A Holocene sedimentary record of the Labrador Current

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The climate of the Atlantic Provinces is influenced by the Gulf Stream and Labrador Current. As temperature rises in response to increased CO_2 output, the increased melting from Greenland may cause a strengthening of the Labrador Current, which could result in regional cooling.

In this study, one marine sediment core from Karlsefni Trough on the Labrador Shelf is analyzed for its Holocene sedimentological record of the Labrador Current in order to determine how the strength of the current has varied in the Holocene. This core was analyzed using the Geological Survey of Canada Atlantic facilities at the Bedford Institute of Oceanography, Dartmouth, Nova Scotia.

Grain size data were obtained from Coulter Laser analyses and percent $CaCO_3$ was obtained using a LECO carbon determinator. Using the signature of ice-rafted detritus (IRD) and the percent $CaCO_3$, the sediment supply to the area was inferred. An age model of the core was determined using carbon-14 dating of mollusk shells and foraminifera.

The Karlsefni Trough core was found to be older than 8.9 ka. Based on the high percent $CaCO_3$, the source of the sediment in the cores before 6.3 ka was inferred to be Canadian Arctic proglacial sediment. After 6.3 ka the $CaCO_3$ drops off and is inferred to be only terrigenous sediment from ice-rafting and reworking of bank sediment. Using the carbon-14 dates, IRD, percent sand, color, and percent $CaCO_3$ the core was interpreted to contain marker beds for both the Lake Agassiz and Foxe Basin Deglaciation events.

The sortable-silt proxy for current strength in the Coulter Laser grain-size data shows a trend from almost unsorted at the base of the core to very well sorted around 7.8 ka with a slight dip around 6.9 ka and a return to maximum strength in the upper part of the core, estimated at 4.4 ka, before gradually declining to the present.

A strong sorting signal can be caused either by reworking of the adjacent bank sediment or a very strong Labrador Current. If there were a large sediment input from the bank, the IRD would be diluted. This is not the case, since IRD increases from around 5.4 ka to the present time. Therefore, the sortable-silt proxy appears to represent variations in the strength of the Labrador Current. Further work is needed to identify what past changes in climate and particularly precipitation on land correlates with increased late Holocene strength of the Labrador Current. Such an understanding may help predict future changes in the Labrador Current as a result of global warming, which could have economic, social, and environmental impacts on the Atlantic Provinces.

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