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Researchers track tornadoes to boost emergency warnings

New low-power, low-cost radar designed by Colorado State University and its research partners will be used in studying tornadoes in one of the most tornado-prone areas of the country.

Some of the nation's leading electrical engineers, atmospheric scientists and computer science experts collaborated on the project.

In 2003, Colorado State teamed with universities across the nation in the National Science Foundation Engineering Research Center for Collaborative Adaptive Sensing of the Atmosphere, or CASA, to develop a network of radar systems. Ultimately, weather forecasters will be able to use the network to direct resources to regions where threats exist.

The first radar created from the CASA partnership, called CASA Radar 1, will be used for severe weather detection in Oklahoma's "tornado alley," which is east of the line between Oklahoma City and Norman. The region experiences about 22 tornadoes per year.

CASA Radar 1 was designed by researchers, faculty and students from Colorado State, the University of Massachusetts at Amherst, the University of Oklahoma and the University of Puerto Rico at Mayagez. The low-power radar is highly reliable, inexpensive, adaptive and can operate collaboratively in a system of similar radars.

V. Chandrasekar, Colorado State electrical and computer engineering professor, is the leader of the sensing stage of the project and also the deputy director in charge of research programs. Also assisting are University of Massachusetts graduate student Francesc Junyet, chief engineer, and students from the University of Massachusetts and Colorado State.

The CASA team worked with CSU-CHILL staff in April to test the newly designed radar next to the CHILL facility east of Greeley.

CSU-CHILL, the nation's most advanced weather radar research facility, supports the atmospheric science and engineering research communities by providing data and evaluating experimental techniques in remote sensing of the atmosphere.

The facility is jointly operated by the Colorado State departments of atmospheric science and electrical and computer engineering and is funded by the National Science Foundation and the state of Colorado.

CHILL is an S-band frequency radar that operates at 3 gigahertz. CASA's primary mission is to develop a Distributed Collaborative Adaptive Sensing radar network at higher frequencies such as X-band. The S-band frequency is used by the current nationwide deployment of weather radars; however, X-band is about three times the frequency of S-band. Such higher frequency is needed to make smaller and cheaper radars.

CASA's radar project consists of three test beds: the first in Oklahoma's tornado alley, the second in Houston to monitor and predict floods more accurately and the third in Puerto Rico to improve monitoring of floods produced by thunderstorms and hurricanes over the island. The second test bed,



led by Colorado State, also will strive to improve the monitoring of air pollution and air transport of chemicals.

In addition to individual university contributions, CASA funding included a \$17 million grant from the National Science Foundation, \$5 million from the commonwealth of Massachusetts and nearly \$6 million from corporations and other in-kind donations. CASA's industry partners include Raytheon, IBM, Vaisala, Vieux and Associates, and The Weather Channel. Government partners include the National Oceanic and Atmospheric Administration's National Severe Storms Laboratory.

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