

New surface-based observations of the environment beneath Pine Island Glacier ice shelf

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Extensive surface, sub-shelf cavity and seabed observations of the Pine Island Glacier (PIG) ice shelf environment were collected by a surface field team during the 2012-13 austral summer. Three sites aligned along a central, flow-aligned surface valley were occupied for about one week each during which two hot-water holes were drilled at each site. In one hole a mast-mounted set of oceanographic sensors recorded water temperature, current and salinity in the few meters immediately below the ice-shelf bottom. In the other hole, a similarly instrumented profiler was deployed to make quasi daily vertical transects of the sub-shelf cavity by rising and sinking along a cable suspended in the cavity. These instruments are already returning data that provide direct rates of heat and momentum transfer in the boundary layer, basal melt rates and the temporal variation of water movements on daily and longer time scales. Shallow cores of the sea bed and a photographic record of the drill holes, ocean cavity and sea bed were also collected at two of the drill sites.

The geophysics program was spatially much broader and consisted of phase-sensitive radars to measure basal melt rates and active seismic instrumentation to explore the character of the sea bed. Continuous profiling between the drill sites established the previously discovered (“Autosub”) sea bed ridge is asymmetric with a steeper downstream face. Spot measurements upstream of the drill sites were reached by helicopter and refined the shape of the ocean cavity where extensive melt rates were measured.