

## **Earth system scientists from UCSD/SDSC to participate in global change project**

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### UCSD/SDSC SCIENTISTS TO PARTICIPATE IN GLOBAL CHANGE PROJECT

Earth system scientists and computer researchers from the University of California, San Diego and the San Diego Supercomputer Center (SDSC) will participate in a proposed \$15 million project sponsored by Digital Equipment Corporation and the University of California.

The multi-campus project, approved by the UC Regents' Committee on Educational Policy today, is expected to develop an advanced information and data management system to better support the study of global change. The full Board will act on the recommendation Friday.

"This project presents a tremendous opportunity for significant advances in global change studies by putting the most advanced computer systems available in the hands of earth system scientists," said Edward A. Frieman, director of UCSD's Scripps Institution of Oceanography and a member of the project's steering committee.

"The challenge is to probe the complex interactions and feedbacks that link the components of the climate system, including atmosphere, oceans, and land surfaces, with the goals of understanding and predicting climate change," Frieman added.

Studying global change requires extremely large sets of data on solar radiation, ocean surface temperatures, atmospheric chemistry, clouds and many other climate factors that are used in the numerical modeling of oceans and the atmosphere. Such information is used to devise what scientists call general circulation models (GCMs), which represent grids of variables denoting atmospheric, oceanic and land surface conditions. Currently, these models incorporate data sets on the order of one terabyte, or a trillion bytes of data. Future GCMs will require even larger amounts of computer storage and rapid access.

"By combining the earth system resources of the University of California campuses participating in the project with the computer expertise of both the University and Digital Equipment Corporation, we hope to learn to work with environmental data sets more effectively and efficiently," said Richard C. J. Somerville, director of the Scripps Institution Climate Research Division and one of the principal investigators for the project.

The Climate Research Division at Scripps is a group of about 30 scientists and staff devoted to research on understanding and predicting climate and related environmental changes on time scales of months to decades. The scientists conduct theoretical, observational and modeling studies of the earth system to investigate fundamental aspects of climate dynamics and global change caused by both natural and human forces. The group's participation in the project will focus on climate process studies and modeling for forecasts of regional and transient aspects of global change.

Daniel Sulzbach, executive director of SDSC, said one of the main goals of the project will be to help the global change scientists share large amounts of information over long-distance computer networks. Sid Karin, director of SDSC, also serves on the project's steering committee.

SDSC's effort will require the creation of a variety of new software packages and tools for operating systems, networking, mass storage and visualization.

"The project will allow global change scientists to interact with computer scientists so they both can start to address the problems entailed with handling massive amounts of data," Sulzbach said.

For example, global change scientists working at different institutions are likely to use varying graphics software packages, displaying their results on different kinds of workstations. Visualization is a crucial step in the modeling process, where the vast amounts of information and numbers are translated into pictures.

"One area we will be researching is making it easier to exchange this visual information, even though the images the scientists want to exchange are in different formats," said Sulzbach.

Michael Bailey, director of the Advanced Scientific Visualization Laboratory (VisLab) at SDSC, will direct the visualization aspect of the project.

UCSD researchers also are working to increase the effectiveness of high-speed networks to handle massive amounts of data.

The project offers a two-pronged challenge for networking, according to Joseph Pasquale and George Polyzos, both with UCSD's Department of Computer Science and Engineering.

First, the information to be transmitted, exchanged, manipulated and stored promises to be voluminous. Second, the information is expected to be shared virtually instantaneously -in real-time.

To accomplish these goals, the computer researchers will work to develop new networking protocols and alter existing operating systems to keep digital traffic moving across the system, while avoiding information bottlenecks.

In this aspect of the project, Pasquale and Polyzos will collaborate with Hans-Werner Braun, of SDSC; and Domenico Ferrari, of UC Berkeley. If successful, the program is expected to move into a second, three-year phase.

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