Waterborne electrical resistivity imaging (ERI) for assessing lake sediment thickness.

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The Illinois Lake Michigan coast is a very dynamic system. The heavily urbanized and engineered coast undergoes constant changes due to complex natural and anthropogenic activities. These activities significantly affect the volume, distribution, and thickness of sand on the nearshore lake bottom leading to challenging coastal management. The Illinois Coastal Management Program is prioritizing sand management to protect the natural and cultural resources along this important shoreline. Understanding sand sinks and extent of down-cutting will facilitate decision making regarding protection and improvements of critical coastal infrastructure. Identification of sand sources will aid in development of a regional sand redistribution model, allowing for comparison of economies and efficiencies of various beach nourishment methods.

Waterborne electrical resistivity imaging (ERI) was carried out as part of a larger project to address the coastal management issues in Lake Michigan. ERI focused on characterizing lake bottom sediment thickness along the nearshore. ERI proved to be a very efficient method for this task, covering large areas in short time while providing high resolution image of lake sediment thickness. The low conductivity of the fresh water lake allowed the acquisition of high quality resistivity and induced polarization data. Concurrent acquisition of bathymetry and water conductivity helped with data processing and inversion efforts. The shore parallel results show thicker sand layers on the south side of the waterborne study area, characteristic of north-south trending lake currents. A decrease in sand thickness is observed lakeward, suggesting lakebed down-cutting in sand-starved areas. These results are in agreement with large scale (airborne electromagnetics) survey and local coring.