

Seismic Analysis of the Subglacial Environment of Thwaites Glacier, West Antarctica

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Thwaites Glacier, one of the fastest and largest glaciers draining the West Antarctic Ice Sheet, is a prime candidate for inducing the potential catastrophic collapse of this marine ice sheet, given that this glacier is situated in an overdeepened basin that extends well into the interior of the ice sheet. While much attention has been given to the retreat, thinning, and acceleration near the grounding line, little is known on the subglacial environment of Thwaites Glacier far inland of the grounding line and how it may evolve in relation to these recent coastal fluctuations. Here we present the results of an active seismic survey performed along Thwaites Glacier to characterize the subglacial environment and determine its influence on the present and potential future ice dynamics in this sector of the ice sheet.

During the 2008-2009 Antarctic field season, 60 km of reflection seismic data were collected ~200 km inland of the current grounding line of Thwaites Glacier, West Antarctica, consisting of one 40-km profile along flow and two 10-km transverse profiles. Our seismic results highlight considerable variability in the shallow subglacial regime of the glacier, particularly in the spatial coverage of subglacial water and deformable sediment at the ice-bed interface. These detailed observations will allow modelers to more accurately conceptualize the subglacial environment, and to better predict how the interior of Thwaites Glacier will respond to the current perturbations near the grounding line.