

Pacific water fluxes through the Barrow Canyon and its effect on warming in the Arctic Ocean

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Over the past few decades, sea ice retreat during summer has been enhanced in the Pacific sector of the Arctic Basin, in part due to increasing summertime heat flux of Pacific-origin water from the Bering Strait. Barrow Canyon, in the northeast Chukchi Sea, is a major conduit through which the Pacific-origin water enters the Arctic Basin. Our study focuses on the quantitative estimate of volume, heat and freshwater fluxes through Barrow Canyon by mooring observations and its role in warming of upper layers in the Canada Basin. We conducted year-round mooring observations from 2000 to 2016 in the mouth of Barrow Canyon. The annual mean poleward volume, freshwater and heat fluxes through Barrow Canyon were 0.43 Sv, 31 mSv and 2.12 TW. The annual averaged heat flux displayed substantial interannual variability, ranging from 0.93 TW to 3.34 TW. Comparing heat content in the Barrow Canyon and satellite derived sea surface temperature around Barrow Canyon, we derive and assess a proxy for estimating heat content in the canyon for the summer time period, which is when most of the heat passes northward towards the basin. The estimated heat content shows increasing trend from 1980 to 2015 and 1.5 times larger than the average value from 1980s to 2010s. Measurements from hydrographic surveys since 1990 reveals that warming of Pacific summer water layer in the Canada Basin tended to be enhanced around 2010s, probably due to higher heat transport via Barrow Canyon into the basin in 2007, 2010 and 2012.

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