Late Quaternary variations of the Labrador Current in Flemish Pass

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Sediment drifts of alternating sand and mud, shaped by the Labrador Current in 600–1000 m water depth, formed during the Late Quaternary in Flemish Pass, seaward of the Grand Banks of Newfoundland. These sediment drifts preserve variations in the Labrador Current flow throughout the last glacial cycle. The northern section of Flemish Pass is well known and previous work there shows that significant grain size variations are influenced by the Labrador Current. During a 2011 cruise on the CCGS Hudson, high resolution seismic profiles and numerous sediment cores were obtained throughout Flemish Pass. Seismic profiles and 4 sediment cores from southern Flemish Pass, an area not well studied, are of interest to this research. A prominent sediment drift is located on the eastern side of Flemish Pass, within a transect of the 4 cores. Cores 0021, 0022, 0023 and 0024 are from on top of the sediment drift, adjacent to the sediment drift, in the middle of Flemish Pass and next to the margin

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of the Grand Banks of Newfoundland, respectively. Core descriptions, down-core measurements of colour, grain size, X-radiography and velocity and density measurements, seismic profiles and correlations provide evidence for the history of the Labrador Current during the Late Quaternary. In core 0022, a 0.12 m thick unit of transported and reworked volcanic rocks is located approximately 4 m beneath the seafloor. A chondrite-normalized REE abundance plot and a spider diagram for the 0022 volcanic rocks show that they are mildly alkaline basalt, presumably transported by floating ice from Iceland or Jan Mayen. A comparison study with basalt from these locations may determine the source of this basalt, providing additional evidence for ocean circulation in glacial times. The petroleum infrastructure in Flemish Pass is designed to withstand forces from the modern Labrador Current. However, if the Labrador Current was stronger in the past, this study will provide a baseline for the required infrastructure strength in Flemish Pass, reducing risks for deep sea drilling. Variations in the Labrador Current also provides a proxy for the strength of the North Atlantic Subpolar Gyre, which influences deep ocean circulation offshore Greenland. If this gyre is weakened by freshwater additions from a large meltwater event (e.g., the Lake Agassiz outburst), then deep water production decreases. A decrease in deep water production offshore Greenland weakens global ocean circulation, providing huge implications for global climate change. This work thus contributes to making predictions for future ocean circulation and climate change.