US Army Corps
of Engineers
Engineer Research and
Development Center

News Release

Release No. V-11-08
For Release: **Immediate (5 Sept 08)**

Contact: Debbie Quimby, Public Affairs Office
Wayne Stroupe, Public Affairs Office
Phone: **(601) 634-3188 or (601_634-2404**

Waterways Experiment Station • 3909 Halls Ferry Road • Vicksburg, MS 39180-6199 • http://www.erdc.usace.army.mil

Advanced modeling provides critical surge data for New Orleans

As Hurricane Gustav bore down on New Orleans, a team of engineering experts was using an advanced surge model and supercomputers to provide critical information to decision makers entrusted with protecting the city.

"We had to be sure we got the right info, to the right people, at the right time," said Nancy Powell, chief of the Hydraulics and Hydrologic Branch of the U.S. Army Corps of Engineers New Orleans District.

Powell and Bruce Ebersole, chief of the Flood and Storm Protection Division at the Corp's Engineer Research and Development Center (ERDC) in Vicksburg, Miss., formed an ad hoc team of experts to model Gustav's storm surge and provide data and information to decision makers on the ground.

Storm surge

For New Orleans, accurately determining storm surge water levels is powerful information. This information can be used to make key decisions, such as when to close a canal to prevent storm surge from entering vulnerable areas like the 17th Street, Orleans and London Avenue outfall canals on Lake Pontchartrain, and the Harvey Canal Sector Gate.

During Hurricane Katrina in 2005, storm surge flowed up these canals and through breaches in the canal floodwalls, contributing to flooding in the city. Following Katrina, giant gates and pumps were installed at the mouths of the canals on the lake. These canals cannot simply be closed off during a storm because they also provide an important avenue for pumping out rainfall from low areas of the city. It is a delicate balance of if, and when, to close the canals.

Ebersole is very familiar with the impacts of hurricanes and storm surge on New Orleans. Following Katrina, he led a team that used the Advanced Circulation Model, or ADCIRC, to study that hurricane's deadly storm surge. Because of this work, there was a highly-accurate, validated computational representation of the New Orleans watershed and canal system (known as a mesh) for ADCIRC, a large amount of available storm data for the New Orleans area, and experts who had worked together well in the past and therefore knew the importance of information to be gained from running the ADCIRC model. So, when Gustav hit New Orleans, the key ingredients were in place to make an important contribution to the event's outcome.

- more -

Storm tracking and model runs

Once Gustav became a tropical storm and the National Oceanographic and Atmospheric Administration (NOAA) began making official track forecasts, Powell and Ebersole started gathering archival storm information from Katrina and long-term work being conducted along the Louisiana and Mississippi coasts. They then looked at existing storm information from Gustav, ADCIRC model runs from teammates Rick Luettich and Jason Fleming at the University of North Carolina, NOAA forecasts, and data collected from hurricane experts to determine what, if anything, was missing and how the team could provide additional data about surge and water levels to help authorities make decisions about gate closures or other critical determinations as the storm moved inland.

Ebersole knew, from his Katrina work, that storm size is an equally important factor to wind speed in generating surge. A key measurement of storm size used in ADCIRC modeling is the radius to maximum winds – Rmax – or the distance between the center of the hurricane's eye and the center of its band of strongest winds. This type of information is not a parameter provided in National Hurricane Center advisories and discussions, but is a critical parameter in the ADCIRC modeling. Ebersole used other NOAA data sources and other storm experts to make estimates of Rmax.

"We've seen great sensitivity of surge results to Rmax in archival storm data," said Powell. As Gustav unfolded, the experts requested ADCIRC model runs with 15-, 25-, and 35-mile Rmax values to see what would happen if the storm changed size.

During Gustav, NOAA released an advisory every six hours. The team incorporated any new data from the advisory into the ADCIRC run, which would take two hours to execute on supercomputer assets from ERDC, the University of North Carolina, Notre Dame, and Louisiana State University. Powell and Ebersole began to provide guidance to the modeling team on the set of Rmax values to use, based on what they had seen on the model runs and real-time water level data. They also examined the timing of peak water levels throughout the region as predicted by the model.

The first ADCIRC model run showed a rapid increase in water levels at some locations, such as Caernarvon and the Inner Harbor Navigation Canal. From local observations, the water had indeed begun to rise there, but big questions remained: "How high will it rise?" and "When will it peak?"

Questions like these caused the modeling and analysis to expand into a larger effort beyond canal surge information. Additional model output was plotted and the team made adjustments on the model runs as needed. "It's a very complex system," said Ebersole. "Any small variable changes a water level at a given location. It would have been very hard to do this modeling without existing information and local expertise."

- more -

The team worked 16 hours a day prior to Gustav's landfall, providing surge data at many locations, and the modeling effort continued after the storm made landfall in order to look at changes in surge elevations as the storm tracked inland.

An important revelation came late on Sept. 1, after the hurricane's landfall, and lessened Gustav's impact on New Orleans. Using data from the day's last model run, the New Orleans District decided to close the gates on the outfall canals.

"You (the expert team) predicted the Lake Pontchartrain surge was coming late, and it was just as you said," commented Col. Alvin Lee, New Orleans District commander. Closing the gates effectively prevented surge invasion, and the pumps successfully removed rainfall from the city and around the gates.

Ebersole, Powell and their team are extremely pleased with the results of ADCIRC model runs. "We provided the best answers we could from our expertise," said Ebersole. However, they hope to get even better information from Gustav. "ERDC, USGS, and Notre Dame put out instrumentation," Ebersole said. "The information gathered will help us refine future modeling."

Powell agrees. "We want to make this model more useful and appropriate, not only for the New Orleans Hurricane Protection system, but for other areas of the country, and for Corps assets, missions, and projects."