Scientists Produce 3-D Models of BP Oil Spill in Gulf of Mexico Using Ranger Supercomputer

June 4 2010

(PhysOrg.com) -- Researchers at The University of Texas at Austin's Texas Advanced Computing Center (TACC) are using the Ranger supercomputer to produce 3-D simulations of the impact of BP's massive Gulf of Mexico oil spill on coastal areas.

With an emergency allocation of one million computing hours from the National Science Foundation TeraGrid project, the researchers are running high resolution models of the Louisiana coast to track the oil spill through the complex marshes, wetlands and channels in the area.

The researchers include Clint Dawson, professor of aerospace engineering and engineering mechanics and head of the Computational Hydraulics Group at the university's Institute for Computational Engineering and Sciences; Rick Luettich, professor of marine sciences and head of the Institute of Marine Sciences at the University of North Carolina in Chapel Hill; and Joannes Westerink, professor of civil engineering at the University of Notre Dame.

Dawson said he and his colleagues have access to highly accurate descriptions of the Louisiana, Mississippi and Texas coastlines due to earlier hurricane storm surge research.

"What our model can do that a lot of the other models can't do is track the oil spill up into the marshes and wetlands, because we have fine-scale

resolution in those areas," he said.

This kind of detail will help the scientists determine how the oil may spread in environmentally sensitive areas. The team's 2-D and 3-D coastal models also will take into account the Gulf of Mexico waves, which may bring the oil closer to the Texas coast.

Of chief concern is the possibility that a hurricane moving through the gulf may bring the oil inland. The team hopes to be able to provide support for disaster responders who may need to make emergency management decisions based on the computer models.

The primary reason for using Ranger is the massive scale of the data involved in this type of modeling and simulation. The researchers receive satellite imagery of the spill from the university's Center for Space Research and download meteorological data from the National Centers for Environmental Protection every six hours. They combine these data into a 72-hour forecast at 50-meter resolution, which is 10 to 20 times more detailed than many other models being run on the spill.

TACC Director Jay Boisseau said this is one of many emergency response efforts for which TACC has provided computational power.

"Ranger gives us the ability to support an immense amount of computational research while reacting quickly to urgent needs such as hurricane predictions, swine flu outbreak scenarios and this oil spill," Boisseau said.

For each model run, the Advanced Circulation Model for Oceanic, Coastal and Estuarine Waters simulation uses 4,096 cores on Ranger for three hours. The group has been performing between one and four simulations each day.

Gordon Wells, program manager for real-time satellite remote sensing at the Center for Space Research, is a technology adviser for state emergency management efforts. He said he is optimistic that the 3-D models will show how the oil spill interacts with underwater vegetation and provide a more accurate forecast of the environmental impact the spill will have in the coming months.

Provided by News from The University of Texas at Austin