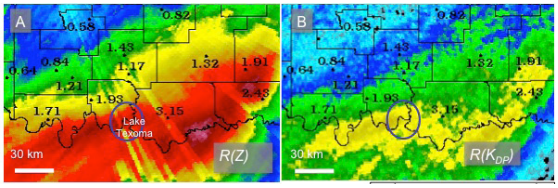
How does it work?

Before the dual-pol upgrade, NOAA NWS radars only received horizontal measurements of an object; now they receive both horizontal and vertical data. This 2-D snapshot tells forecasters if rain, hail, snow, or sleet is falling.



How much precipitation will fall?

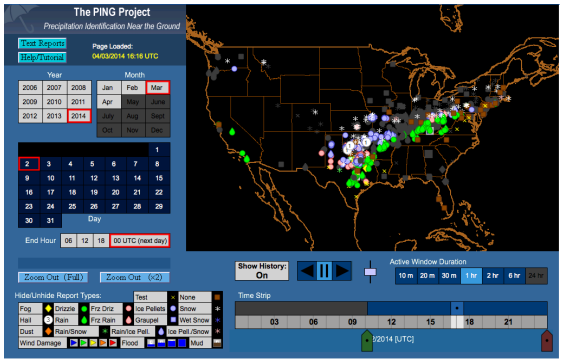
NSSL develops dual-pol radar algorithms that sort radar data into different types of liquid or frozen precipitation, and algorithms that estimate of how much precipitation will fall. In a recent study, researchers compared precipitation amounts measured by rain gauges with precipitation amounts estimated by dual-pol. They found that using dual-pol data improved estimates of precipitation amounts by 19% for all rain gauge amounts, and a 23% improvement for gauge amounts greater than 2 inches.



Dual-pol estimated up to 3 inches of rainfall in southern Oklahoma on this day but traditional radar measurements estimated more than 6 inches. 3.15 inches of rain actually fell.

mPING!

Anyone with NSSL/OU's "mPING" free smart phone app can be a citizen scientist and report weather at their location. Researchers will compare the crowd-sourced reports with what radars detect and use the information to improve new radar and forecasting technologies and techniques. Researchers hope to build a valuable database of tens of thousands of observations from across the United States.



mPING reports on a busy weather day! mPING has collected more than 500,000 reports since it was launched in December, 2012.

A cleaner weather picture

Radar energy fields bounce off anything in its path, including weather, birds, bats, bugs, and ground targets. Dual-pol can tell the difference between these targets, and NSSL develops algorithms that remove this data and other clutter from the radar display.

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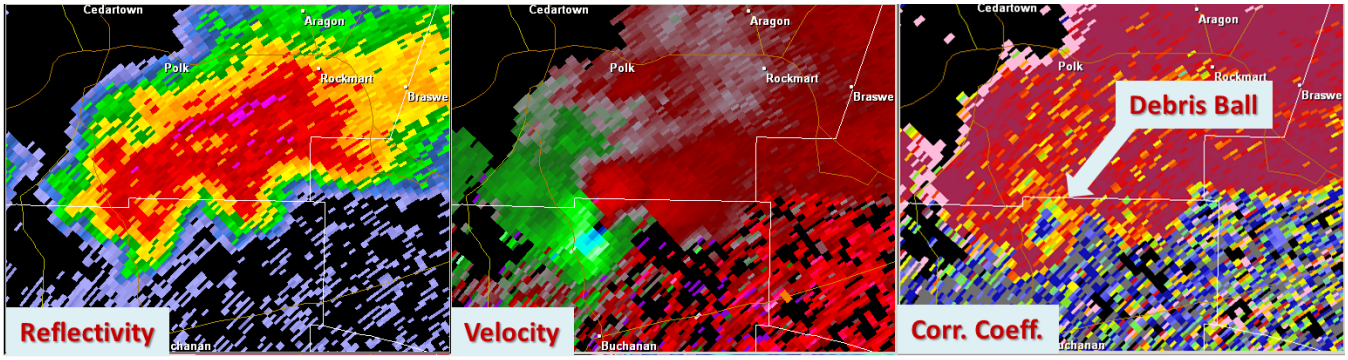
www.nssl.noaa.gov



Detecting tornado debris

NSSL first discovered the Tornado Debris Signature (TDS) in 1999, while monitoring a tornado outbreak using an experimental dual-pol radar. The radar detected the presence of random shaped and sized targets such as leaves, insulation, shingles or other airborne debris, indicating a tornado on the ground producing damage. Now that all NWS radars have been upgraded with dual-pol technology, the NWS has found the TDS especially helpful at night or if the tornado is wrapped in rain and difficult to see. The image above shows a debris ball from a tornado on March 2, 2012 in Peachtree City, GA and that the information influenced their tornado warning.

Mapping tornado debris

NSSL's new Tornado Debris Signature algorithm uses dual-pol data to map the path of airborne debris to help with damage surveys and to give first-guess information to emergency responders about what areas may have been hit hardest. The image to the right shows the debris path of the Moore tornado on May 20, 2013. The lines outline areas of damage with red indicating the most severe.

Storm of the month

During the past three years as the dual-pol upgrades to the NEXRAD were being installed, the National Weather Service Warning Decision Training Branch hosted Dual-Pol "Storm of the Month" webinars. NWS forecaseters took turns giving short presentations sharing their experience using dual-pol during a particular event or on a relevant dual-pol topic. This provided NWS forecasters access to operational Dual-Pol subject matter experts, including NSSL researchers so that all shared lessons learned, best practices and areas of improvement.

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BULLETIN - EAS ACTIVATION REQUESTED
TORNADO WARNING
NATIONAL WEATHER SERVICE PEACHTREE CITY GA
814 PM EST FRI MAR 2 2012

THE NATIONAL WEATHER SERVICE IN PEACHTREE CITY HAS
ISSUED A

* TORNADO WARNING FOR...
  NORTHERN HARALSON COUNTY IN NORTHWEST GEORGIA
  NORTHWESTERN PAULDING COUNTY IN NORTHWEST GEORGIA
  SOUTHERN POLK COUNTY IN NORTHWEST GEORGIA

*  UNTIL 900 PM EST

*  AT 809 PM EST...DOPPLER RADAR CONFIRMED A TORNADO
17 MILES SOUTHWEST OF ROCKMART...MOVING EAST AT 40
MPH
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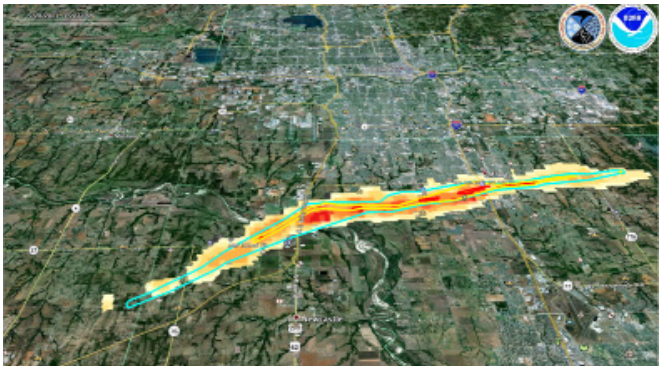
NWS forecasters in Peachtree City, GA used the dual-pol debris signature to confirm a tornado on the ground, and included the information in the text of the tornado warning.



NSSL's new Tornado Debris Signature algorithm shows the debris path of the devastating tornado that struck Moore, OK on May 20, 2013.