ANDRILL (Mackay Sea Valley) – Snow Streamer Experiment 0734

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- **Overview**

During the austral summer, 2007, approximately 20.5 km of high-quality seismic reflection data were collected in Granite Harbor. The focus of this study was to find Quaternary geological successions in the hope that these records could help decipher past environmental changes. The Mackay Sea Valley (MSV) is a deep trough thought to have been eroded beneath Granite Harbor by previous expansion of the Mackay Glacier. The seismic survey's intent was to image recent sediment layers that accumulated in the MSV following erosion (Figure 1). The MSV seismic survey incorporated and refined techniques of over-sea-ice seismic data collection that had been used previously during the ANtarctic geological DRILLing (ANDRILL) Program's Southern McMurdo Sound (SMS) seismic site survey in 2005. A Generator-Injector (GI) air gun was used as the seismic source that was lowered into the water column through holes drilled through the sea ice. The GI air gun minimized the source bubble effects that had plagued previous over-sea-ice experiments in the Antarctic. A 60-channel seismic snow streamer consisting of vertically oriented gimbaled geophones with 25-m takeout spacing was employed to aid rapid data collection. The MSV seismic survey was successful in locating a thin succession of low-amplitude reflections atop the higher-amplitude granite basement reflections in the deepest parts of the valley. The low-amplitude reflections are likely caused by layers of pelagic sediment. Future coring of these recent sediments could provide a high-resolution Quaternary climate record.

- **Acquisition**

Nine high-resolution normal-incident seismic reflection profiles were collected and are named MSV-07-01, MSV-07-02, MSV-07-03, MSV-07-04, MSV-07-05, MSV-07-06, MSV-07-07, MSV-07-08 and MSV-07-09. The following parameters were used for these seismic profiles:

- Source Type: A Seismic Systems 210 in^3 Generator-Injector (GI) airgun shot in true GI mode for profiles MSV-07-01-04. Lines MSV-07-05-09 were shot in harmonic mode with a 25 in^3 generator chamber volume and a 25 in^3 injector chamber volume. Gun pressure was 2000 psi.
- Seismic recording system: Geometrics Geode seismic recorder.
- Shot Interval: 50 m, perpendicular offset of 2 m.
- Shot Depth (below ice surface): 8 m.
- Receiver Interval: 25 m.
- Shot-receiver near offset: 25 m.

- Shot-receiver far offset: 1500 m.
- Number of live channels: 60.
- Survey geometry: off-end.
- Sampling rate: 0.5 ms.
- Record length: 3 s.

Further acquisition details can be found in the Observer Notes and Survey Notes that accompany the recorded seismic data.

➢ **Station Timing**

All shot gathers were triggered using the air gun source pulse.

➢ **Data Organization**

The southern McMurdo Sound assembled data set was prepared at Montana Tech by Brian Williams and submitted on our public ftp site:

File	Description
MSVReport.pdf	This document as pdf.
MSVReport.txt	This document as ascii.
MSVReport.wd	This document as a Word file.
MSVObservers_SurveyorsNotes.xls	Observer's and Surveyor's notes as an Excel file.
MSVObservers_Notes.txt	Observer's notes.
MSVSurveyors_Notes.txt	Surveyor's notes.
MSV-07-01shots.sgy	Raw shot gathers for first profile in SEGY format.
MSV-07-02shots.sgy	Raw shot gathers for second profile in SEGY format.
MSV-07-03shots.sgy	Raw shot gathers for first profile in SEGY format.
MSV-07-04shots.sgy	Raw shot gathers for second profile in SEGY format.

MSV-07-05shots.sgy	Raw shot gathers for first profile in SEGY format.
MSV-07-06shots.sgy	Raw shot gathers for second profile in SEGY format.
MSV-07-07shots.sgy	Raw shot gathers for first profile in SEGY format.
MSV-07-08shots.sgy	Raw shot gathers for second profile in SEGY format.
MSV-07-09shots.sgy	Raw shot gathers for first profile in SEGY format.