Reduced Drake Passage throughflow during the last glacial and millennial-scale variability

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The Antarctic Circumpolar Current (ACC) plays an essential role in the thermohaline circulation and global climate. Today, a large volume of ACC water passes through the Drake Passage, the major geographic constrain for the circumpolar flow. Here we present the first millennial-scale proxy records of Holocene and last glacial variations of the Drake Passage throughflow. Our study reports geochemical, paleomagnetic, and grain-size data from a sediment core retrieved from the upper continental slope off southernmost Chile. The site is located beneath the strong Cape Horn Current that transports northern ACC water towards the Drake Passage. Our data reveal large amplitude changes in current intensity proxy records suggesting pronounced variations in surface and sub-surface flow. We interpret these changes in terms of strongly reduced contributions of northern ACC water to the Drake Passage throughflow during the glacial in general and particularly during millennial-scale cold phases as known from e.g. Antarctic ice-cores. At the same time, advection of northern ACC water into the Humboldt current system was likely enhanced. These results support climate models showing largely reduced volume transport through the Drake Passage during the last glacial maximum and an increasing throughflow during the last deglaciation that affected the strengthening of the Atlantic Meridional Overturning Circulation.