

Straneo Report for COMER/OCCI Project in Hudson Strait

Freshwater through Hudson Strait

The Hudson Bay System (Hudson, James and Ungava Bays, Foxe Basin and Hudson Strait) is a large and very fresh arctic basin due to a large river input and to the inflow of Arctic Ocean waters. This freshwater cycles through the Hudson Bay System and, eventually, is exported to the North Atlantic, along the southern side of Hudson Strait, where it is thought to play a significant role in modulating the Labrador Sea's deep convection and, thus, the climate of the North Atlantic. Indeed, the contribution from Hudson Strait is thought to be the 3rd largest source of freshwater for the North Atlantic – even though the net freshwater flow through Hudson Strait has never been observed.

In 2004, Straneo set out to fill this gap by measuring how much fresh water is exported out of Hudson Strait along its southern side. Year-long mooring records revealed a much larger freshwater export than was expected. This excess freshwater can be a result of only two processes: 1) a larger than expected amount of Arctic Ocean fresh water enters the Hudson Bay System 2) the Hudson Bay System has the ability to accumulate and release freshwater due to internal processes. Understanding the sources of this excess freshwater and, in general, the pathways of freshwater in this region is key to our understanding of what governs freshwater input into the North Atlantic and its variability – a crucial aspect of our climate system.

Objective:

The objective of this project is, for the first time, to measure how much fresh water enters the Hudson Bay System from the Arctic Ocean (along the northern side of Hudson Strait) and how much freshwater exits into the Labrador Sea (along the southern side). To achieve this Straneo and her Canadian co-PI, Prof Yves Gratton, University of Quebec, will deploy four moorings across Hudson Strait.

Results: Year 1

The four joint US/Canadian moorings were successfully deployed by Straneo from the R/V Knorr in the August of 2008 (Figure 1). These moorings contain a series of temperature, salinity and velocity recorders as well as two upward looking sonars aimed at measuring sea-ice thickness. In addition, two of the moorings were equipped with a long aluminum “tube” carrying a temperature and salinity recorder aimed at obtaining measurements from the upper part of the water column. The upper 20m or so are risky for moorings because icebergs and sea-ice ridges can potentially damage the instruments and the mooring itself. The tube is attached to the sub-surface top of the mooring with a relatively weak link so that if hit – the tube will be lost but the bulk of the mooring will be saved (Figure 2). This is a new instrument that seeks to fill an important data gap.



Figure 1: Deployment of velocity measuring instruments in Hudson Strait



Figure 2 Deployment of the tube mooring for sampling the upper part of the water column. Left: the tube is visible floating behind the sphere. Right: Straneo and the Knorr's Boatswain assemble the tube mooring.

The mooring deployment locations are indicated in Figure 3. In addition, we were able to collect profiles of temperature, salinity and depth across the strait (CTD profiles) at seven stations so as to obtain a snapshot of both the flow and the property distribution. The deployment cruise was successful and very cost-effective because of the joint US/Canadian efforts. It also provided training for a post-doc, Dr. D. Sutherland, who participated in cruise planning efforts, deployment strategy and hands-on experience in conducting fieldwork.

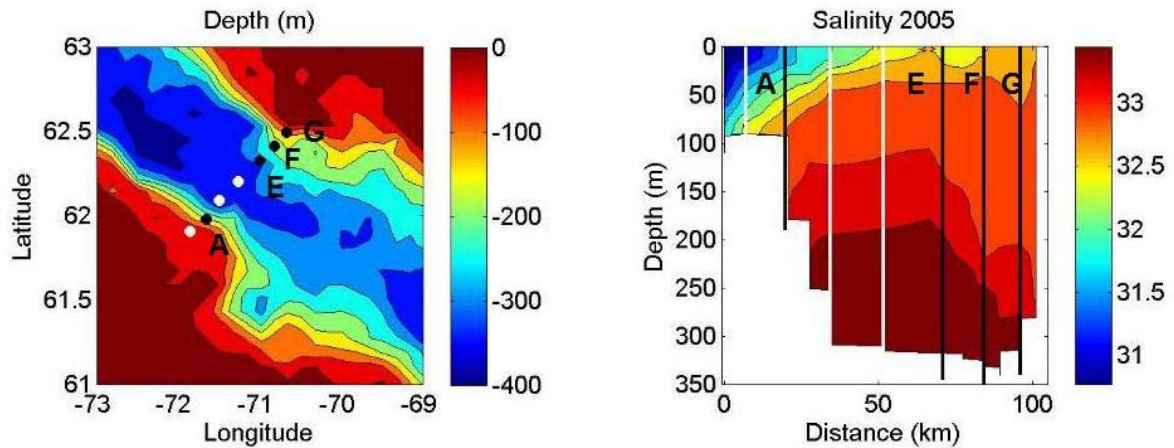


Figure 3 Left: CTD location (white) and Mooring+CTD Location (black). Right, vertical station profiles in relation to the salinity distribution observed in 2005.

Future Goals:

The four moorings will be recovered in September 2009 by Straneo from the R/V Knorr. No data will be available until since the moorings have no surface component (and hence no ability to transmit data) due the moving sea-ice cover in the Strait.