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Ice and ocean mooring data statistics from Barrow Strait, the central section of the NW Passage in the Canadian Arctic Archipelago

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ABSTRACT

Since August 1998, personnel from the Bedford Institute of Oceanography have deployed year-long moorings in Barrow Strait of the Canadian Arctic Archipelago (CAA) to monitor the seasonal and inter-annual 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 eight year time series. Maximum ocean and ice velocities of 150cm/sec were observed and ice drafts of up to 22m. The 8-yr bi-monthly mean currents were stronger along the southern shore (15cm/sec) where most of Arctic surface waters pass eastwards through the Barrow Strait.

KEY WORDS: ADCP and ULS mooring data, Canadian Arctic Archipelago, NW Passage, ice velocities, ocean velocities and ice drafts.

INTRODUCTION

It is generally accepted now that due to climate change, the polar ice caps are melting (ACIA, 2004, 2005 and IPCC, 2007) and indeed, the Arctic Ocean ice extent of September 2007 was the smallest observed over the past 30yr when satellite imagery was available to document accurately its extent (National Snow and Ice Data Centre, www://nsidc.org.). In addition, all three NW Passage routes through the Canadian Arctic Archipelago (CAA) were ice free for the first time for the 30yr 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 re-supply eastern northern communities. In contrast, the western section (M'Clure Strait and Viscount Melville Sound) remains mostly filled with ice and is re-filled 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 retreats north past the entrance of the M'Clure Strait as it has 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 available data sets prior to 2007 that improved shipping was not expected to be happening in the near future (Melling 2002, Wilson et al., 2004 and 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-Sub-Arctic Ocean Flux (ASOF) program, moorings have been monitoring the volume, heat and freshwater fluxes passing through 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 Archipelago 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).

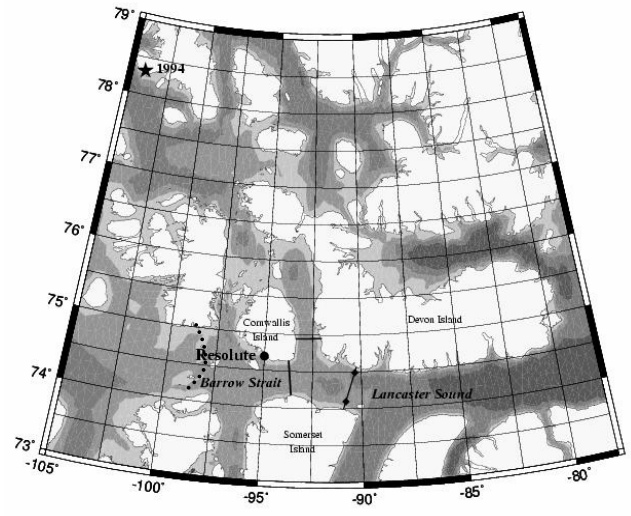

Fig.1, Map of the eastern CAA section of the NW Passage showing the CTD transects as solid lines, mooring sites (dots) in is eastern Barrow Strait, the sill (dotted line) in western Barrow Strait and the north magnetic pole location (1994) which is moving northwards.