Holocene history of the Labrador Current around the Flemish Cap, Canada

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This study investigated how the Labrador Current and North Atlantic Current have changed over the Holocene on Flemish Cap and Flemish Pass, east of the Grand Banks of Newfoundland. This study is based on push cores that were collected from box cores. As the speed of the currents changes, so does the grain size of hemipelagic sediment. The paths of currents can be identified from their suspended and ice-rafted material and types of microfossils. Grain size data was obtained by sieving and by laser analysis, and used to determine the mean grain size of sortable silt, a proxy for current speed. Chemical data were acquired by portable X-ray fluorescence (pXRF) and mineralogical data by quantitative X-ray diffraction (qXRD). Petrology of granules in the cores was determined using a binocular microscope. Foraminifera samples were collected for C^{14} dating.

Surface sediments show a higher concentration of sand on southeastern Flemish Cap due to the North Atlantic Current. Surface total carbonate content increases towards the open ocean, reflecting different detrital carbonate content of the inner and outer Labrador Current, and higher biogenic carbonate productivity in the North Atlantic Current. Five cores were studied in detail to determine changes in the Labrador Current through the Holocene. Two lithologic units were distinguished. Unit A (0–6.3 ka) consists of olive grey silty mud; unit B is a lighter coloured mud with abundant ice-rafted gravel and sand (6.3–14 ka). Two cores penetrated only the last thousand years; one penetrated all of unit A, and two had a thin unit A over a long unit B. Granule counts showed that the proportion of detrital carbonate grains remained almost constant throughout the Holocene, suggesting that modern ice-rafting is supplied from the lower Paleozoic of northern Greenland. pXRF and qXRD data were used to track the carbonate supply and compare detrital dolomite with total (detrital + biogenic) calcite. The inner Labrador Current transports sediment with a higher dolomite/calcite ratio than the outer Labrador Current and the record in a few cores suggests shifts in those currents through the Holocene. Grain size (sortable silt) shows increase in current strength in the last 1500 years, preceded by a gradual decrease. This record can be compared with other proxy records of the vigour of the Labrador Current in the late Holocene. Such data are important for understanding the impact of future melting of the Greenland Ice Sheet on Atlantic Canada.

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