

Variability of the oceanic environment and basal melting of the Dotson Ice Shelf, West Antarctica, 2000 to 2014

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It is well known that the ocean plays a key role in the process of mass loss from ice sheets through iceberg calving and basal melting. The Amundsen Sea, in the eastern Pacific sector of the Southern Ocean, is a region where the ice shelves are rapidly thinning. The widespread, coherent nature of the thinning suggests oceanic forcing, which has now been well documented for Pine Island Glacier. Studies using satellite data have indicated that Dotson Ice Shelf was melting at a rate of 8 m per year and thinning by about 3 m per year during the 2003 - 2008 period. This study takes a slightly longer term perspective, exploiting oceanographic observations spanning a decade and a half (2000 – 2014) that have been obtained at the Dotson Ice Front. A total of 7 hydrographic sections reveal variability in the oceanographic environment in front of the ice shelf and associated changes in meltwater production over time. We quantify the variability in circulation and net meltwater transport from beneath the ice shelf to produce estimates of the basal melt rate for this 15 year period. We find that changes in ocean heat content in front of the ice shelf drive high variability in melting on multi-annual to decadal time-scales.