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Post-glacial climatic and environmental changes in the Fury and Hecla Strait region based on biological and geochemical proxies

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Located between Melville Peninsula and northwestern Baffin Island (69.9247° N, 84.5121° W), the Fury and Hecla Strait region plays a key role in the understanding of the postglacial evolution of the Canadian Arctic. The absence of paleolimnological data in the region as well as the strategic position of the strait itself, given its location at the junction of the Atlantic Ocean currents coming from Foxe Basin and those of the Pacific Ocean through the Gulf of Boothia, make it a prominent region for Quaternary research. Although some studies have suggested a timing for the regional deglaciation, results remain extrapolated and do not provide high-resolution data for the region.

This project aims to analyze sediment cores of lakes located on the southern shore of the Fury and Hecla Strait, in the Canadian Arctic, in order to reconstruct past climates and landscapes since the end of the last glacial period. A multi-proxy approach based on physical, chemical and biological core parameters, allowed high-resolution paleoenvironmental reconstructions of the region, including natural climate fluctuations, past extreme climate events and major landscape changes induced by glacial retreat, marine inundation and glacial isostatic readjustment.

Various radiometric dating methods (210Pb, 137Cs and 14C) were used to establish a chronology for the reconstructed changes, pointing towards a glacio-marine phase that lasted from 8250 cal. BP, at its latest, to 6675 cal. BP, followed by a gradual transition towards freshwater conditions and the establishment of a lacustrine phase at 6125 cal. BP. An extreme event, marked by major geochemical and sedimentological shifts, also appears to have happened at 3950 cal. BP, but the nature of this abrupt change remains unknown. The results were also correlated with regional temperature data from previous studies to explore the relationship between diatom assemblage changes and environmental fluctuations.

This study is crucial to respond to many unsolved questions in oceanography, biogeography, genetics or even anthropology, by providing a high-resolution chronology of geophysical changes, namely regional deglaciation and the opening of the strait. Furthermore, it improves our understanding of paleoenvironmental variability in the Foxe Basin throughout the Holocene, including climatic and physico-chemical shifts, enabling us to predict ecosystem responses to future global change.