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Late Quaternary patterns of retreat of the Laurentide Ice Sheet margin in Clyde Inlet, eastern Baffin Island (Arctic Canada)

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The maximal extent of the Laurentide Ice Sheet (LIS) on eastern Baffin Island has been widely debated during the last decades as different palaeoglaciological models have been proposed, ranging from a single-domed ice sheet extending beyond the shelf break to an ice sheet margin barely reaching the head of the fjords. Spatial and temporal variability of ice sheets extension on eastern Baffin Island during Quaternary glaciations complicate the establishment of a reliable reconstruction of the ice margin. Furthermore, the lack of geophysical data in most of the fjords, and seaward, makes it difficult to reconcile the proposed terrestrial and marine glacial margins at the Last Glacial Maximum (LGM).

Here we use high-resolution swath bathymetry imagery combined with acoustic stratigraphy data collected during various oceanographic expeditions of the RV Maria S. Merian, CCGS Amundsen and RV Nuliajuk to: (1) define the maximal extent of the LIS margin in Clyde Trough during the LGM; (2) reconstruct ice-flow variations and glacial dynamics while the ice retreated on the shelf and in Clyde Inlet; and (3) identify phases of stillstand and/or readvance during deglaciation of the sector.

Geomorphological mapping of Clyde Inlet and its adjacent continental shelf allowed the identification of subglacial landforms, such as crag-and-tails and mega-scale glacial lineations (MSGLs), which are indicators of fast-flowing ice (i.e. ice streams). The swath bathymetry imagery also allowed delineating four grounding-zone wedges (GZWs) in the trough, indicating positions of stability of LIS margins during the LGM and early deglaciation. Several moraines observed in the fjord suggest that ice retreat occurred by steps in a less catastrophic way than previously proposed. The data show five different moraine systems in Clyde Inlet. Sediments cores collected during the summer of 2017 will provide additional insight on the deglacial history and processes on eastern Baffin Island.