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# Ice and Ocean Mooring Data Statistics from Barrow Strait, Central Section of NW Passage in Canadian Arctic Archipelago

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**Since August 1998, personnel from the Bedford Institute of Oceanography have deployed year-long moorings in the Barrow Strait of the Canadian Arctic Archipelago (CAA) to monitor the seasonal and interannual variabilities of ocean and pack ice parameters. Data from these moorings provide statistics on ice drafts and on ocean and ice velocities. This statistical information is presented here for bi-monthly subsets of the total 8-year time series. Maximum ocean and ice velocities of 150 cm/s were observed as well as ice drafts up to 22 m. The 8-year bi-monthly mean currents were stronger along the southern shore (15 cm/s) where most of the Arctic surface waters pass eastwards through the Barrow Strait.**

## INTRODUCTION

It is generally accepted now that, due to climate change, the polar ice caps are melting (ACIA, 2004, 2005; IPCC, 2007) and indeed the Arctic Ocean's ice extent of September 2007 was the smallest observed over the past 30 years, when satellite imagery became available to accurately document its extent (National Snow and Ice Data Centre, www://nsidc.org). In addition, all 3 NW Passage routes through the Canadian Arctic Archipelago (CAA) were ice-free for the first time during the 30-year satellite observation period. Normally the eastern part of the NW Passage within the CAA, consisting of Barrow Strait and Lancaster Sound (Fig. 1), becomes ice-free and is used by Canada's domestic shipping to resupply eastern and northern communities. In contrast, the western section (M'Clure Strait and Viscount Melville Sound) remains mostly filled with ice and is refilled with multiyear (MY) ice from the Beaufort Sea Gyre through M'Clure Strait (Howell et al., 2008). Models (Lindsay and Zhang, 2005) have suggested that if the polar pack ice were to retreat north past the entrance of the M'Clure Strait as it did in 2007, the flux of MY ice to the region would stop, thus improving navigation through the entire NW Passage. This is contrary to the speculation based on data sets available prior to 2007 that improved shipping was not expected to be happening in the near future (Melling, 2002; Wilson et al., 2004; Howell et al., 2008), as Arctic MY ice would come into the CAA from the north and east. Only data sets from future years will tell us what will happen, but the ice conditions that occurred in the Arctic and the NW Passage in 2007 had never been seen before (www://nsidc.org).

As part of the international Arctic/Subarctic Ocean Flux (ASOF) program, moorings have been monitoring the volume, heat and freshwater fluxes passing through the Barrow Strait of the Canadian Arctic Archipelago since August 1998 (ASOF, 2004). The aim of the program is to better understand the oceanographic and pack ice fluxes passing through the CAA and their relationship to the heat and freshwater budgets of the Arctic Ocean and the CAA, to the circulation and vertical ventilation of the North Atlantic Ocean, and to the global meridional overturning circulation (MOC).

The same data sets can be used to answer engineering questions being asked by shippers and regulators managing Canada's domestic shipping in the NW Passage. These regulatory programs have supported the mooring program in Barrow Strait to obtain statistics on the seasonal and interannual variability and possibly long-term trends of ocean currents, ice velocities and ice drafts. The object of this article is to present this statistical navigation information covering 8 years of mooring data.

## MOORING INSTRUMENTATION

Barrow Strait is 65 km (37 nm) wide at the mooring site and reaches depths of 285 m. Both mobile and land-fast pack ice conditions occur for 10 months of the year. Ice ridge keels within the pack ice are a threat to moorings, which for this reason were designed not to extend into the top 25 m of the water column. Instrumentation of the yearly arrays has varied, but they use Acoustic Doppler Current Profilers (ADCP) to monitor ocean and ice velocities, Upward Looking Sonars (ULS) to monitor ice

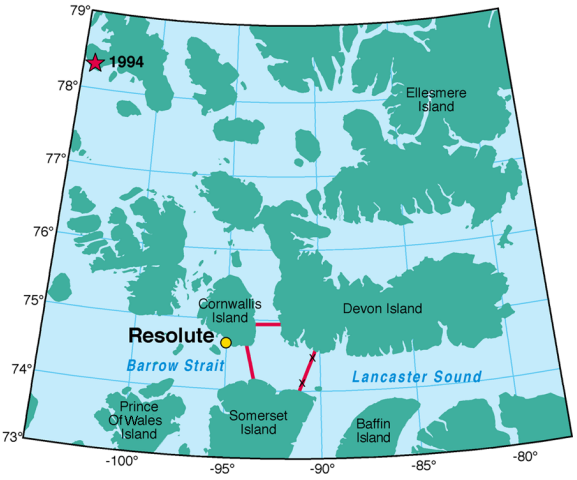


Fig. 1 Eastern CAA section of NW Passage: CTD transects (solid lines), mooring sites (dots) in eastern Barrow Strait, sill located at 97°W longitude in western Barrow Strait, and north magnetic pole location (1994) moving northwards

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