Post-Sandy, Long Island barrier systems appear surprisingly sound

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This is John Goff of the University of Texas Institute for Geophysics and Beth Christensen of Adelphi University on Stony Brook University's R/V Seawolf outside Manhattan shipping out to the sites of their offshore survey, January 2013. Credit: The University of Texas Institute for Geophysics.

As coastal communities continue to rebuild in the wake of Hurricane Sandy, scientists at this week's annual meeting of the American Geophysical Union offer some encouraging news: the storm did not seriously damage the offshore barrier system that controls erosion on Long Island. Long-term concerns remain about the effects on the region of sea-level rise, pollutants churned up by the storm within back-barrier estuaries, and the damage closer to shore, but in the near-term, Long Island residents can rebuild knowing that Hurricane Sandy did not significantly alter the offshore barrier systems that control coastal erosion on the island.

The findings are based on pre-storm survey data compared to post-storm data acquired through a collaborative rapid response science mission to the south shore of Long Island led by scientists at The University of Texas at Austin's Institute for Geophysics, Adelphi University, Stony Brook University and other institutions in the New York metro area. The purpose of the mission, conducted last January, was to assess the post-Sandy health of the offshore barrier system that protects the New York Harbor and southwestern Long Island region against damage from future storms.

The team conducted marine geophysical surveys of the seafloor and shallow subsurface to map the sedimentary impact of the hurricane on the beach/barrier systems of selected bay, inlet and nearshore areas of portions of the south shore of Long Island.

Using a CHIRP (compressed high-intensity radar pulse) sonar system and an even higher frequency seafloor mapping system supplied by Stony Brook University, the scientists used two research vessels to profile the seafloor and upper sediment layers of the ocean bottom. They surveyed three representative segments of the shoreface that protects Long Island, each segment about 15 meters deep, one mile offshore and roughly six square miles in size.

The storm, they found, did not significantly erode these sampled segments of shoreface.

"The shape of the bedforms that make up the barrier system did not change a whole lot," said co-Principal Investigator (PI) John Goff of the Institute for Geophysics. "Where we might have expected to see significant erosion based on long-term history, not a lot happened—nothing that ate into the shoreface."

"The sand largely took the blow," added co-PI Jamie Austin of the Institute for Geophysics. "Like a good barricade, the barrier system absorbed the significant blow, but held."

This was not the case in other storm-ravaged zones the Texas team has surveyed. When Hurricane Ike hit Galveston in 2008, the storm significantly disrupted the thin finer-grained sediment layer offshore, removing material underneath the shoreline in a way that exacerbated long-term problems of erosion.

Compared to Galveston, Long Island has a greater abundance of sand in its overall system. The storm churned up much of this sand and moved bedforms, but the scientists speculate that the greater abundance of sand helped the offshore barriers maintain their overall shape and integrity as erosional barriers.

Tempering this good news, the survey team also found evidence the storm brought new pollutants into the waters off Long Island. Heavy metals were detected in a layer of mud that the storm deposited offshore. Beth Christensen of Adelphi University traced the metals back to muds from the South Shore Estuary Reserve, which has a long history of pollution from industry and human habitation.

By this summer, natural forces had dispersed the layer of mud offshore, and the concentrations of toxins were not high enough to be an immediate concern, said Christensen.

"But if we continue to see more events like Sandy, we'll see the introduction of more and more muds from the estuary," said Christensen, "adding additional toxins to an already stressed system."

Continued sea-level rise will also create more pressure on the barrier system, heightening problems onshore. With higher sea level, all of the onshore impacts of a storm like Sandy will go up, notes Goff.

"In the long-term, if sea level gets high enough, the barrier system has no choice but to retreat and move landwards," said Goff, exposing the shoreline to increased erosion. "But at least for the present, there's no evidence of that being imminent."

The mission was the sixth rapid response science mission funded by the Jackson School of Geosciences at The University of Texas at Austin. (The Institute for Geophysics is a research unit within the Jackson School.) The missions place geoscientists on the scenes of natural disasters as quickly as possible to measure the often vanishing traces of hurricanes, earthquakes, tsunamis and other disasters.

"The faster we get out into the field to measure Earth's response to naturally destructive events, the better we can relate data to the disasters," said Austin.

Provided by University of Texas at Austin

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