

RECONSTRUCTING THE GEOMORPHIC EVOLUTION OF A FRESHWATER BAYMOUTH BAR IN RESPONSE TO LAKE LEVEL CHANGE USING THREE DIMENSIONAL (3D) GROUND PENETRATING RADAR (GPR) DATA

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Abstract

The St. Louis River baymouth bar is a 10 mile long sandy barrier located at the western tip of Lake Superior that stretches between Duluth, Minnesota and Superior, Wisconsin. Formed primarily from sandy sediment derived from the Wisconsin South Shore, it forms the outer breakwater for the Duluth-Superior harbor. Additional sources of sediment to the bar are the Nemadji and St Louis Rivers. Due to continuing differential isostatic rebound of the basin, local lake level at Duluth is presently rising at approximately 23.5 cm/century. The objective of this project is to understand how the baymouth bar has evolved in response to lake level change. Although it is a young, non-marine system in which hydrocarbons are not developing, this baymouth bar is a useful analogue for similar, much larger systems in basins experiencing sea-level change. Using an approach similar to that used to study the seismic geomorphology of a sand-prone marine system using three-dimensional (3-D) seismic data, the geomorphic expression of the baymouth bar's response to lake level change will be investigated using 3D ground penetrating radar (GPR) data. This data will be calibrated using sediment cores obtained with a vibracore. In addition to calibrating the GPR data, samples taken from the cores will be sent for Optically Stimulated Luminescence (OSL) dating. These dates will be used to establish a chronology for the evolution of the bar, making it possible to draw linkages between the various phases of the system and changes in local lake level.

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