Video: Improved radar systems could save lives and money when severe weather strikes

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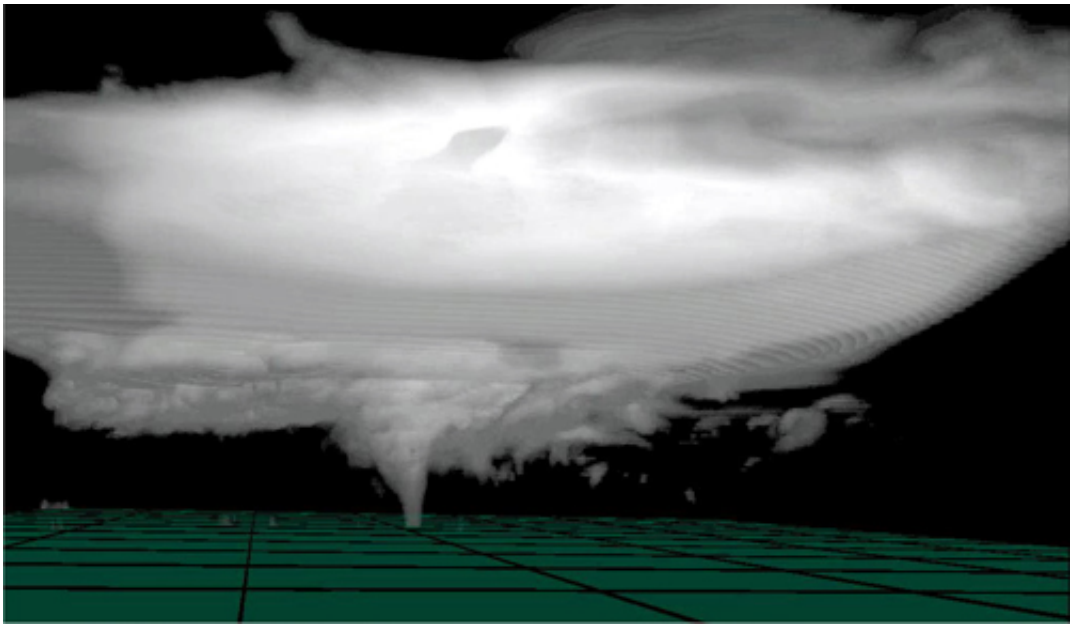

Tornadoes can be especially frightening and potentially damaging. They occur in many parts of the world, but most frequently in the United States, causing about 70 deaths and 1,500 injuries annually, according to the National Oceanic and Atmospheric Administration (NOAA). NSF-supported research into severe thunderstorms and tornadoes, particularly model development and observation field campaigns, often are collaborations with other agencies, such as NOAA. NSF's effort to better understand and more accurately predict tornadoes began on Feb. 1, 1989, when it announced it would fund the Center for Analysis and Prediction of Storms (CAPS) at the University of Oklahoma, The center's mission was to take computer weather prediction--until then and for several decades the mainstay of daily forecasting--down to the scale of individual thunderstorms and other high-impact local weather, aiming to provide more accurate predictions and longer warning times. The challenge CAPS faced in

1989 was simple but profoundly difficult to address. Doppler weather radar is the only observational tool that can provide information about wind speeds at fine scales, a critical element of storm prediction. Unfortunately, a Doppler radar, in addition to precipitation intensity, only measures wind speed along one dimension--a thin beam in the direction the radar is pointing. In addition, the radar provides only wind information where precipitation or other scattering particles are present. But numerical forecast models require all three dimensions of the wind, plus pressure, temperature, hydrometeor types (rain, snow, hail, for example), solar and terrestrial radiation, soil composition, land cover characteristics, and numerous other variables and parameters in both the areas of precipitation and clear air. Credit: Numerical simulation performed by Dr. Ming Xue, Center for Analysis and Prediction of Storms and School of Meteorology, University of Oklahoma; 3-D visualization created by Greg Foss, Pittsburg Supercomputing Center, with assistance from Ming Xu

A new generation of smaller, highly capable radar systems in the Dallas/Fort Worth area is able to track with more accuracy the location of tornadoes and other severe weather conditions, such as heavy rain and ice storms, compared to other systems. These new systems are spaced much closer together than current radar sensors, which are typically 100 to 200 miles apart. The closer proximity is part of the reason the new systems can catch a tornado that could be missed by current radar.

In 2012, NSF awarded nearly $6 million for eight emerging-technology projects that held the promise of resulting in technologies poised for commercialization. The grants, issued as part of NSF's Accelerating Innovation Research program, went to projects that aimed to create innovative products, processes and systems. Each project was focused on solving problems for various industries, ranging from energy and weather to healthcare and information technology. "The collaborations fostered by AIR will accelerate the translation from innovative research to market reality and strengthen the national innovation ecosystem," said Grace Wang, director of the Engineering Directorate's (ENG) Division of Industrial Innovation and Partnerships (IIP) at the time the projects were announced and currently deputy assistant director of ENG. IIP funded the awards. "Partnerships and third-party investment are essential for successful technology translation, she added. The awards called for academic researchers to collaborate with private-sector partners as they began the development of new technology concepts. In addition, the AIR Research Alliance competition required researchers to obtain an equal commitment of resources for their projects from a company, a venture capital firm, an individual "angel" investor, or a federal, state or local government--or a combination of those entities. Credit: Sandra Cruz-Pol, UPRM-CASA

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Research Center award, the new technology was developed over 10 years by a multidisciplinary group of engineers and scientists at the Center for Collaborative Adaptive Sensing of the Atmosphere (CASA). The center is led by the University of Massachusetts, Amherst, with core partners Colorado State University, University of Oklahoma, University of Puerto Rico, and University of Colorado, Colorado Springs.

"Installing a system in Dallas/Fort Worth allows us to demonstrate the benefits of the system for urban flash flooding response," says V. Chandrasekar, CASA deputy director and a professor at Colorado State University.

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