



News Release

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UNIVERSITY OF OKLAHOMA ORGANIZATION AWARDED THREE GRANTS WORTH \$3 MILLION

NORMAN, Okla. – The University of Oklahoma Center for Analysis and Prediction of Storms recently was awarded three separate grants from the National Science Foundation and the Office of Naval Research that together total nearly \$3 million, with \$2 million designated for OU researchers.

Individually, the grants will focus on enhancing severe weather prediction, improving wildfire management and prediction and advancing the understanding and prediction of tropical cyclones, including hurricanes. All three grants are led by Ming Xue, CAPS director and a professor in OU's School of Meteorology.

"CAPS is one of the outstanding weather modeling centers in the United States and, indeed, the world, and is well known for its cutting-edge research efforts," said John Snow, dean of OU's College of Atmospheric and Geographic Sciences. "However, receiving three large grants in such key areas is extraordinary! Awards of these three competitive grants are an exceptional vote of confidence in CAPS' capabilities by colleagues and funding agencies around the nation."

The first grant is for a project titled "Collaborative Research: Enabling Petascale Ensemble-based Data Assimilation for the Numerical Analysis and Prediction of High-Impact Weather." The project will enable scientists and weather forecasters to efficiently use next-generation super computers to determine the current state of the atmosphere and predict, in real time, high-impact weather, including thunderstorms, tornadoes and hurricanes. Properly assimilating observations made using weather stations, balloons, radars, aircraft and satellite provides the starting conditions for the advanced weather models now in use. The predictions from such models can be no better than the initial picture of atmospheric conditions used to start them running.

"A computer capable of performing 10^{12} (1 million of millions) calculations per second will be deployed by NSF within two years, and so far, no weather prediction model can take full advantage of such a computer," said Xue. "This project stands to change that through close collaborations between atmospheric and computer scientists and supercomputing experts. It promises to significantly improve the accuracy of severe weather forecasting, as has been partially demonstrated in recent springtime forecast experiments conducted by CAPS, utilizing over 10,000 CPU cores at NSF supercomputer centers, and OU's Oklahoma Supercomputing Center Education and Research."

This four-year grant is a multi-institution collaboration involving OU, Oklahoma State University and the Pittsburgh Supercomputing Center, with OU acting as the lead organization. The total funding from NSF is \$1.2 million, with \$900,000 coming to OU. High-resolution numerical weather prediction and high-performance computing are traditional areas of strength for CAPS, a former NSF Science and Technology Center established to tackle this exact problem. Xuguang Wang, School of Meteorology assistant professor, Ronald D. Barnes, School of Electrical and Computer Engineering assistant professor, and Henry J. Neeman, Oklahoma Supercomputing Center for Education and Research director, are the co-PIs of the OU grant.

The proposal received the highest possible rating of “highly competitive” from the NSF review panel. Additional details on the project can be found at http://twister.ou.edu/PetaApps_Abstract.html.

The second grant will fund a project titled “Collaborative Research: CDI-Type II: Integrated Weather and Wildfire Simulation and Optimization for Wildfire Management.” In this project, Xue and other researchers will develop new models and computation methods that integrate weather prediction, wildfire simulation and data assimilation in ways that are optimal for effective wildfire response management, something which has never been done before.

The results of this project will aid wildfire managers in alleviating major losses caused by wildfires through robust firefighting resource management decisions and benefit other emergency response applications such as those in homeland security. The project also employs computational thinking to solve problems associated with complex natural systems.

The proposal was ranked by the NSF review panel as “among the very best that it reviewed.” The OU portion of the project will be managed by CAPS and serves to broaden CAPS’ research areas, while taking advantage of its modeling strength.

The grant is funded by the NSF Cyber-enabled Discovery and Innovation program. OU’s portion is part of a collaborative project with Georgia State University, Texas A&M University and the Oakridge National Lab, led by GSU. The total budget is \$1 million distributed over four years. Nearly half of that budget will come to OU. Xue and Yang Hong of the School of Civil Engineering and Environmental Sciences are OU’s PI and co-PI, respectively.

The third project receiving grant funding is titled “Prediction and Predictability of Tropical Cyclones Over Oceanic and Coastal Regions and Advanced Assimilation of Radar and Satellite Data for the Navy Coupled Ocean-Atmosphere Mesoscale Prediction System.”

For decades, prediction of the structure and intensity of hurricanes has improved very little, due in a significant part to the lack of sufficient model resolution, inadequate observations of the interiors of hurricanes and ineffective use of such observations. This project aims to address this problem.

In collaboration with the Naval Research Lab – Monterey, a research team led by OU School of Meteorology professors Xue and Guifu Zhang and CAPS scientists Keith Brewster and Fanyou Kong, will address the tropical cyclone structure and intensity prediction improvement problem by developing advanced data assimilation capabilities and by studying the predictability of tropical cyclones, which will in turn provide guidance to optimal prediction system design and data assimilation improvement.

The economic benefits of improved hurricane and typhoon forecasts are apparent after seeing the effects of Hurricane Katrina in 2005 and most recently Typhoon Morakot over Taiwan. The project also helps CAPS extend its areas of research into tropical weather systems.

The grant is funded by the Office of Navy Research through the Defense Experimental Program to Stimulate Competitive Research program, at \$476,000 plus a \$100,000 match from the Oklahoma State Regents for Higher Education and OU.

About CAPS

CAPS was established at OU in 1989 as one of the first 11 NSF Science and Technology Centers. It is currently located within the National Weather Center in Norman, Okla.

CAPS works to develop and demonstrate techniques for the numerical analysis and prediction of high-impact local weather and environmental conditions, with emphasis on the assimilation of observations from Doppler radars and other advanced in-situ and remote sensing systems.

CAPS conducts a broad-based program of basic and applied weather research, and its award-winning Advanced Regional Prediction System is used worldwide.

For more information about CAPS, visit <http://www.caps.ou.edu/>.

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Center for Analysis and Prediction of Storms

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