



Glacial landforms identified in high-resolution bathymetry indicate past Greenland ice sheet dynamics in Melville Bay, northeast Baffin Bay

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The maximum glacial extent of the Greenland Ice Sheet (GIS) and its advance and retreat across the continental shelf are crucial to better understand past ice-sheet dynamics and to predict its future development in times of climate change. Analyses of distribution and shape of glacial landforms are, thus, used to interpret information on ice-stream advances and retreats across the shelf.

This study focuses on the past dynamics of the northwest GIS across the Greenland continental shelf. The research area is located in the Melville Bay, northeast Baffin Bay. Our interpretations base on analyses of high-resolution swath-bathymetric data acquired in 2010 and 2015 with the research vessels RV Polarstern and RV Maria S. Merian. The bathymetric data provide information along and across the axes of the major cross-shelf troughs of Melville Bay, allowing us to reconstruct the ice-sheet dynamics between the shelf edge and the present-day coast. The results of the analyses show glacial landforms that document former dynamics of the Greenland Ice Sheet (GIS). Moraines at the shelf edge give evidence for the maximum GIS extent. Grounding-zone wedges (GZWs), till lobes and glacial lineations define a pattern of variable ice-stream retreat in the individual cross-shelf troughs. Slow ice-stream retreat occurred in the northern cross-shelf trough compared to more episodic retreats in the central and southern cross-shelf troughs of Melville Bay. Periods of ice sheet grounding-zone stabilizations are indicated by large GZW-complexes on the mid- to inner shelf. Finally, the northwest GIS retreated across the inner continental shelf before 8.41 ka BP as revealed by an age-dated geological sample. Furthermore, on inter-trough banks, evidence has been found for minor ice-stream activity on localized ice domes. The glacial landforms across the northwest Greenland continental shelf, thus, host records of varying and discontinuous ice-sheet retreats since the last glacial maximum.