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Variability of ocean heat transport and implications for melting beneath Dotson Ice Shelf, West Antarctica

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The ocean has a key role to play in the process of mass loss from ice sheets through iceberg calving and basal melting. Given current concerns about the mass balance of the West Antarctic Ice Sheet, it is important that we understand this oceanographic impact. The Amundsen Sea, located in the eastern Pacific sector of the Southern Ocean (West Antarctica), is a region where the ice shelves are rapidly thinning. The widespread, coherent nature of the thinning, in a region where air temperatures are rarely above freezing, suggests a response to oceanic forcing. In the Amundsen Sea, the continental shelf is flooded by Circumpolar Deep Water (CDW), which is $\sim 3^{\circ}$C warmer than the surface freezing point and is found only within the latitudinal band of the Antarctic Circumpolar Current around most of Antarctica. However, our knowledge of CDW transport under the Amundsen Sea ice shelves, where the high temperature can drive rapid basal melting, is limited by a sparsity of observations. To address this, in early 2006 and 2007 we conducted high resolution hydrographic surveys along the front of Dotson Ice Shelf. Studies using satellite data have indicated that Dotson Ice Shelf is thinning by about 3 m per year. Since the ice shelf is bounded by land, the CTD sections fully enclose the cavern of water beneath the ice, thus sampling both inflows and outflows. The purpose of this study was to quantify the rate of melting beneath the ice shelf, and investigate the temporal variability of both the basal melting and the water mass properties at the ice shelf front.