Forecast: Showers and Thunderstorms

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Measuring low-level moisture is expected to help forecasters pin down the location and timing of storms that might rage from a few minutes to a few hours later. Credit: University Corporation for Atmospheric Research

People planning baseball games, picnics, and other outdoor events may have more precise short-term forecasts of rainfall in the next few years, thanks to an observing strategy now being tested by atmospheric scientists at the National Center for Atmospheric Research (NCAR) in Boulder, Colo.

The effort, nicknamed REFRACTT (refractivity experiment for H_2O research and collaborative operational technology transfer), is for the first time using multiple Doppler weather radars to track water vapor in the lower atmosphere. Measuring the low-level moisture is expected to help forecasters pin down the location and timing of storms that might

rage a few minutes to a few hours later.

Along with the four radars, the project is using computer models, satellites, special launches of weather balloons known as radiosondes, and moisture sensors that intercept Global Positioning System (GPS) signals.

"REFRACTT extends the application of refraction of radio waves, and has the potential for completely transforming the accuracy of short-term weather forecasts," said Cliff Jacobs of NSF's Division of Atmospheric Sciences, which funded the project that began on June 5 and wraps up on Aug. 11.

Scientists are measuring how refraction--the bending of light as it passes through different substances, in this case, air and water--changes the speed of radar signals. That in turn reveals the presence or absence of atmospheric moisture.If it proves successful, the technique could be added in the next few years to the national network of Doppler radars operated by the National Weather Service (NWS), the researchers say.

"Nobody's ever seen such high-resolution data on moisture before. We believe this could greatly help forecasters predict where heavy rains might develop," said Rita Roberts, NCAR's lead scientist on REFRACTT.

Currently, NWS radars detect rainfall and winds but not water vapor.And because weather stations and weather-balloon launches are often separated by 50-100 miles or more, there is no regular monitoring of low-level moisture between surface stations. Strong contrasts in the amount of moisture often help to spawn intense storms, but the exact location of these differences is often hard to identify before storms develop.

When meteorologists use Doppler radar to track storms, they normally monitor signals that strike raindrops, hailstones, or snowflakes and bounce back toward the radar. The strength of the returning signals indicate the intensity of rain, hail, or snow, while the change in signal frequency reveals information about wind speed.

REFRACTT scientists are using fixed targets such as power lines and silos to see how much the radar signal is sped up or slowed down by variations in water vapor.

Forecasters at the Denver NWS office have used REFRACTT data this summer to monitor weather across northeast Colorado, including the risk of weak tornadoes that often spin up east of the Front Range.

Source: NSF