



## **Ross Ice Shelf Seismic Survey and Future Drilling Recommendation**

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The Ross Ice Shelf (RIS) is one of three gateways through which change in the ocean can be propagated into the interior of West Antarctica. Both the geologic record and ice sheet models indicate that it has experienced widespread retreat under past warm climates. But inland of the continental shelf, there are limited data available to validate the models. Understanding what controls the rate at which the ice shelf will respond to future climate change is central to making useful climate projections. Determining the retreat rate at the end of the last glacial maximum is one part of this challenge.

In November 2015, four lines of multi-channel seismic data, totalling over 45 km, were collected on the Ross Ice Shelf, approximately 300 km south of Ross Island using a thumper seismic source and a 96 channel snow streamer. The seismic survey was undertaken under the New Zealand Antarctic Research Institute (NZARI) funded Aotearoa New Zealand Ross Ice Shelf Programme to resolve bathymetric details and to image sea floor sediments under a proposed drilling site on the ice shelf, at about 80.7 S and 174 E.

The thumper, a purpose-built, trailer mounted, weight-drop seismic source was towed behind a Hägglund tracked vehicle to image the bathymetry and sediments underneath the RIS. Seismic data collection on an ice shelf has unique challenges, in particular strong attenuation of the seismic energy by snow and firn, and complex multiple ray paths. The thumper, which consists of a heavy weight (250kg) that is dropped on a large, ski mounted steel plate, produced a consistent, repeatable higher energy signal when compared to sledge hammer source and allowed for a greater geographic coverage and lower environmental impact than an explosive source survey.

Our survey revealed that the seafloor is smooth and that there may be up to 100 m of layered sediments beneath the seafloor and possibly deeper, more complex structures. A multiple generated by internally reflected seismic energy within the ice shelf may indicate that the underside of the ice is smooth in sector of the Ross Ice Shelf.