

# The marine signal of a collapsing ice margin: the catastrophic advance and collapse of the end Pleistocene Viscount Melville Sound Ice Shelf, Canadian Arctic Archipelago

Furze, Mark F.A. (1); Pieńkowski Anna J. (1, 2); Nichols, Keir A. (1, 3); Reedman, Amy (1); Esteves, Mariana S.R. (2); Cage, Alix G. (3); Bennett, Robbie (4).

1 Earth & Planetary Sciences, Department of Physical Sciences, MacEwan University, Edmonton, Alberta, T5J 4S2, Canada; 2 School of Ocean Sciences, Bangor University, Menai Bridge, Isle of Anglesey, Wales, LL59 5AB, UK.; 3 Department of Geography, Geology and the Environment, Keele University, Keele, Staffordshire, England, ST5 5BG, UK; 4 Natural Resources Canada - Geological Survey of Canada (Atlantic), Bedford Institute of Oceanography, P.O. Box: 1006, Dartmouth, Nova Scotia, B2Y 4A2, Canada

**Abstract:** Recent work in the western Canadian Arctic Archipelago has seen a dramatic re-evaluation of the timing and extent of Late Wisconsinan glaciation by a primarily cold-based Laurentide Ice sheet. Although the pattern of ice extent and retreat is now better constrained terrestrially, questions remain regarding ice retreat southeastwards onto mainland Canada.

Earlier research along the coasts of Viscount Melville Sound has demonstrated the re-establishment of a floating iceshelf during regional deglaciation ~10.9 cal ka BP. Molluscan chronologies suggest the establishment of the iceshelf was extremely rapid, persisting for less than 800 years, and subsequently undergoing an equally rapid collapse.

These terrestrial observations are now complemented by piston cores from central Viscount Melville Sound that document the short-lived ice shelf. The presence of water-lain diamictons as well as ice rafted debris indicative of a southern provenance is considered a result of deposition from a debris-rich tongue of floating glacial ice originating in M'Clintock Channel, thus permitting on-shore rafting of ice and emplacement of coastal tills and iceshelf moraines. The rapid transition from sub-iceshelf sediments to ice-proximal and distal deposits is also consistent with terrestrial evidence for the rapid retreat of the iceshelf. <sup>14</sup>C-dated benthic foraminifera provide a minimum age on iceshelf collapse c.10.6 cal ka BP. Age-depth model projections indicate an approximate iceshelf collapse date far earlier than previously indicated, suggesting an even more dramatic event than hitherto hypothesised: an iceshelf establishing itself in Viscount Melville Sound and then collapsing in <400 cal yrs.

This detailed study contributes towards an improved understanding of the constraints placed on the streaming of ice from M'Clintock Channel and the resulting draw-down and destabilization of the NW sector of the Laurentide Ice Sheet. Emerging foraminiferal, diatom, and biogeochemical data provide valuable insights into the deglacial and postglacial history of the western Northwest Passage.