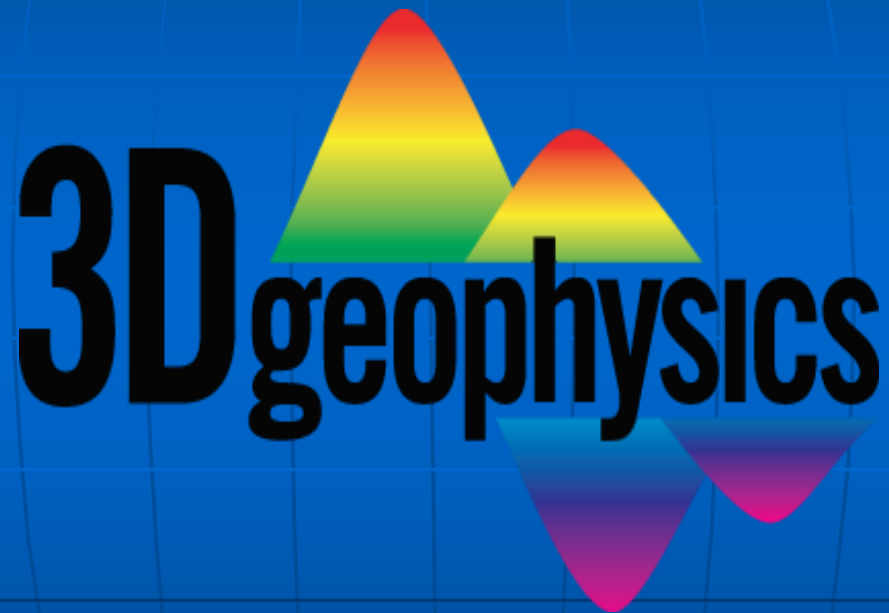


GEOPHYSICAL *Cut-Off Wall Evaluation*

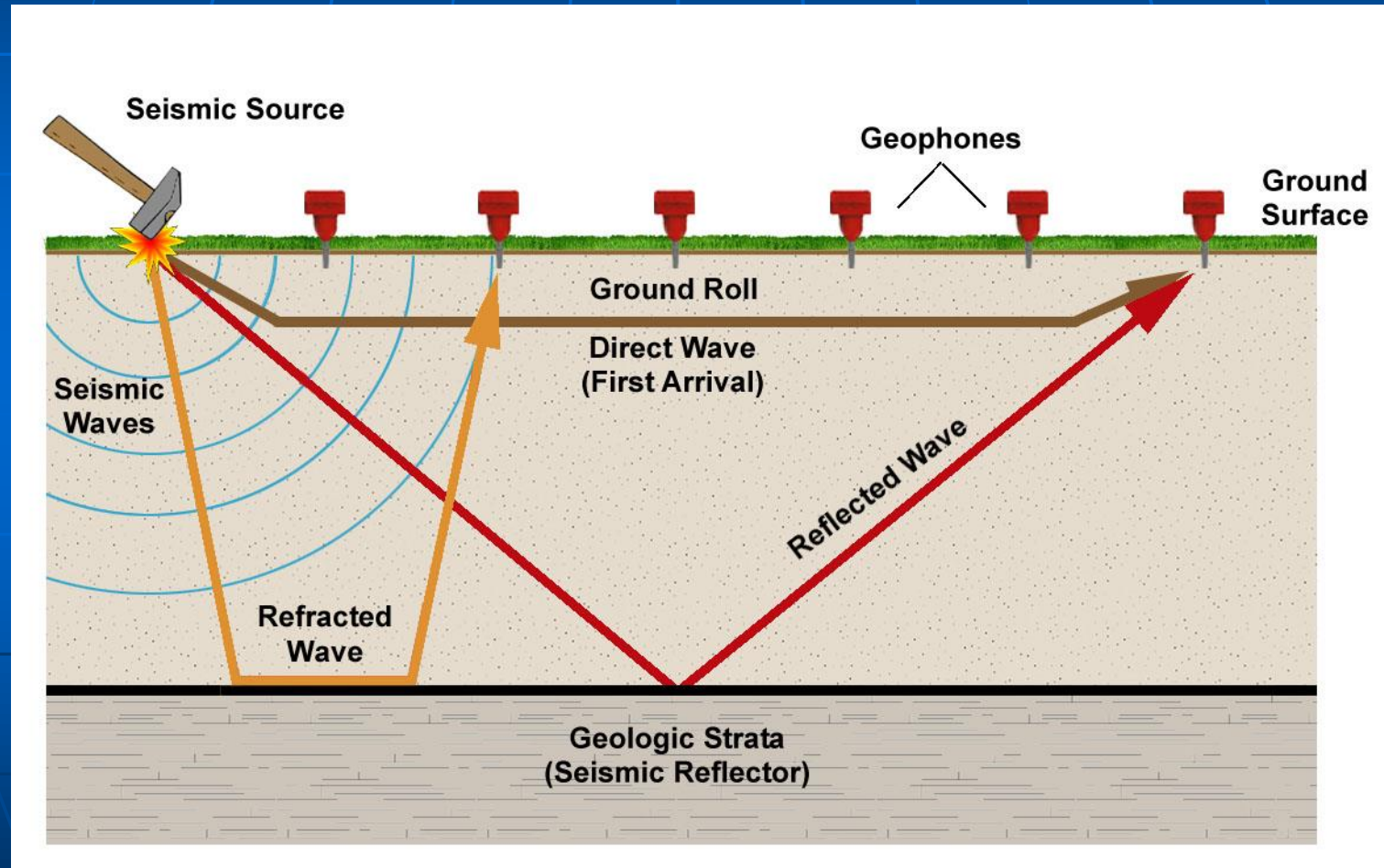
*High Resolution Seismic Imaging @ **St Antony Falls***



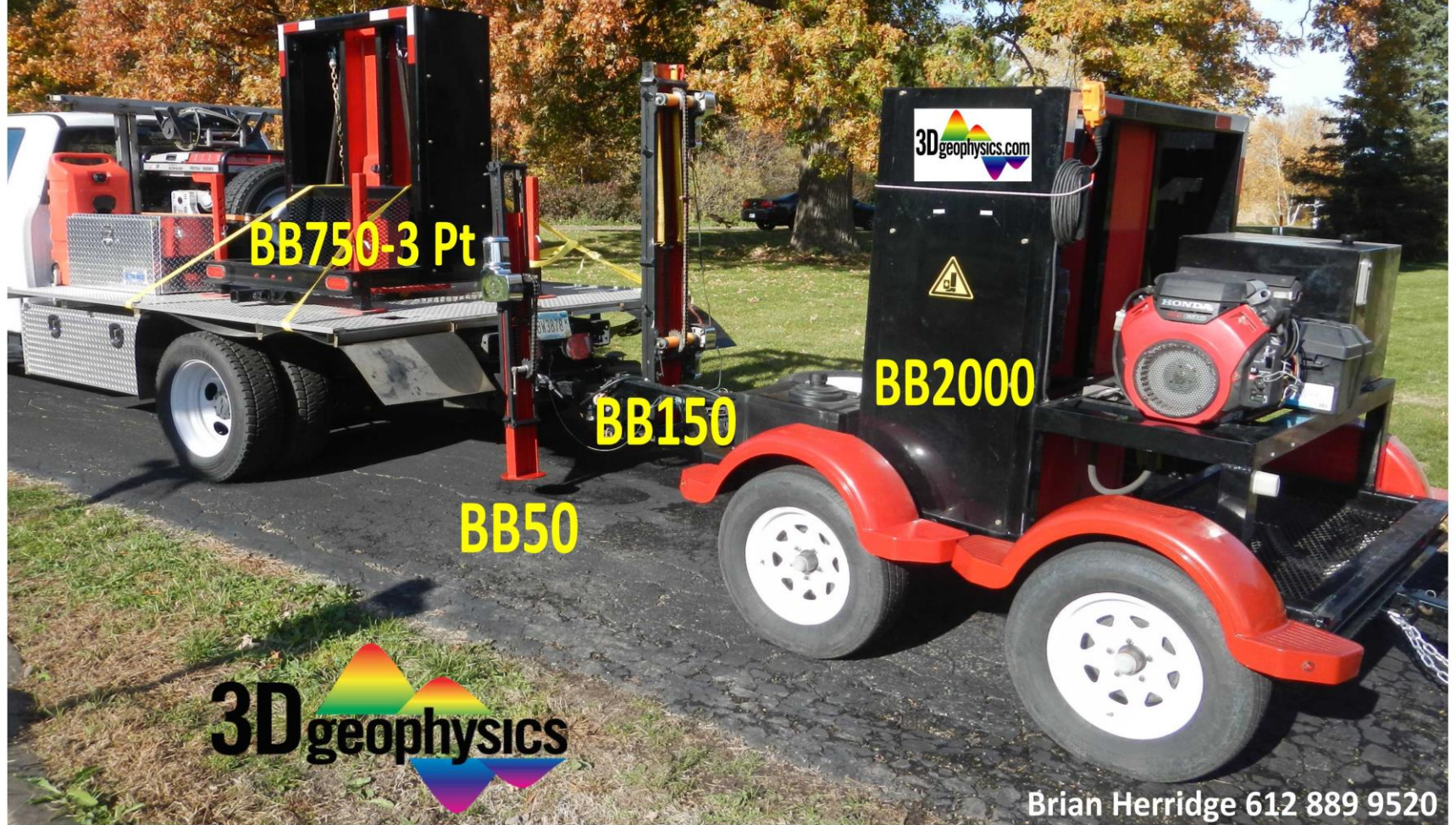
presenter:

Brian Herridge

Seismic Imaging

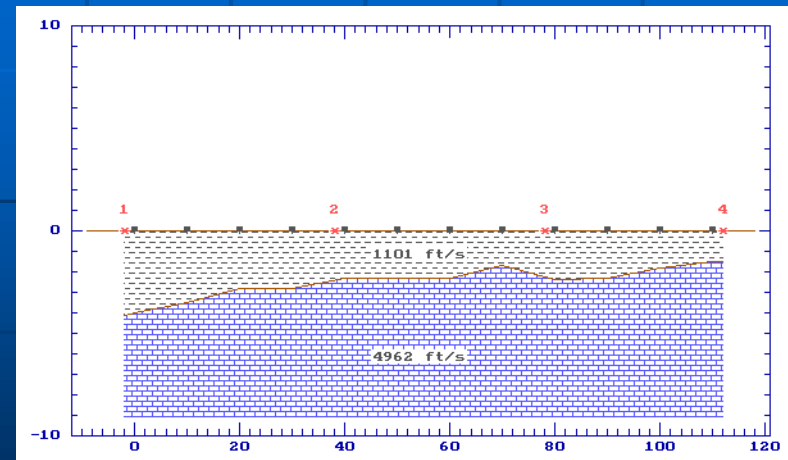
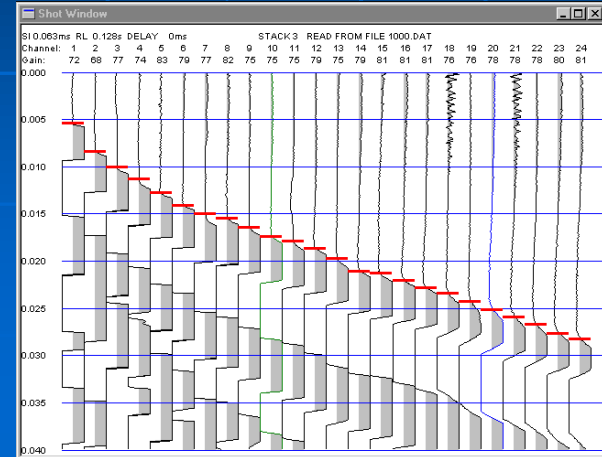


Reliable Seismic Sources



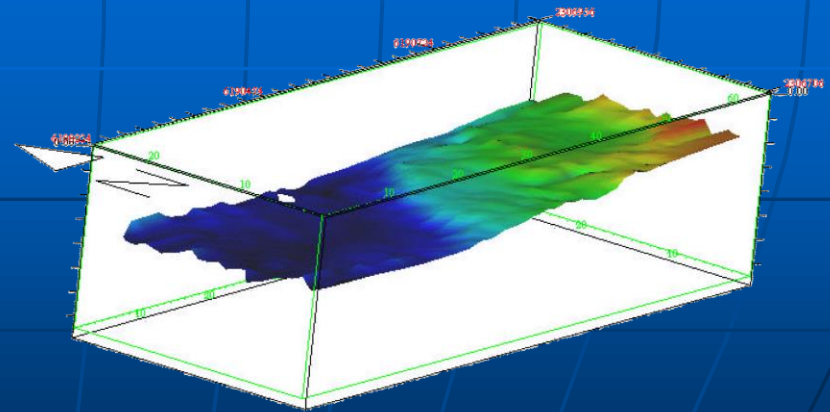
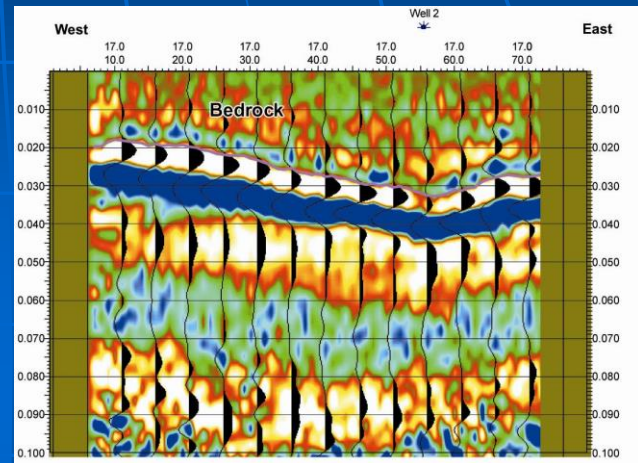
Seismic Refraction a la 1980

- Layered earth model
- Subsurface velocities
- 2D profiles
- Rock properties
- Depth calculations

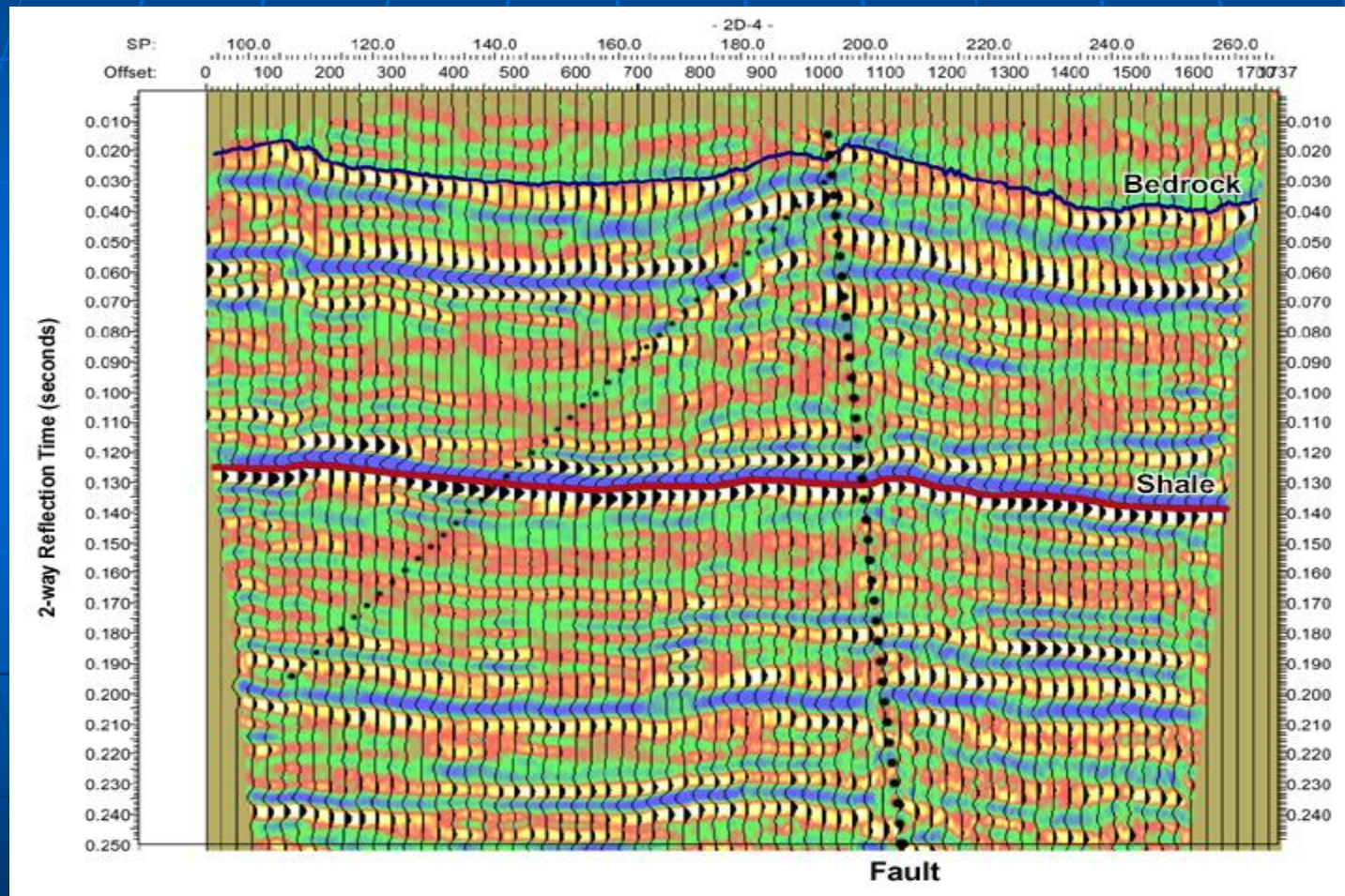


Seismic Reflection 2000

- Sound wave reflections (echoes)
- 2D profiles
- 3D data volumes / depth slices
- Depth of Investigation: 0-25,000 ft (0-10,000 ft common)

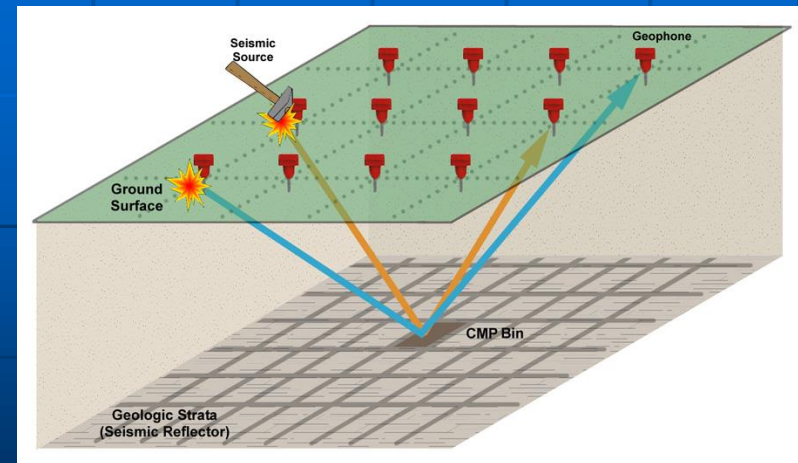
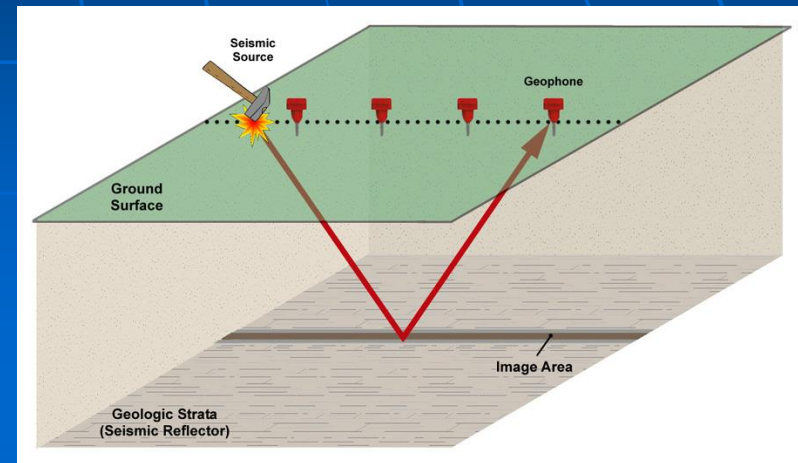


Detailed Fracture Interpretation



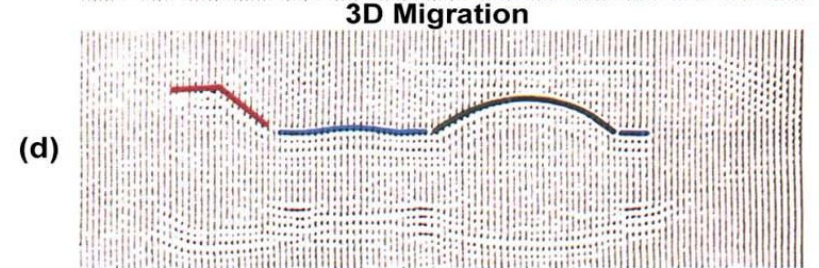
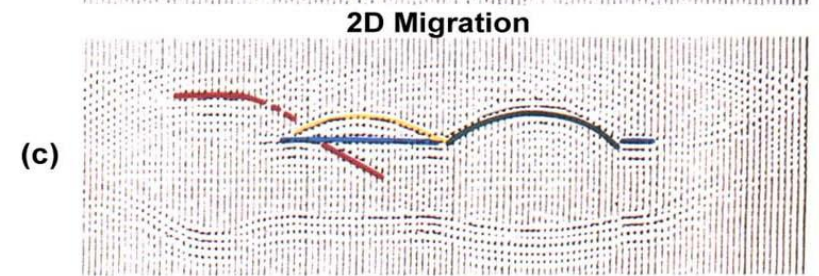
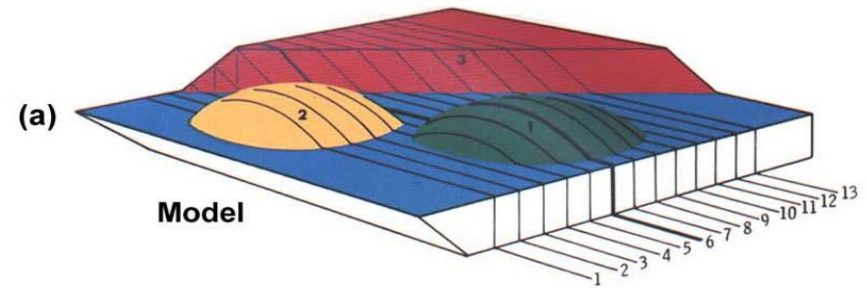
True 3D Data Collection

- 3-dimensional data collection
 - Receiver grid
 - Source grid
- Data Volume
 - Cube vs. lines
 - Time / depth slices



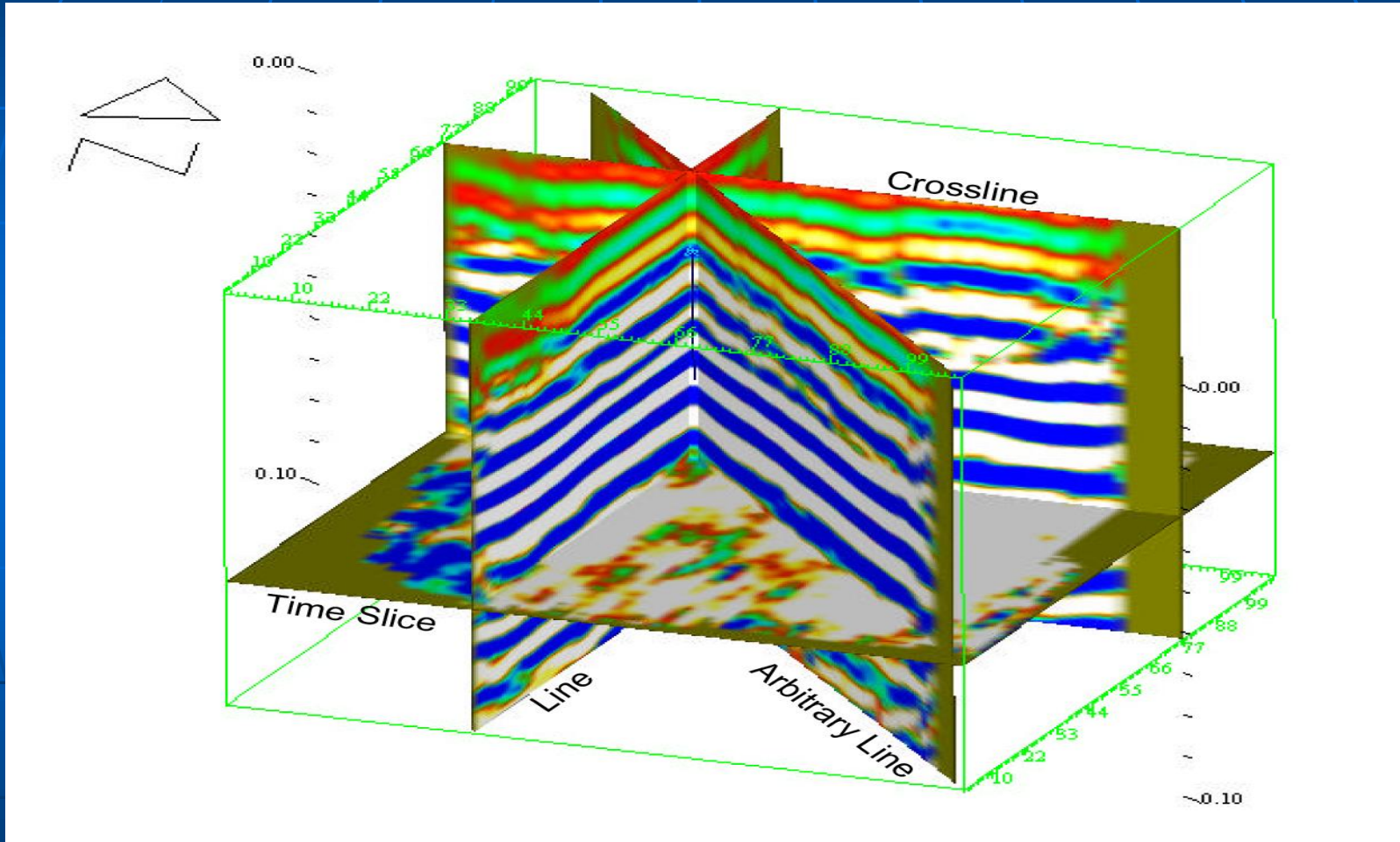
3D Data Quality

- Improved Data Quality
 - 3D data scan process
 - Eliminate offline errors
 - **Allows true 3D Migration**
 - Provides for 3D Inversion
- Visualization Software

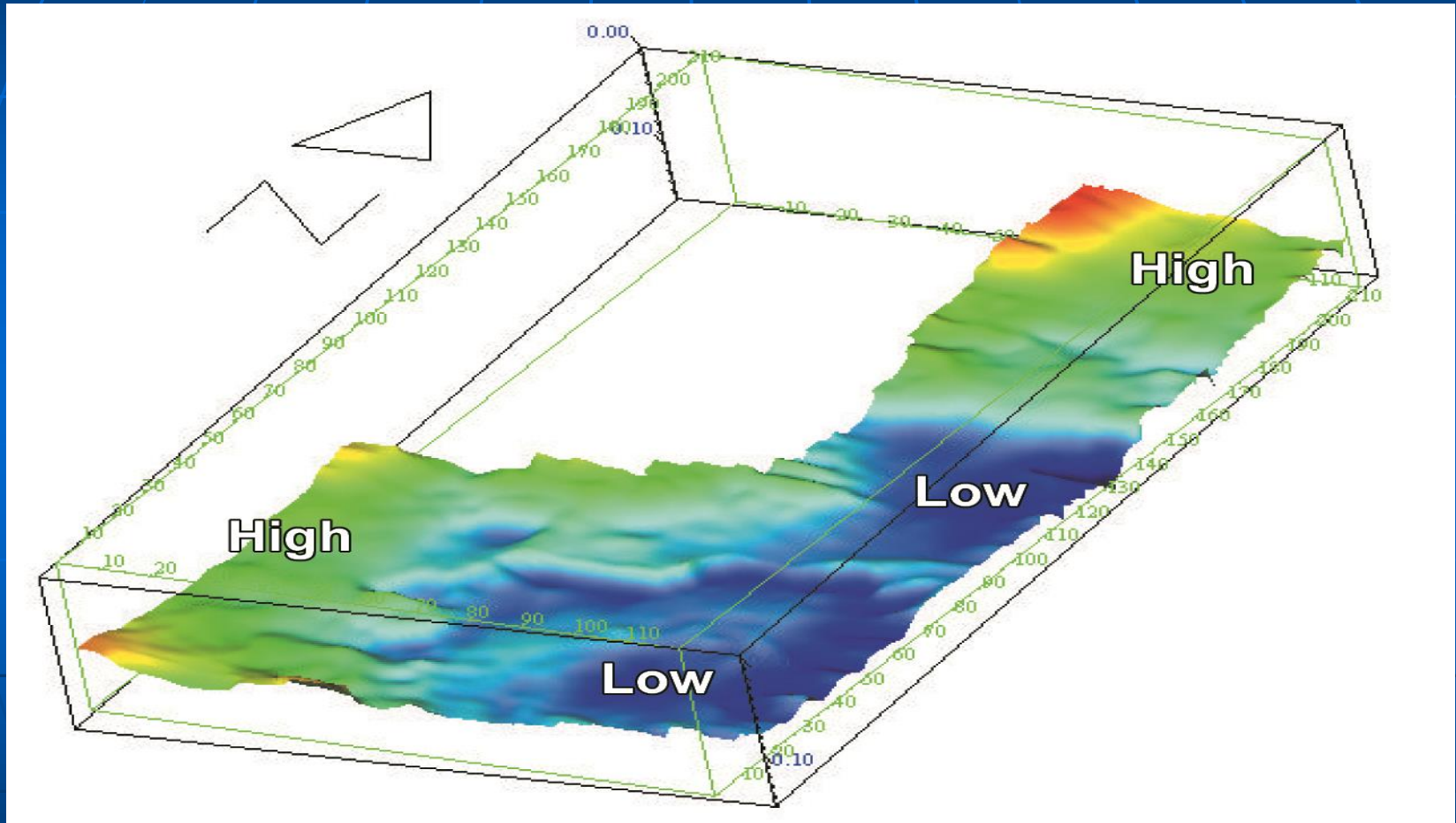


after French (1974)

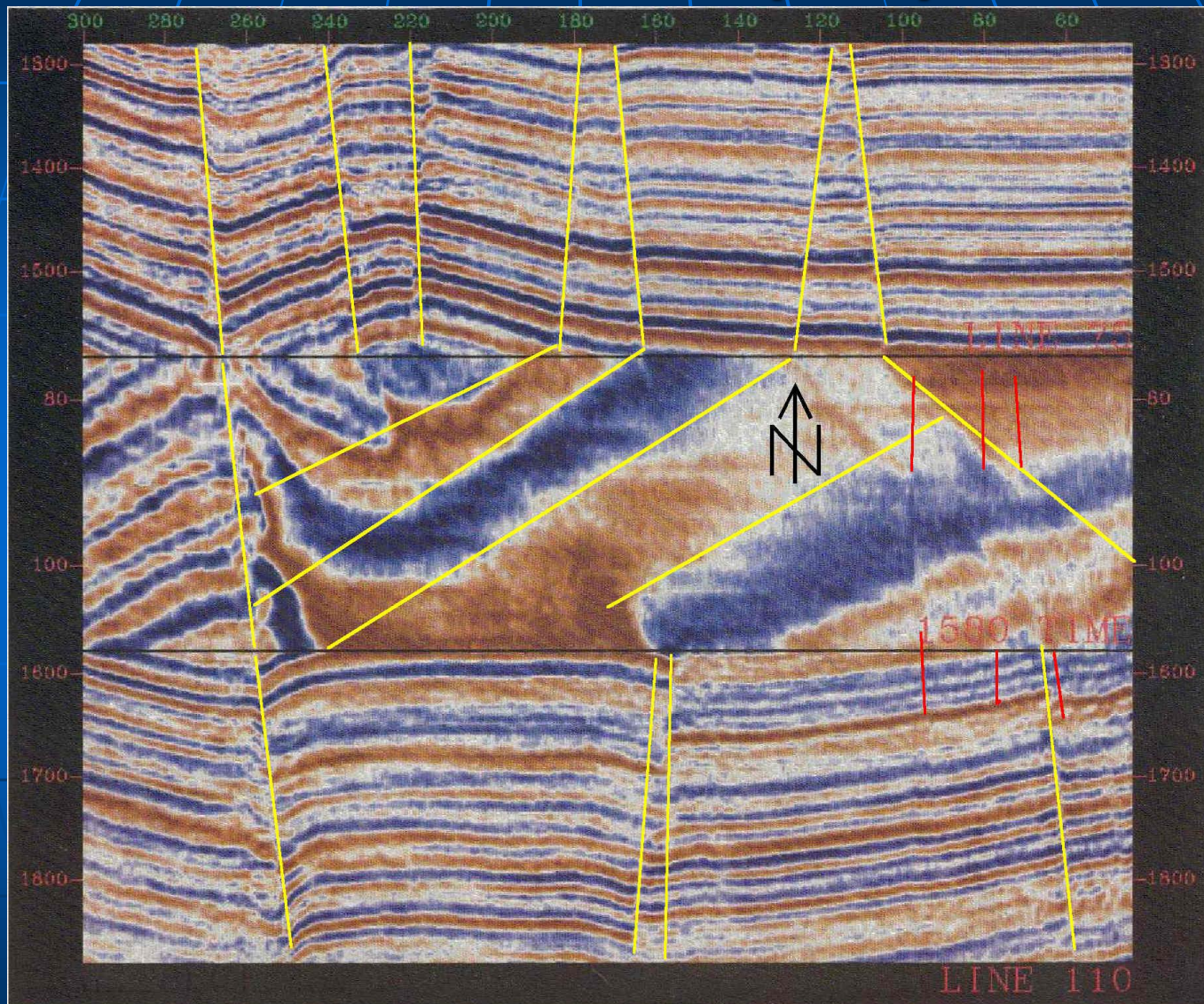
3D Analysis



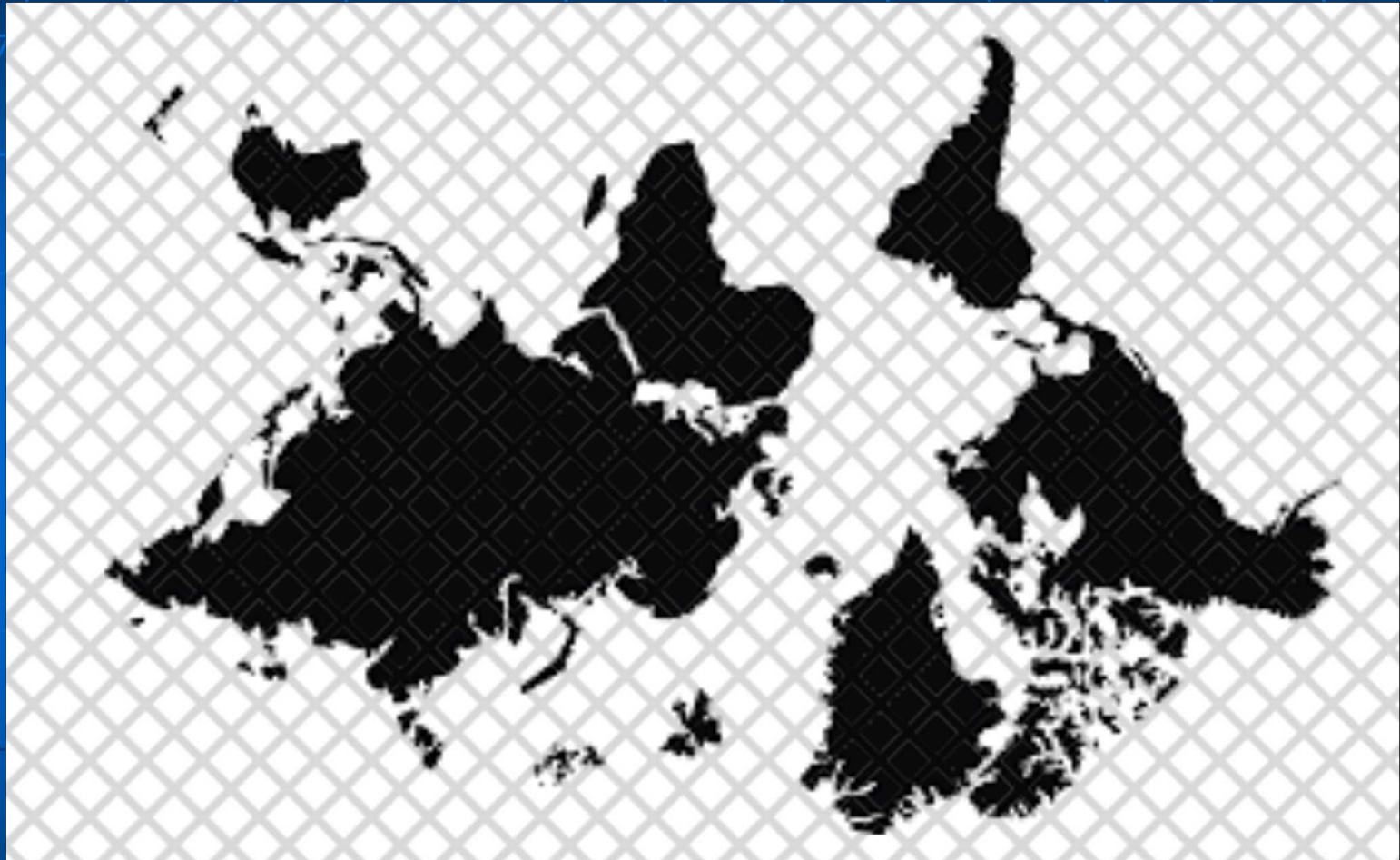
3D Surfaces



3D Chair Display

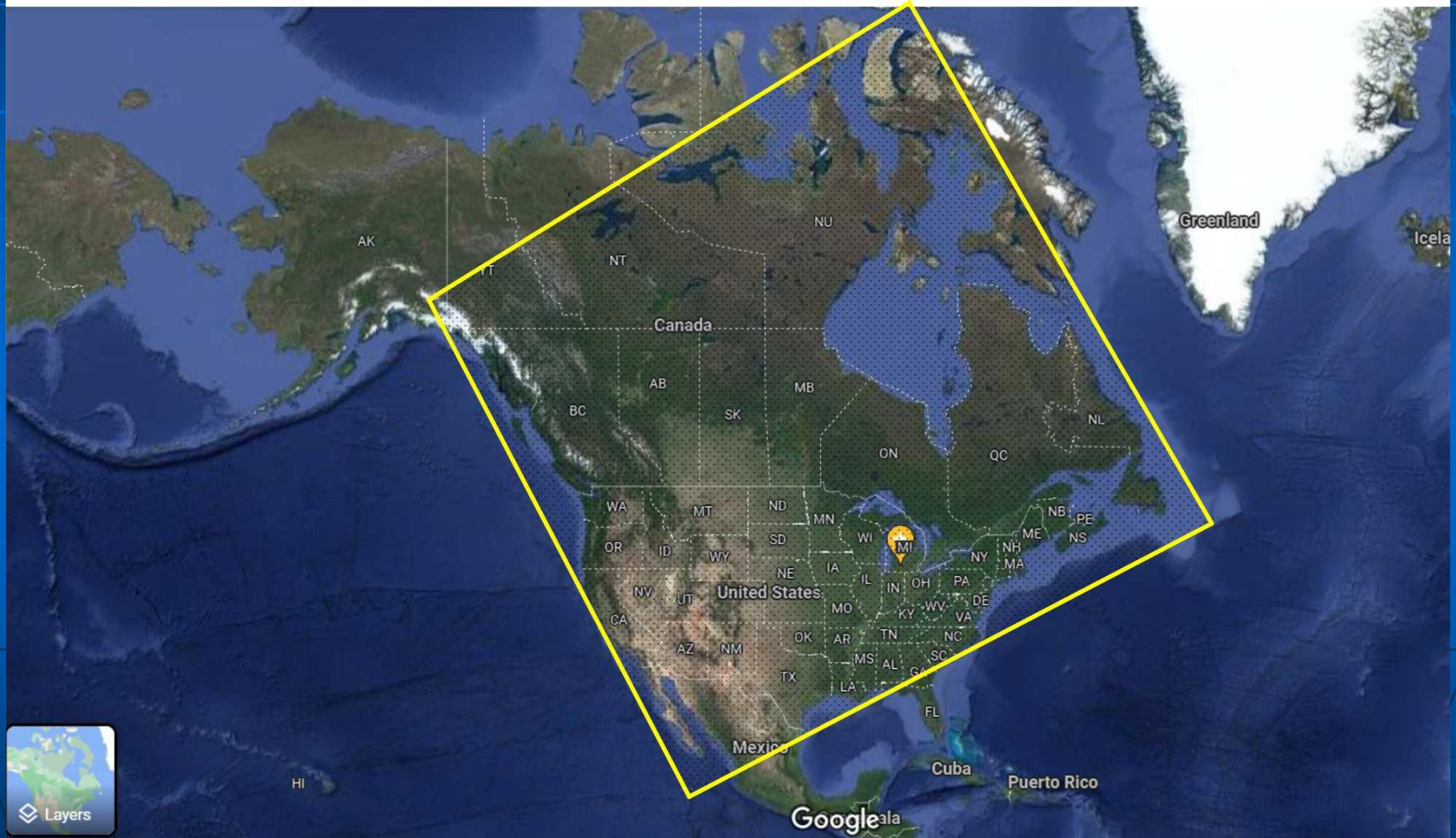


Brittle Planets & Moons

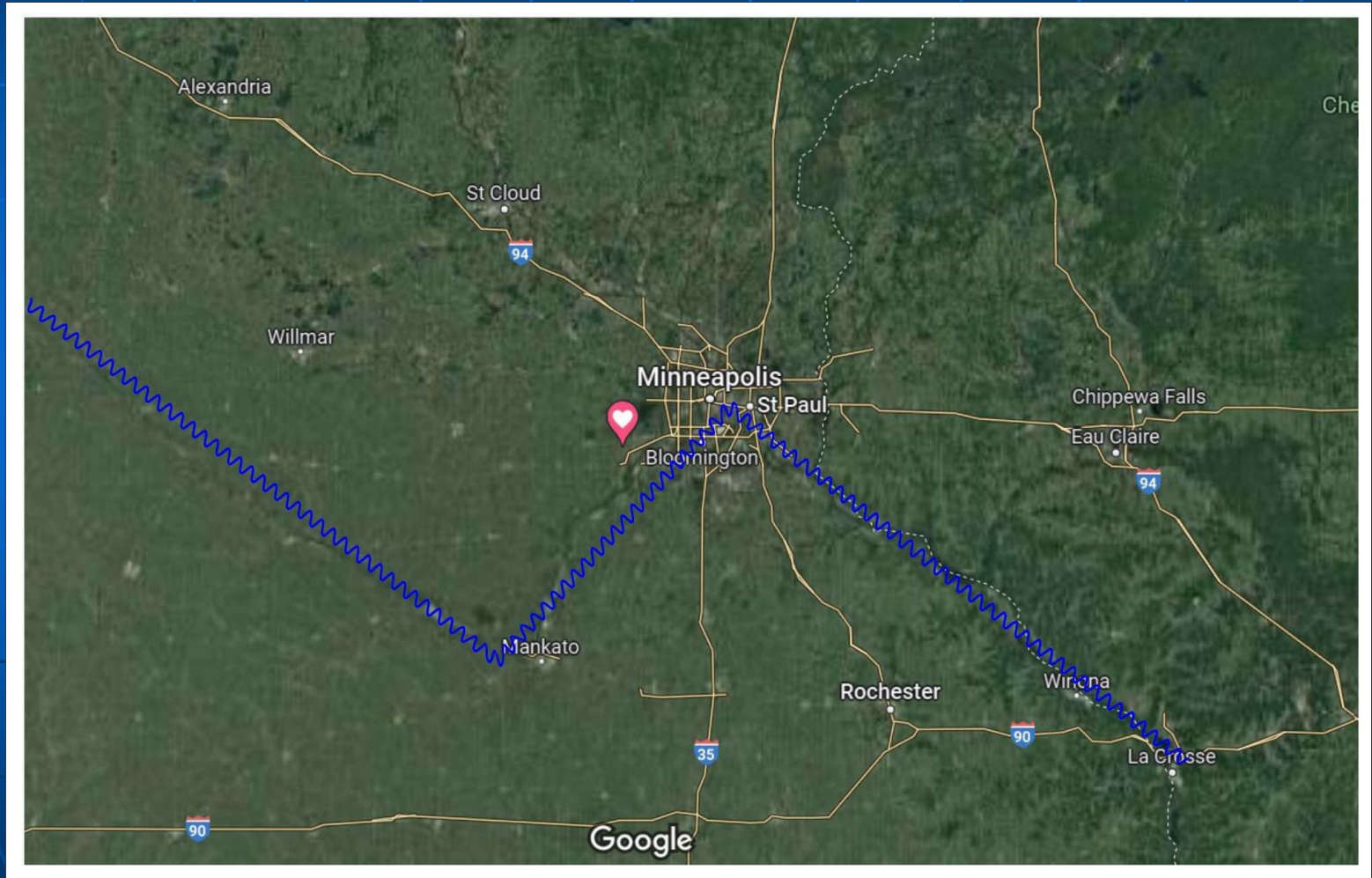


Planets Fracture 45 Degrees to the Spin Axis

Ever notice this?

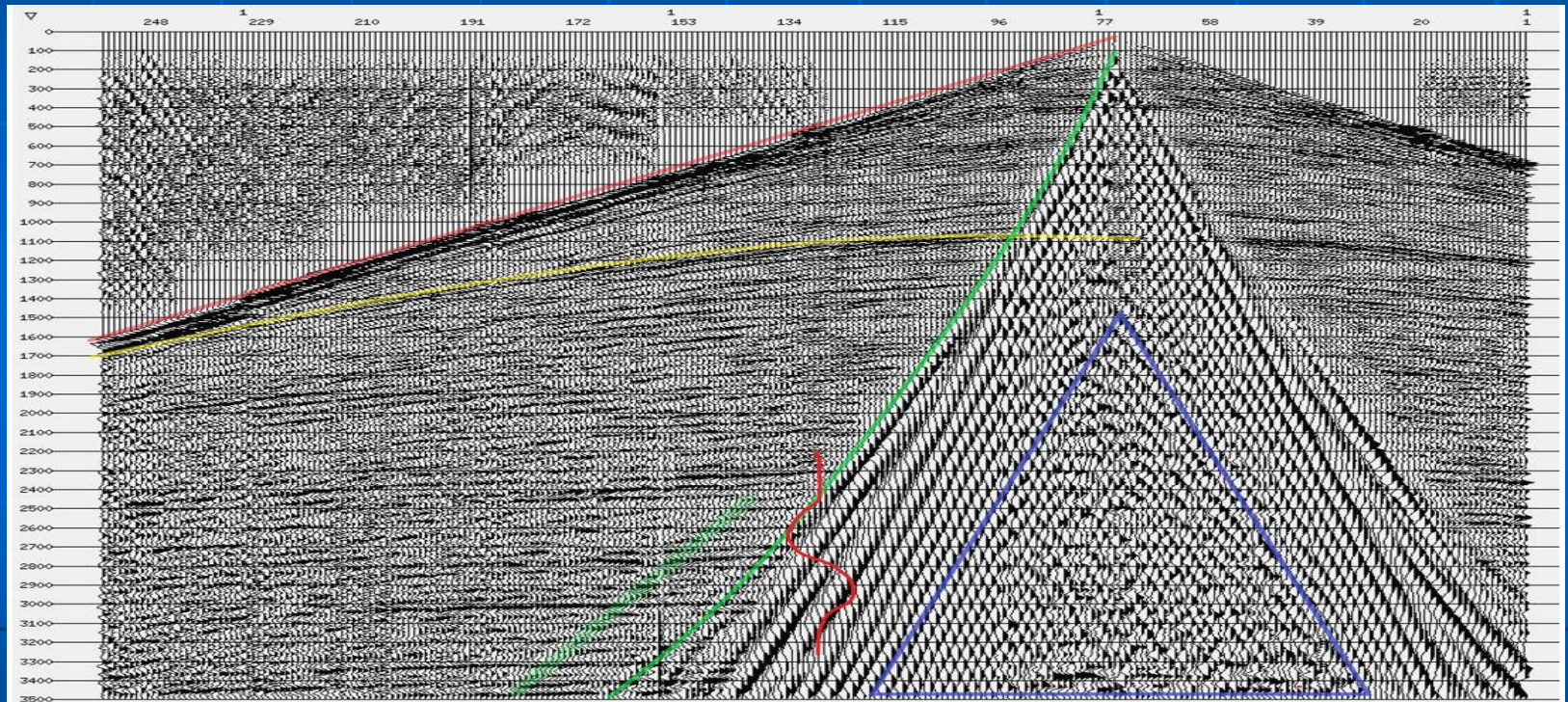


Fracture Control of the River



MASW 2020

Multi-channel Analysis of Surface Waves

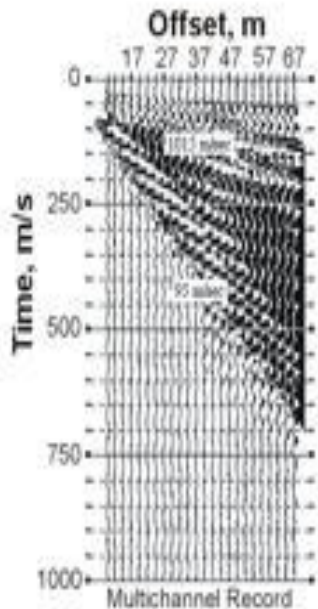


MASW Field Equipment

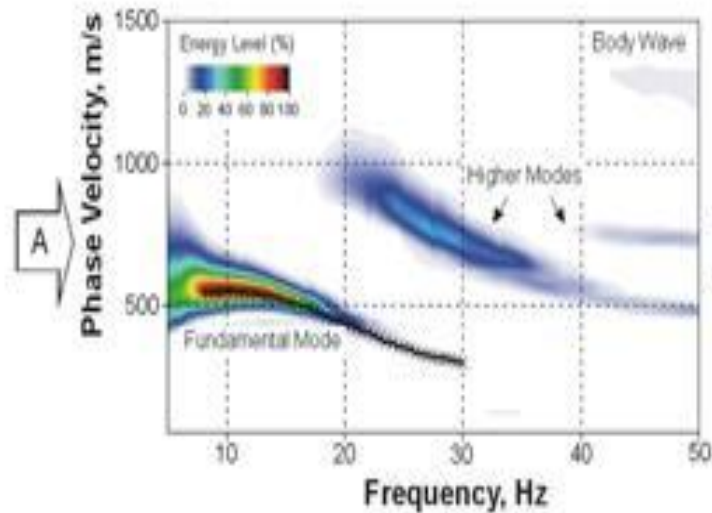


MASW Data Analysis

Detection of Surface Waves

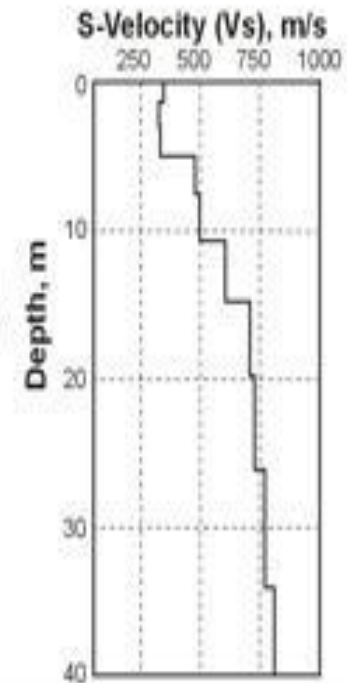


Extraction of Signal Dispersion Curve

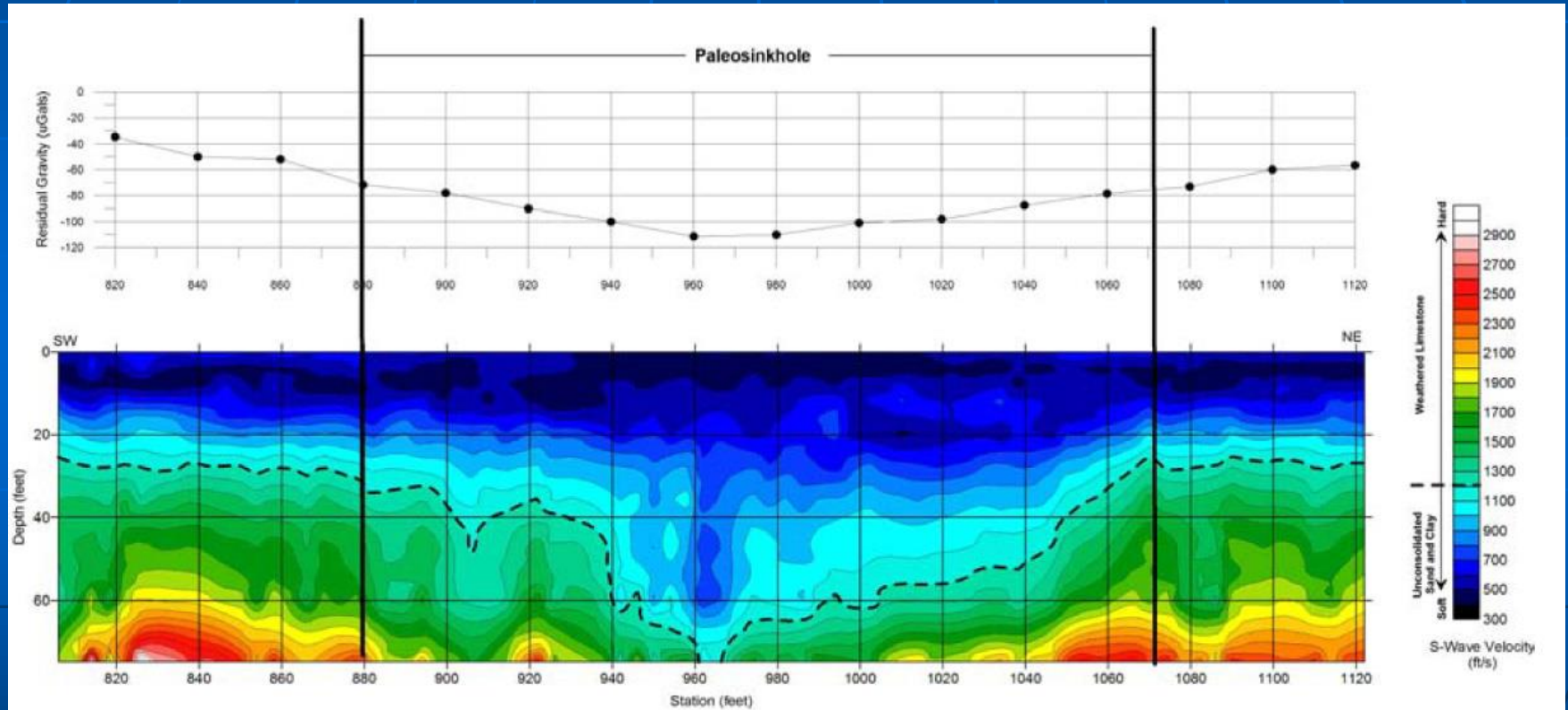


A : 2-D Wavefield Transformation
B : Inversion

1-D S-Velocity (V_s) Profile



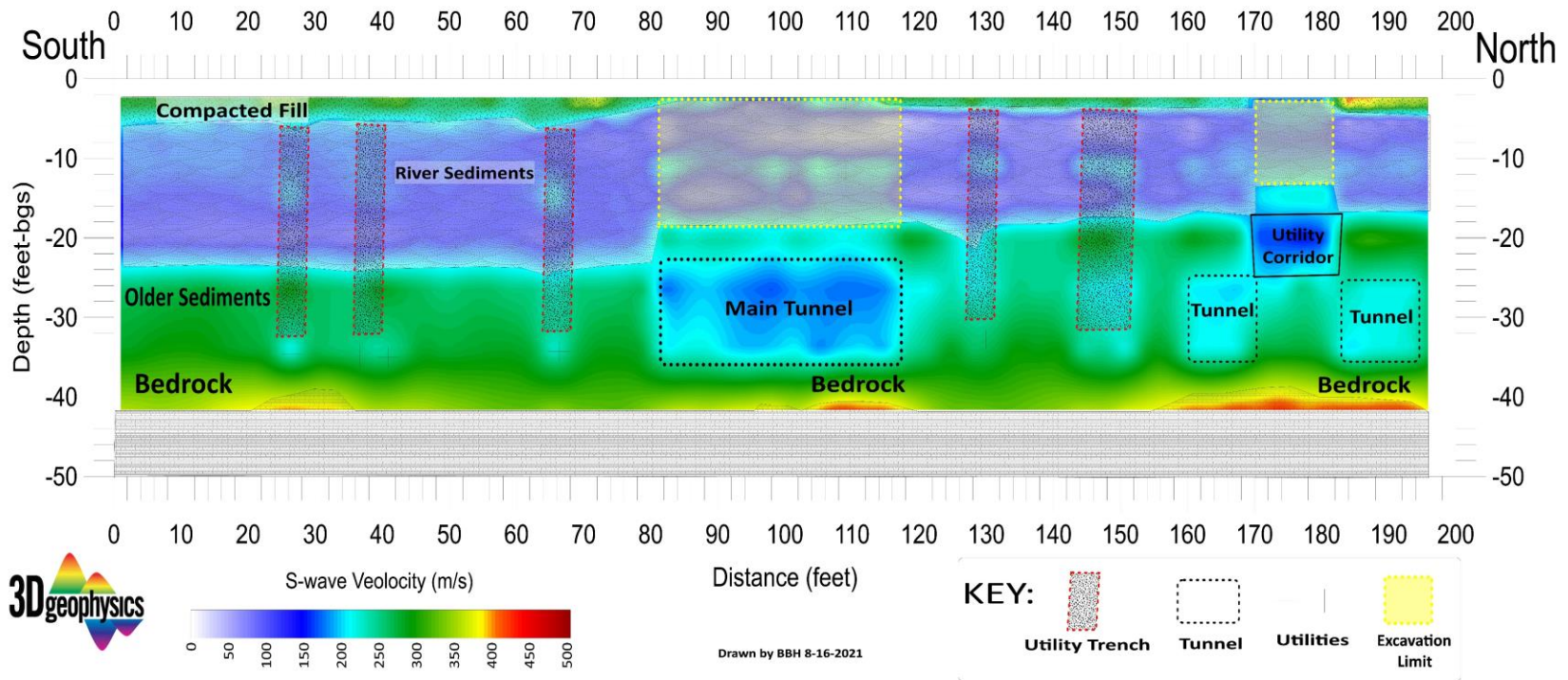
MASW Data Example



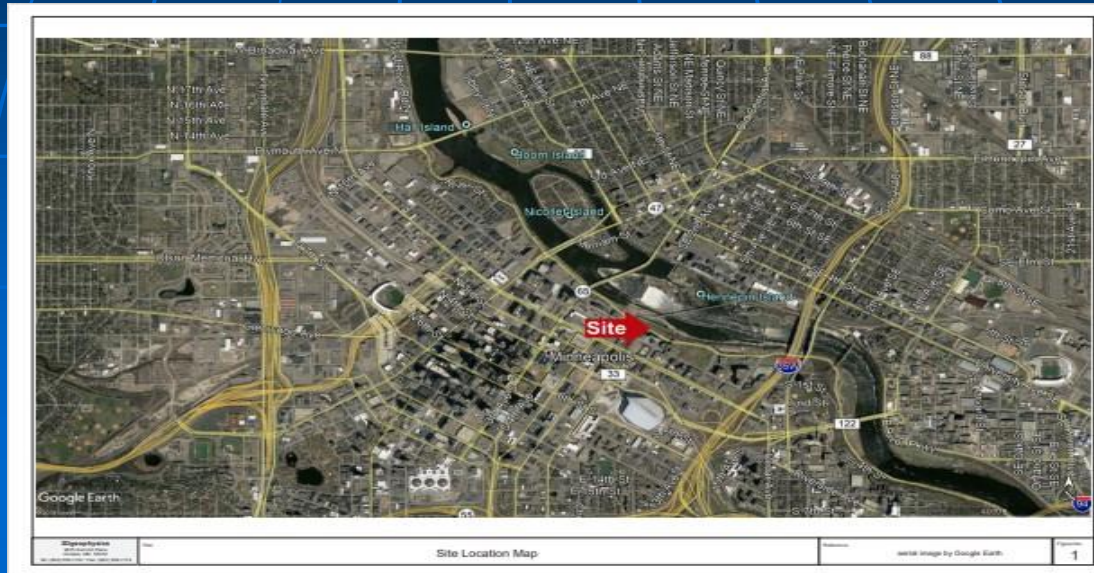
Data courtesy of Technos

Tunnel Detection

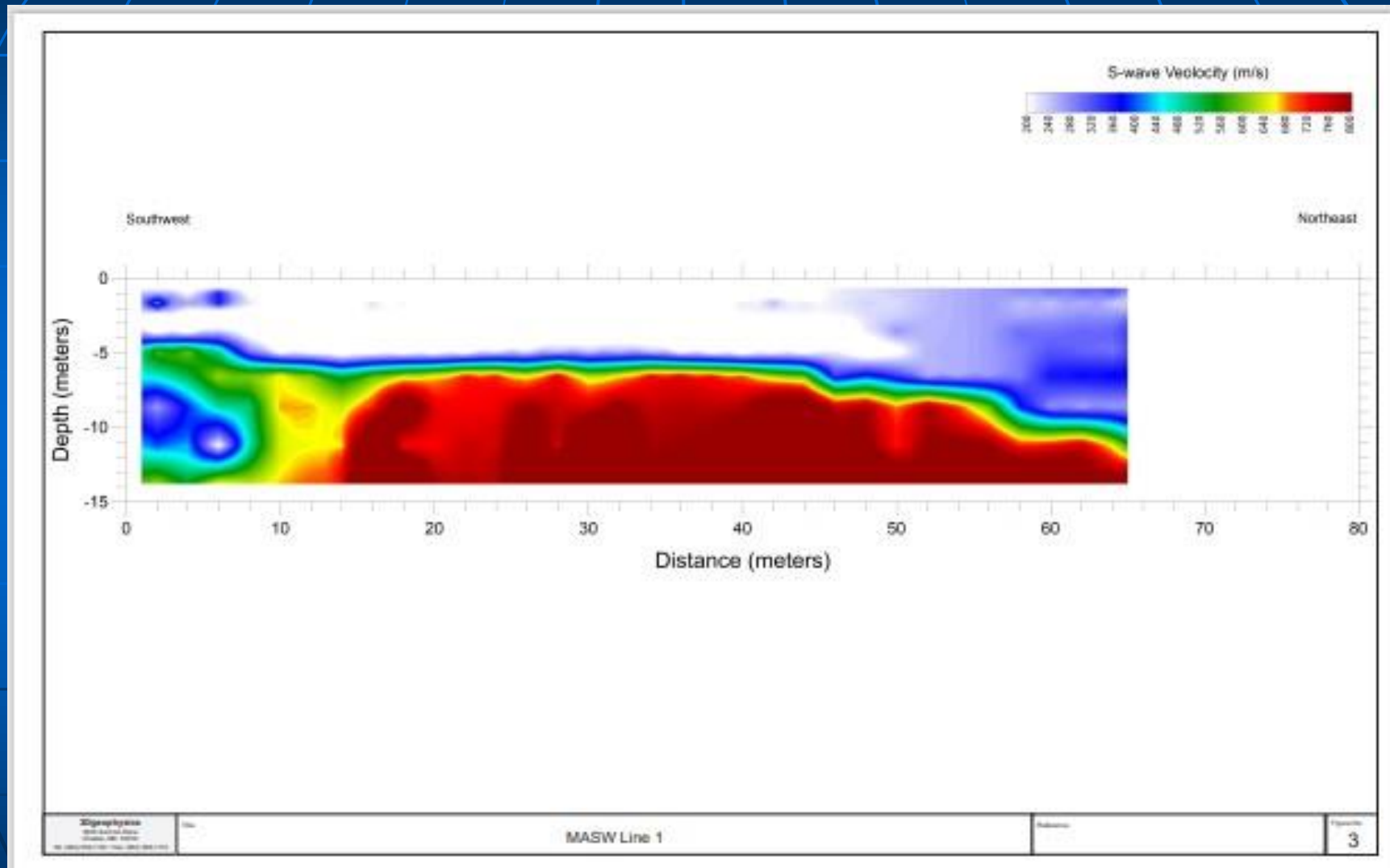
Minneapolis MASW Tunnel and Utility Corridor Map



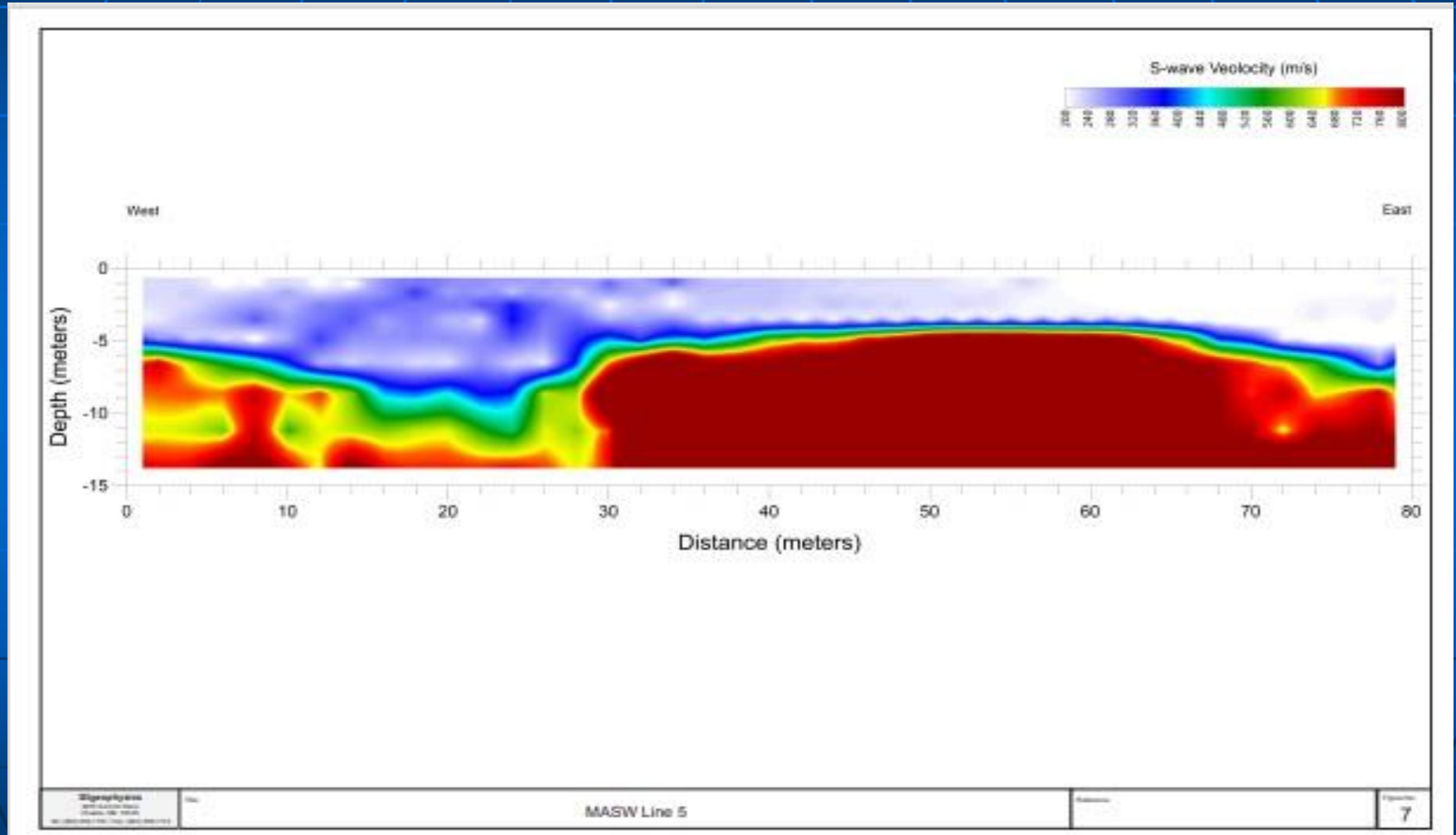
MASW at St Antony Falls



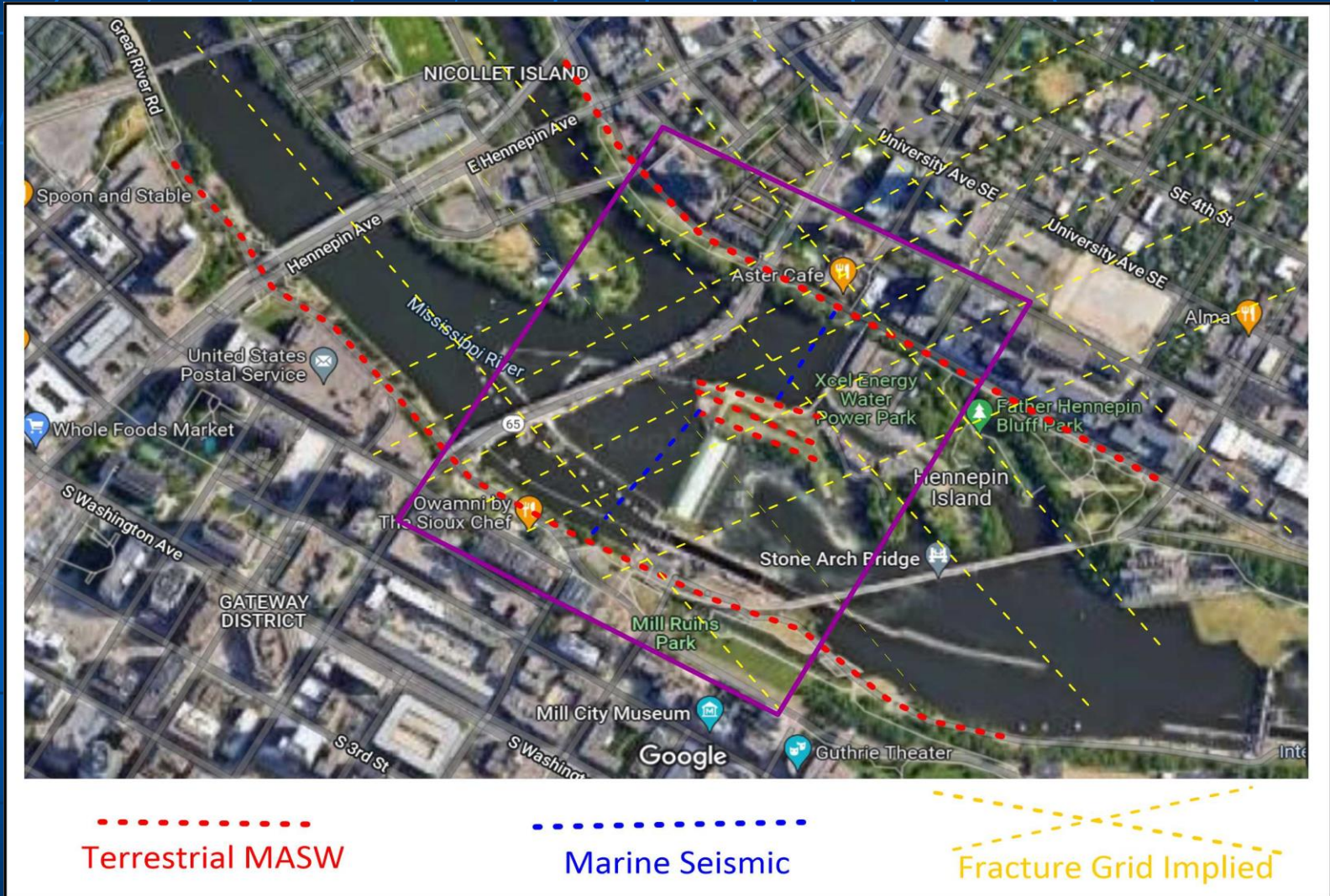
MPLS Portal Line 1



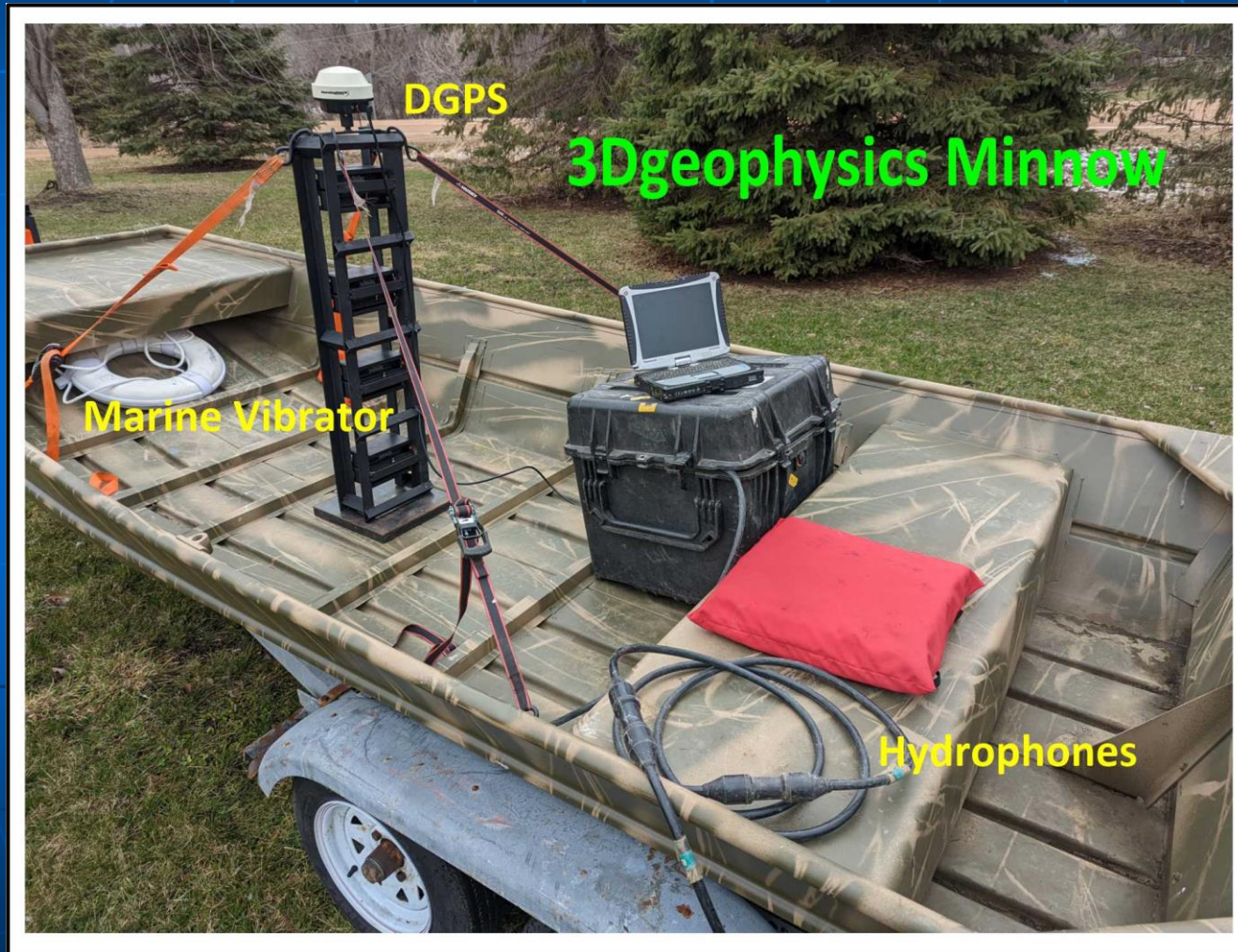
MPLS Portal Line 5

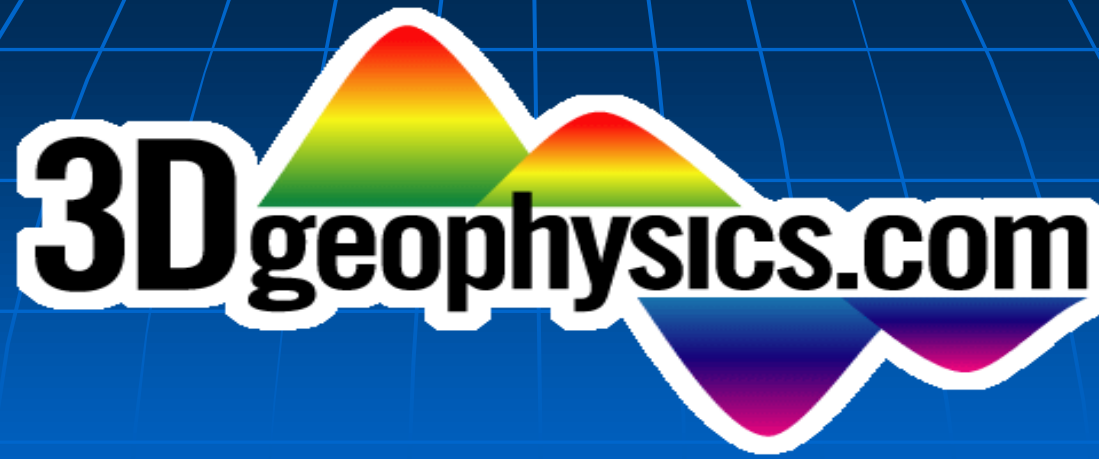


Proposed Seismic Survey



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