

The Sedimentary Record of Meltwater Intensive Glacial Erosion in Pine Island Bay, West Antarctica and Implications for Glacial Dynamics

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Here we show that the uppermost sediments in Pine Island Bay were deposited from a meltwater plume, a plumite, which episodically occurred during the late stages of ice sheet retreat since ~7-8.6 k cal yr BP and most recently during modern times. It is a hydraulically sorted, glacially sourced, draping deposit that overlies proximal glacial marine sediments and thickens towards the modern grounding line. The most recent release of sediment coincides with rapid retreat of the grounding line, and has an order of magnitude greater flux relative to the entire unit, indicating episodic sedimentation. These observations are consistent with recent results from Smith et al. (2012) for rapid subglacial erosion beneath Pine Island Glacier.

Our identification of a meltwater-derived deposit has profound implications for understanding glacial instability and numerically modeling ice sheet dynamics for more accurate predictions. This study demonstrates that punctuated meltwater-intensive glacial retreat may have occurred at least three times in the Holocene in this region. We further suggest that the modern Thwaites Glacier is poised for a meltwater-intensive similar retreat.

Reference

Smith, A.M., Bentley, C.R., Bingham, R.G., and Jordan, T.A., 2012, Rapid subglacial erosion beneath Pine Island Glacier, West Antarctica, *Geophysical Research Letters*, 39, 1-5.