Extracting New Periglacial Lacustrine Information from the 1970 Flathead Lake Seismic Survey Data

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Method:
- Overlay calculated diffraction curves on the seismic sections to determine whether or not the observed patterns match mathematical predictions.

Problem:
- Are concave downward reflection patterns diffractions, from beds terminated by faults, or are they true reflections possibly from sedimentary beds that collapsed into “sinkholes” caused by melting of detached blocks of glacial ice?

Background:
Despite the age of the dataset, no systematic and quantitative analysis of the diffraction-like patterns has ever been done. In 1970, University of Montana facilities lacked computational resources and seismic processing tools for the analysis and correction of the diffractions. In addition, the embryonic nature of digital migration in the era of the Flathead Lake Seismic survey prevented a study of this type from being completed.

Interpretation Options:

Diffraction curve modeling for a velocity through Water saturated sediment (sand and clay) show that the observed data (a) in order to match the diffraction curve flanks with the observed data a velocity of (8,000 ft/s) must be used to approximate the observed pattern (b).

Bowers Velocity Model

Methods Continued: Bowers Velocity Model

V = 5000 + a(es)^b

Modeling Suggest there is more similarity between observed data and model of continuous reflections of collapsed sediment (a) Than between observed data and fault-caused diffractions (b). Diffraction curves (b) are less continuous and have steeper patterns than in the continuous reflector model (a).

Map View of Survey Area

References and Acknowledgements
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Conclusion:
With the help of modeling, the reflections data are interpreted to indicate collapse of a continuous sedimentary horizons, into a “sinkhole” that developed as a result of melting a grounded ice block that became detached from the retreating glacier.