

New research may lead to better climate models for global warming, El Niño

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One hundred fifty scientists from more than 40 universities in nine countries are starting a coordinated program aimed at gaining new insights about the Earth's climate and the complex, interconnected system involving the oceans, the atmosphere and the land.

The program will study the southeastern Pacific Ocean, the marine area off South America's west coast — a region where the interplay among low clouds, strong low-level winds, coastal ocean currents, surfacing of deep water, the Andes Mountains, aerosols and other factors shape the regional climate and affect global weather in ways that are poorly understood.

"Our research should produce a better understanding of the southeast Pacific Ocean system and improve our global computer climate models, which would lead to more confidence in climate forecasts, including predictions about global warming," said UCLA professor of atmospheric and oceanic sciences C. Roberto Mechoso, who chairs the program, known as VOCALS (VAMOS Ocean-Cloud-Atmosphere-Land Study). "Models currently used for climate change studies have systematic errors concerning the southeastern Pacific Ocean, and because the models are not accurate for such an extensive area, the El Niños they produce in the Pacific are questionable as well. We hope our research will get rid of, or at least greatly decrease, these uncertainties."

Variations in the southeast Pacific climate affect rainfall and temperature worldwide, directly or indirectly, Mechoso believes, but how the system works is not well understood and therefore cannot be modeled or predicted accurately.

"Despite its great importance to the Earth's climate system, the ocean-cloud-atmosphere-land system in the southeast Pacific has been sparsely observed," Mechoso said. "With VOCALS, that will

change drastically."

Will VOCALS increase our understanding of how much global warming will occur, and over what period of time?

"Absolutely," said Mechoso, an expert on El Niño who studies the coasts of Ecuador, Peru and Chile. "We may also produce a better understanding of the dynamics of El Niño. The relation between the eastern Pacific and El Niño is strong. El Niño develops in the eastern Pacific, so when the eastern Pacific is not well represented in climate models, El Niño is not well represented in the models either."

VOCALS has a scientific modeling program, headed by Mechoso, which seeks to improve model simulations of key climate processes, and an experimental field component, headed by Robert Wood, assistant professor of atmospheric sciences at the University of Washington. This intensive experimental field program will measure — using four aircraft and two research ships containing scientific instruments — how thick and deep the clouds are, where and why they open, and a variety of other elements to answer key scientific questions related to the climate system of the southeast Pacific region. One ship is from the United States, the other is from Peru; the scientists expect another ship from either Chile or Ecuador.

"There is tremendous analysis and modeling work that will go along with the field project," Mechoso said.

VOCALS is supported primarily by federal funding from the National Science Foundation and the National Atmospheric and Oceanic Administrations. Additional support comes from the U.S. Department of Energy and the Office of Naval Research, as well as Chile, Peru and the U.K. Meteorological Office, which provided a research aircraft.

VOCALS, which has a budget of more than \$16 million, will continue for three to five years, beginning in January 2008. The field program will begin in October 2008 off the coasts of Chile and Peru.

"I believe we have the right questions and the right hypotheses to guide our work," Mechoso said. "We will learn how the southeastern Pacific Ocean system works and find out ways to improve the performance of our climate models."

Mechoso's own research project within VOCALS, in collaboration with the National Center for Environmental Prediction, aims to improve the model that is used by the United States for seasonal climate prediction. The "V" in VOCALS represents an acronym: VAMOS, or Variability of the American Monsoon Systems. Mechoso was the first chair of this panel of the World Climate Research Program, which identified the eastern Pacific as an area where improvement in climate models is essential.

The scientists in VOCALS are also trying to learn more about the role of aerosol in cloud behavior and climate.

"The role of aerosol in climate is very complex and we are working very hard to capture aerosol effects in climate models," Mechoso said.

Particles in the atmosphere can directly influence radiation from the sun but can also have indirect influences on solar radiation by affecting cloud formation. The United Nations' Intergovernmental Panel on Climate Change (which shared the 2007 Nobel Peace Prize with former Vice President Al Gore) has emphasized the need to reduce the overall uncertainty in the calculation of climate-forcing by aerosol.

Source: University of California - Los Angeles

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