

New constraints on the ocean cavity beneath the Pine Island Glacier Ice Shelf, Antarctica

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Pine Island Glacier exhibits some of the largest ice mass loss in all of Antarctica, even though it is currently buttressed by a small ice shelf. Warming ocean waters are potentially threatening the future of this ice shelf, which could lead to even greater ice mass loss from this sector of the West Antarctic Ice Sheet in the future. However, the ability to accurately model how these warm ocean waters will interact with the ice shelf is dependent on constraining ocean circulation patterns beneath the ice shelf, which requires detailed information on the shape of the sub-ice-shelf ocean cavity. We present new constraints on the geometry of the ocean cavity beneath the Pine Island Glacier Ice Shelf, Antarctica, from seismic measurements collected across the ice shelf.

This past field season, the first active seismic observations of the ocean cavity and seafloor geology beneath the Pine Island Glacier Ice Shelf were made in an effort to better constrain the geometry of the ocean cavity beneath the ice shelf and improve ice-ocean modeling studies. 55 point observations were made across the ice shelf and approximately 15-line-kilometers of seismic reflection data were collected across the ice shelf; these data point to an ocean cavity ranging in thickness from ~200 m along a seafloor high beneath the ice shelf to >600 m in some localities. The three-dimensional shape of this cavity, coupled with oceanographic measurements made at three locations across the ice shelf, will provide modelers with the ability to model ocean circulation beneath the ice shelf and predict its fate in a warming climate.