Survey reveals extent of Hurricane Ike's underwater damage to galveston

October 30 2008

Conducting a rapid response research mission after Hurricane Ike, scientists at The University of Texas at Austin surveyed the inlet between Galveston Bay and the Gulf of Mexico, discovering the hurricane significantly reshaped the seafloor and likely carried an enormous amount of sand and sediment out into the Gulf.

The ongoing research could help coastal communities gauge the effectiveness of their sometimes controversial efforts to replenish eroding sand along shorelines while revealing the role storms play in building and eroding barrier islands such as Galveston.

"The big question is whether the sand was entirely removed from the system or if it's still close enough to the shoreline to get back into the system," said John Goff, survey team member and senior research scientist at the university's Jackson School of Geosciences.

Goff and Mead Allison, another research scientist at the Jackson School, used the 60-foot research vessel R/V Acadiana to conduct a seafloor survey of the Bolivar Roads inlet just a week and a half after Hurricane Ike made landfall on the Texas coast. The inlet is the main passage between the Gulf of Mexico and Galveston Bay and is the route of the Houston Ship Channel as it passes between Galveston Island to the west and the Bolivar Peninsula to the east. The team used sonar to map the depth of the seafloor and seismic instruments to measure the thickness of sediments.

The researchers knew the area well having led a group of university students on a marine geology and geophysics field class to Galveston this summer, collecting the most recent pre-Ike seafloor mapping and sample data from Bolivar Roads.

"The timing of our previous study was fortuitous," said Goff, "adding to the practical and public benefit of our post-Ike data."

Hurricane Ike's surge last Sept. 13 filled Galveston Bay with 12 feet of water, which subsequently drained back into the ocean as a "back surge." Although considerable amounts of water flowed over the Bolivar Peninsula and other lower-lying portions of the barrier system, most of the surge and back surge likely passed through Bolivar Roads, by far the deepest access between the Gulf and the Bay. The very high rate of flow that must have passed through the inlet had the potential to cause substantial erosion and transport sediment long distances.

Comparing pre- and post-Ike surveys, the scientists determined the hurricane's surge and back surge significantly modified the seabed over broad areas. Ike either erased or substantially degraded large shell-gravel ridges up to 10 feet high. The storm gouged out sediments deposited hundreds of thousands of years ago to create "erosional pits" up to five feet deep in one area. It appears to have mobilized and redeposited sediments over large regions in a layer eight to 40 inches thick, and in isolated spots up to 6.5 feet thick. Most of the movement of sediments is associated with the back surge.

In conducting their post-Ike survey, the scientists are primarily interested in investigating the impact of the storm surges on the movement of sediment into and out of the beach barrier system. Maintenance of a barrier system requires an influx of sand, provided naturally by rivers such as the Mississippi. Human modifications to rivers by dams or levees disrupt the delivery of sand to the shore, which can cause the barrier

system to degrade.

Until now, the transport of sediments during large storms was a poorly known quantity. Surges could potentially boost the barrier island sand budget by delivering sediments to the shore face, or they could subtract from it by moving sand too far off shore to be incorporated into the barrier system. The pre- and post-Ike survey work will also identify any storm-affected changes to the inlet channel that could affect navigation.

Weather permitting, the team will conduct an additional survey Nov. 6-8 offshore of Bolivar Roads to identify the extent of storm-related deposition, and offshore of the Bolivar Peninsula, where aerial and satellite photos suggest significant amounts of surface erosion during the back surge and consequential deposition off shore. Jackson School researcher Sean Gulick will also participate in this extended effort.

Source: University of Texas at Austin