Relationship of Deep Troughs in the Eastern Lake Superior Basin and Large-scale Glacioluvial Landforms in the Central Upper Peninsula of Michigan

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Introduction
Researchers have been aware of the unusually deep bedrock troughs in the eastern part of the Great Lakes for more than 100 years (Heald, 1906; Laidly, 1961; Seaborg, 1969). The troughs are some of the deepest features known and reach to bedrock and are filled with a variety of sediments (Hamblin, 1958). Despite their importance to a variety of ways, much detail concerning their origin remains uncertain. We present new data from the analysis of multibeam and sidescan images of several of these features to constrain their origin and evolution.

Bedrock Geology
The Lakes Superior basin is structurally controlled by faults that extend upward from the 12 km thick overlying sediments (Farrand and Zumberge, 1966). These faults are observed as linear ridges of seismically-chaotic sediment oriented parallel to the trench axis. The ridges are evidence of differential movement on the faults and indicate that the troughs are controlled by faulting (Farrand and Zumberge, 1966; Farrand, 1969). The trenches are present on both sides of the Michigan Basin and are oriented parallel to the trend of the Michigan Basin (Farrand and Zumberge, 1966). The trenches are coincident with the carbonate platforms and indicate that they are formed by glacial erosion of the carbonate platforms. The trenches are not filled with sediments except in the case of the Offshore Trough, which is filled with Holocene lake sediment.

Glacial geology
The trenches in the Upper Peninsula of Michigan are interpreted as partly filled bedrock valleys that are obscured by the overlying sediments. The trenches are not filled with sediments except in the case of the Offshore Trough, which is filled with Holocene lake sediment. The trenches are formed by glacial erosion of the carbonate platforms and are controlled by faulting (Farrand and Zumberge, 1966; Farrand, 1969).

Implications of the unexpected continuation of the trenches into the Lake Michigan basin
As part of our study we discovered that the trenches continue into Lake Michigan. These trenches were not recognized in previous work and were not considered in the modeling of the glacial history of the region. The trenches continue into Lake Michigan and are controlled by faulting (Farrand and Zumberge, 1966; Farrand, 1969).

Summary of the dynamic history of the ice in this region
Ice from the Michigan Basin continued into the Superior Basin and then into Lake Michigan. The ice was not stagnant and continued to move to the south and east. The ice was not stagnant and continued to move to the south and east. The ice was not stagnant and continued to move to the south and east.

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References