

## ANDRILL (Offshore New Harbor) - Snow Streamer Experiment 0834

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### ➤ Overview

During October and November of 2008, approximately 48 km of multi-channel seismic reflection data were collected on a sea-ice platform east of New Harbor, Antarctica. The Offshore New Harbor (ONH) survey is third in a series of three successful over-sea-ice seismic reflection surveys recently conducted in McMurdo Sound, Antarctica. For rapid data acquisition, the ONH project employed a 60-channel snow streamer cable, with gimbaled geophones installed at 25 m spacing. In addition, a dual-chamber Generator-Injector (GI) air gun, used as a seismic source, mitigated bubble-pulse effects inherent with submerged explosive seismic sources. These new ONH data were collected to support the ANTArctic geological DRILLing Program (ANDRILL) which seeks to understand past tectonic and climatic regimes by recovering coevally deposited sediments. These ONH data tie into the 2005 Southern McMurdo Sound (SMS) multi-channel seismic survey which successfully delineated sedimentary rock reflectors on the western margin of the Victoria Land Basin (VLB), a sub-depositional basin of the Ross Embayment. Moreover, the 2008 ONH project resurveyed a portion of the single-channel marine seismic survey collected in 1990 by the *Polar Duke* research vessel. Unlike the *Polar Duke's* single-channel data, multi-channel data from the ONH survey will allow us to remove the sea-floor multiple that masks primary reflections from sedimentary rock boundaries. Removing the sea-floor multiple will reveal deeper and older sedimentary rock contrasts that have not been well imaged by previous seismic surveys in the western VLB. In order to achieve better signal response at depth than the 2005 SMS survey, the GI air gun pressure was increased from  $3.4 \times 10^6$  Pa to  $13.8 \times 10^6$  Pa. Brute common midpoint stacks from the ONH data clearly show primary reflector signal beneath the sea-floor multiple. These preliminary results are encouraging because we expect to image Eocene and Oligocene sedimentary rocks which lie below the sea-floor multiple. Cenozoic Investigations of the Ross Sea-Borehole 1 (CIROS-1) was intersected by line one of the ONH survey and recovered Eocene and Oligocene sedimentary rocks that were below an unconformity 366 m below the sea-floor. Although Eocene and Oligocene sedimentary rocks have already been sampled by CIROS-1, ANDRILL hopes to locate (up-dip from CIROS-1) a thicker and more complete sequence of sedimentary rocks that records the transition from the Eocene to the Oligocene. The Eocene/Oligocene boundary marks an abrupt change in global climate conditions where the Eocene Greenhouse World transitioned into the Oligocene Icehouse World. Additionally, a more complete sedimentary section from the Eocene and Oligocene will help elucidate rifting events that contributed to the formation of

the Ross Embayment. Once the sea-floor multiple is removed, the ONH data can be interpreted in order to locate the thickest succession of ANDRILL's target strata. ONH data will expand our knowledge regarding the seismic stratigraphy located below the sea-floor multiple and will help locate optimal drilling sites. The ONH project has generated new seismic data and will eventually obtain sediment cores that will resolve paleoenvironments that controlled sedimentation during the Eocene and late Oligocene in the VLB.

➤ **Acquisition**

Two normal-incident seismic reflection profiles were collected and are named ONH-08-01 and ONH-08-02. The following parameters were used for these seismic profiles:

- Source Type: A Seismic Systems 210 in<sup>3</sup> Generator-Injector airgun shot in harmonic mode with a 105 in<sup>3</sup> generator chamber volume and a 105 in<sup>3</sup> injector chamber volume. Gun pressure was 2000 psi.
- Seismic recording system: Geometrics Geode seismic recorder.
- Shot Interval: 100 m, perpendicular offset of 2 m.
- Shot Depth (below ice surface): 8 m and 15.6 m depending on sea-ice thickness.
- 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: 1 ms.
- Record length: 6 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 David Sunwall and submitted on our public ftp site:

File	Description
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ONHReport.pdf	This document as pdf.
ONHReport.txt	This document as ascii.

ONHReport.wd	This document as a Word file.
ONHObservers_SurveyorsNotes.xls	Observer's and Surveyor's notes as an Excel file.
ONHObservers_Notes.txt	Observer's notes.
ONHSurveyors_Notes.txt	Surveyor's notes.
ONH-08-01shots.sgy	Raw shot gathers for first profile in SEG Y format.
ONH-08-02shots.sgy	Raw shot gathers for second profile in SEG Y format.