

Ice shelf melting in the Amundsen Sea from oceanographic observations

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The Amundsen Sea, located in the eastern Pacific sector of the Southern Ocean, is a region where 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. Around most of Antarctica, warm Circumpolar Deep Water (CDW) is only found in the Antarctic Circumpolar Current. However, in the Amundsen and Bellingshausen Seas the continental shelves are flooded by CDW, which is $\sim 3^{\circ}\text{C}$ warmer than the surface freezing point. When CDW has access to the base of an ice shelf, melting is one to two orders of magnitude higher than it would otherwise be.

Our knowledge of heat and fresh water transports under the Amundsen Sea ice shelves is limited by a sparsity of observations. To address this, in February 2006 we conducted a high resolution hydrographic survey 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 section fully encloses 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 at the base of the ice shelf by determining the changes between inflows and outflows.