Geological impacts on sediment transport and beach erosion in Fire Island, New York

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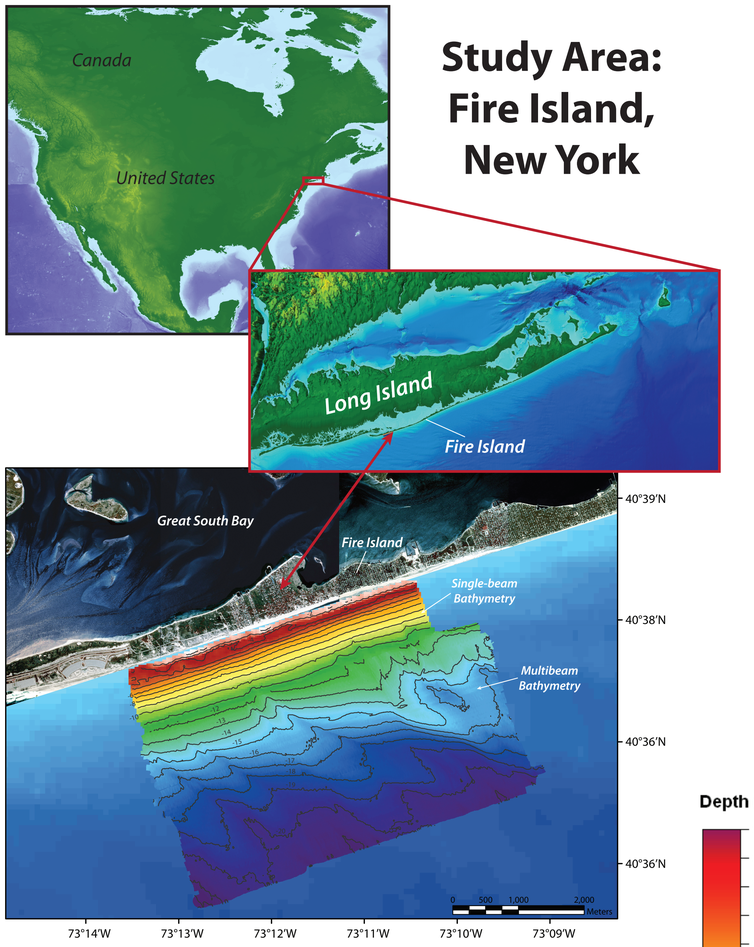
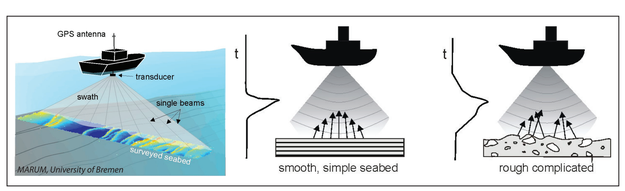
Study Area: Fire Island, New York



Fire Island is a narrow barrier island approximately 0.5 km wide by 50 km in length and 50 km from New York City, New York. The island experiences severe erosion and beach nourishment has been the primary method to combat erosion and prevent loss of property and infrastructure. Sediment transport is primarily to the west and sediment budget estimates are unable to account for all sediment entering the system. Single-beam and multibeam data was collected at two sites, Lighthouse and Watch Hill, to examine seafloor morphology and the connection between offshore ridges and nearshore sediment dynamics. This data set indicates offshore ridges composed of Holocene sediments consistent with sediment found on island beaches is a likely contributor to the sediment budget of Fire Island.

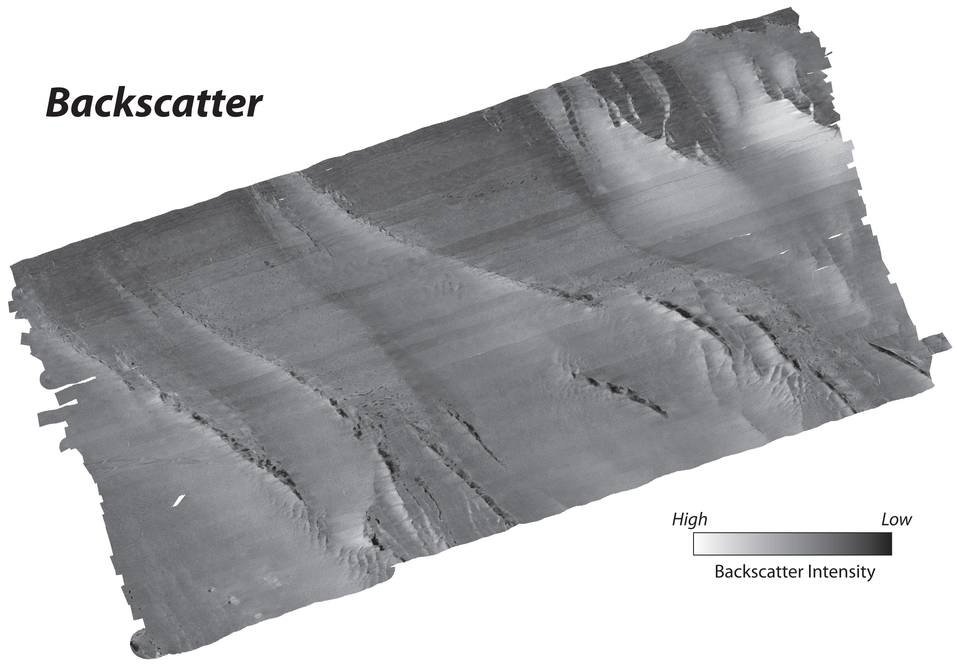
The detailed bathymetric and backscatter data is an invaluable tool for coastal resource managers in the region charged with managing the beach and nearshore regions. The data provides insight into the formation and stability of nearshore ridges as well as suitable borrow sites for nourishment projects. Alteration of the system could affect local hydrodynamics and would likely impact local erosion rates and future shoreline locations.



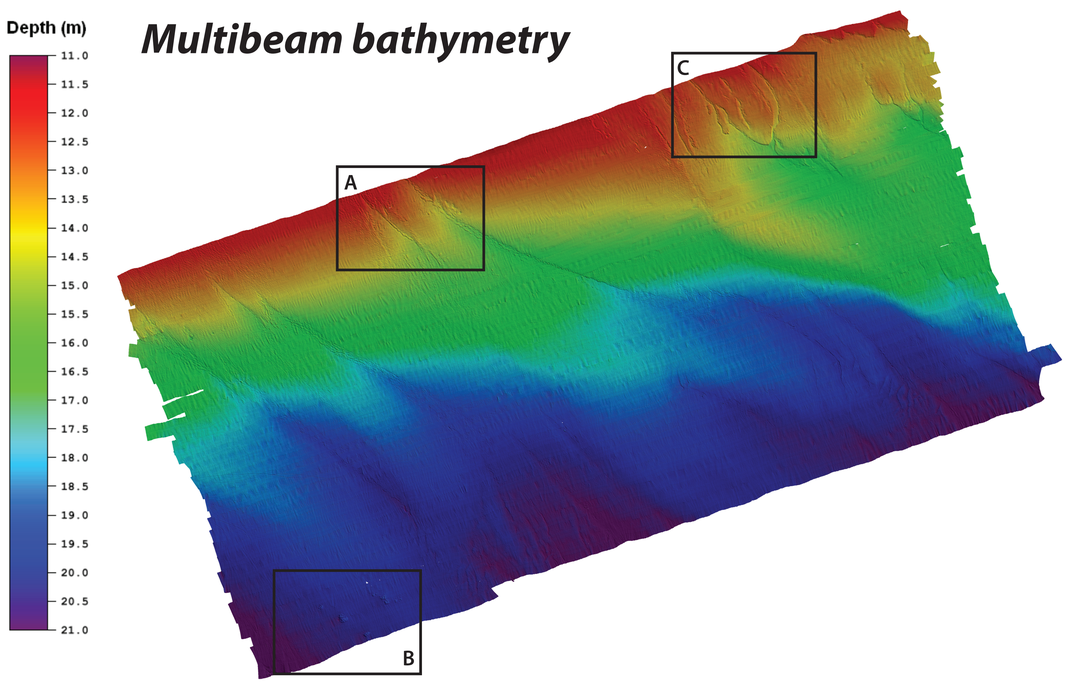
Multibeam echosounders use a swath of sound to measure the depth and morphology of the seafloor. Backscatter intensity is a measure of seafloor roughness.

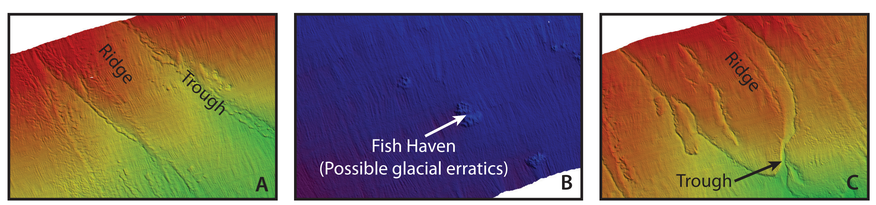
Seafloor Imagery

Backscatter



Multibeam bathymetry





Survey Methods

Coastal Carolina University's Privateer with a bow-mounted Kongsberg EM3002d dual-head shallow water multibeam bathymetry system.

Coastal Carolina University's BERM boat with a single-beam echosounder for shallow water bathymetry.

Data acquisition within 1 km of the coast was collected using a shallow water single beam survey boat equipped with RTK-GPS, a survey-grade single beam fathometer and a heave, pitch and roll sensor. The single beam grid was 100 m by 100 m for both shore parallel and perpendicular lines covering an area of 1 km offshore by 4.5 km alongshore. In deeper waters, 1 km – 4 km offshore, Coastal Carolina University's EM3002d dual head multi-beam sonar system was used to collect high resolution bathymetry and acoustic backscatter data. Single-beam data was collected and edited with Hypack software. Multi-beam bathymetry data was edited and analyzed using Caris HIPS and SIPS.