



A new over sea-ice active-source seismic method to support ANDRILL

M. Speece (1), S. Betterly (1), R. Levy (2), D. Harwood (2), S. Pekar (3), D. Winter, (2), M. Lutz (2), J. Doren (4)

(1) Geophysical Engineering Department, Montana Tech, Butte, Montana, USA, (2) ANDRILL Science Management Office and Department of Geosciences, University of Nebraska-Lincoln, Lincoln, Nebraska, USA, (3) Queens College, School of Earth and Environmental Sciences, Flushing, New York, USA, (4) Raytheon Polar Services Company, Centennial, Colorado, USA (mspeece@mtech.edu / Fax: 1-406-496-4133 / Phone: 1-406-496-4188)

During the austral summer of 2007 the ANtarctic DRILLing (ANDRILL) Program will drill from a sea-ice platform in Southern McMurdo Sound (SMS). Two drillholes will sample a lower Miocene and younger sequence of strata to obtain new information about the Neogene Antarctic cryosphere and evolution of Antarctic rift basins. These strata have been inferred from distinct reflections on nearby single-channel marine seismic reflection profiles from the Polar Duke 90 cruise. In order to increase the chance for a successful drilling season, an over sea-ice seismic reflection survey was conducted during 2005 to tie the existing marine seismic geologic interpretation to an area of more stable sea-ice in SMS. Previous over sea-ice experiments have had limited success because of (1) poor source coupling caused by thin sea-ice, or because of (2) source bubble-pulse effects caused by seismic sources placed in the water column. To avoid these problems, a Generator Injector (GI) air gun was used. GI guns are designed to minimize the source bubble-pulse reverberating wavetrain. The GI gun was lowered into the water column through holes drilled in the sea-ice. The GI gun was fired multiple times at each location so that field stacking could be used to increase signal-to-noise during windy periods. Moreover, a 60-channel seismic snowstreamer consisting of vertically oriented gimbaled geophones with 25-m takeout spacing was employed to aid rapid data collection. The snowstreamer was pulled between shot-points without the need for time-consuming hand placement of conventional spiked geophones. 27 km of high quality, over sea-ice seismic reflection data were collected

in SMS during the 2005 field season. These data were collected in two separate profiles: a 14 km strike line and a 13 km dip line. Shot gathers and stacked sections show distinct reflections that tie to the preexisting marine seismic line PD 90-46. This method has tremendous potential for use during other over sea-ice seismic surveys. Additional surveys are planned over the Mackay Sea Valley and at offshore New Harbor in McMurdo Sound.