

Volume, heat and freshwater fluxes of Pacific Water through the Barrow Canyon in the Arctic Ocean

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Interest in Pacific Water flowing from the Bering Strait into the Arctic Ocean has increased markedly in recent years, because of warming and increasing of Pacific Water inflow. Barrow Canyon, in the northeast Chukchi Sea, is a major conduit for Pacific Water to enter the interior Arctic basins. Our study focuses on the quantitative estimate of volume, heat and freshwater fluxes through Barrow Canyon by mooring observations with hydrographic surveys. We conducted year-round mooring observations at one station from 2000 to 2001 and at three stations from 2001 to 2013 in the mouth of Barrow Canyon. The annual mean volume, heat and freshwater fluxes through Barrow Canyon were 0.49 Sv, 2.25 TW and 31 mSv, respectively. Annual averaged volume and freshwater fluxes through Barrow Canyon in recent years from 2010 to 2013 were lower than the 2000-2008 averages, mainly due to strong northerly wind. In contrast, heat flux for the period 2010-2013 was higher than the 2000-2008 average. It tended to be three highest maximum in 2007, 2010 and 2012, when summer sea ice extent extraordinary retreats in the Arctic Ocean, mainly because of the warming of Pacific Summer Water. Heat fluxes observed in these years were 3-4 times larger than that observed in summer 1993. It is sufficient to melt 1-m-thick ice over an area of 360,000 km², which is equivalent to the total land area of Japan. The heat possibly contributes to both sea-ice melt in summer and a decrease in sea-ice formation during winter because this water typically subsides just below the surface mixed layer in the Canada Basin.

Keywords: Arctic Ocean, Pacific Water, Heat flux, Sea ice extent