Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.35886

Deglaciation history of the Innuitian and Greenland Ice Sheets in the Kane Basin

JEAN-CARLOS MONTERO-SERRANO[1,2], BETHANY C. BEHRENS[2], YUSUKE YOKOYAMA[2,3,4], GUILLAUME ST-ONGE[1], YOSUKE MIYAIRI[5], ALEXANDRE NORMANDEAU[6] AND MATTHEW O'REGAN[7,8]

[1]Institut des sciences de la mer de Rimouski, Université du Québec à Rimouski, Québec-Océan, Geotop, Rimouski, Canada
[2]The University of Tokyo, Atmosphere and Ocean Research Institute, Kashiwa, Japan
[3]Japan Agency for Marine-Earth Science and Technology, Japan
[4]Graduate Program on Environmental Sciences, Graduate School of Arts and Sciences, The University of Tokyo
[5]Atmosphere and Ocean Research Institute, The University of Tokyo
[6]Geological Survey of Canada (Atlantic), Natural Resources Canada, Dartmouth, Nova Scotia, Canada
[7]Department of Geological Sciences, Stockholm University, Stockholm, Sweden
[8]Bolin Centre for Climate Research, Stockholm University

Kane Basin forms part of the Nares Strait, a major northern outflow pathway connecting the Arctic Ocean to Baffin Bay. During the last glaciation, this strait was blocked by the coalescence of the Innuitian and Greenland ice sheets. Its deglaciation and subsequent opening have been documented in previous paleoceanographic studies [1-4]. Newly collected sediment cores from both sides of Kane Basin (near the Eugenie-Dobbin and Humboldt glaciers), together with an existing core from central Kane Basin [1], offer a unique opportunity to refine the timing and pattern of deglaciation within the basin (Fig. 1).

In this study, we investigated the physical, sedimentological, mineralogical and elemental geochemical properties of these sediment cores, complemented by beryllium isotope measurements ($^{10}Be/^{9}Be$) from the reactive sediment fraction and carbon isotope analyses ($\delta^{13}C$ and ^{14}C) of organic matter. We established a robust postglacial chronostratigraphic framework by integrating radiocarbon dating of shell fragments and foraminifera with paleomagnetic analyses.

The mineralogical and geochemical signatures of the cores support the hypothesis of a gradual opening of Nares Strait between 8.8 and 8.2 cal ka BP and indicate a progressive retreat of the bordering ice sheets onto land between 7.7 and 7.5 cal ka BP. More open, glacier-influenced marine conditions were established in Kane Basin during the Middle to Late Holocene (8.2 to 2.2 cal ka BP). Detrital proxies further reveal a landward retreat of the ice front between 5.2 and 1.5 cal ka BP, followed by a phase of ice-margin regrowth during the Late Holocene (1.5 cal ka BP to present). A period of enhanced export of sea-ice-rafted sediments across Nares Strait is recorded between 2 and 0.5 cal ka BP, coinciding with the Roman Warm Period and the Medieval Warm Period.

Together, these datasets provide new constraints on how ice-ocean interactions governed sediment dynamics and the opening of Kane Basin since the last deglaciation, and allow us to document the sensitivity of the Eugenie-Dobbin and Humboldt glaciers to changing climatic and oceanic conditions throughout the Holocene.

References

1. Caron et al. (2019). https://doi.org/10.1111/bor.12346
2. Georgiadis et al. (2018). https://doi.org/10.5194/cp-14-1991-2018
3. Jennings et al. (2019). https://doi.org/10.1111/bor.12391.
4. Jennings et al. (2011). https://doi.org/10.5670/oceanog.2011.52.

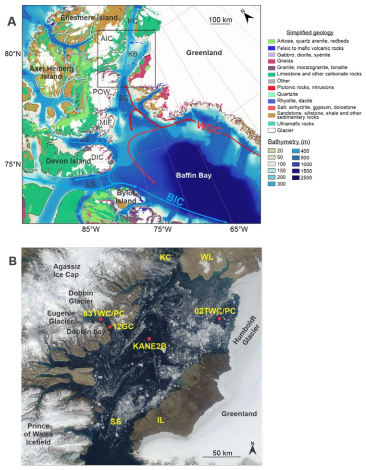

Fig. 1. Maps of the study area. A) Simplified bathymetric and geologic map of northern Baffin Bay with major surface currents. Red arrows represent warm (>2 °C) surface currents, and blue arrows represent cold (<-1 °C) Arctic surface waters (ASW). WGC = West Greenland Current; BIC = Baffin Island Current; LS = Lancaster Sound; JS = Jones Sound; SS = Smith Sound; KB = Kane Basin; KC = Kennedy Channel; MIF = Manson Icefield; POW = Prince of Wales Icefield; DIC=Devon Ice Cap; AIC=Agassiz Ice Cap; IL=Inglefield Land; WL=Washington Land. Modified from Harrison et al. (2011). B) MODIS satellite image from August 14, 2019, showing an overview of the distribution of sea ice and icebergs around Kane Basin with the location of the sediment cores (yellow text and red dots) analyzed in this study.