Geophysical Research Abstracts
Vol. 14, EGU2012-12907-1, 2012
EGU General Assembly 2012

Chronology and dynamics of the Amundsen Gulf Ice Stream in Arctic Canada during the last glacial-interglacial transition

T.R. Lakeman (1), B. MacLean (2), S. Blasco (2), R. Bennett (2), and J.E. Hughes Clarke (3)

(1) Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, AB, Canada, (2) Geological Survey of Canada–Atlantic, Dartmouth, NS, Canada, (3) Department of Geodesy and Geomatics Engineering, University of New Brunswick, Fredericton, NB, Canada

An extensive ice stream of the Laurentide ice sheet occupied Amundsen Gulf during the Last Glacial Maximum. The grounded ice stream extended northwestward to the margin of the inner shelf in the Beaufort Sea and to a depth of 450 metres. This glacier was one of the largest ice streams to emanate into the Arctic Ocean during the last glaciation and, as such, exerted a primary influence on the dynamics of the northwest Laurentide Ice Sheet. Ice stream retreat from its maximum position began prior to 13,000 cal yr BP. The pattern of extensive sole marks or glacial flutings on the seabed and on the adjacent mainland and islands confirms the direction of flow was from southeast to northwest. In the Gulf these features are imprinted primarily on subglacial sediment deposits. The bathymetry of the Gulf and known extent of the ice stream on land indicates the ice was at least 700 m thick. A series of moraines at the mouth of the Gulf mark temporary positions of the retreating ice stream margin. Early stages of ice retreat may have been associated with meltwater discharge under the ice stream as evidenced by current erosion associated with some sole marks or glacial flutings. Melting at the leading edge of the ice stream resulted in calving of icebergs and the generation of keel-scour marks in the seabed. Retreat of the ice stream was relatively rapid as indicated by thin and spatially discontinuous deglacial glaciomarine sediment in the Gulf. Furthermore, an expansive database of deglacial radiocarbon ages from eastern Banks Island, western Victoria Island, and the adjacent Arctic mainland, indicates that the ice stream had retreated fully from the Gulf by 12,500 cal yr BP. The lack of Holocene sediment draping the sole marks or flutings, and outcrops of exposed bedrock and glaciomarine sediment indicate very low sedimentation rates since ice retreat. The thin veneer of recent fine sediment that has been deposited discontinuously on the seabed in the Gulf indicates little influence of the Mackenzie and other fluvial sediment discharge on the seabed over the last 13,000 cal yr BP. The deglacial history of Amundsen Gulf under ameliorating climate conditions of the last $\sim$19,000 cal yr BP provides important constraints on the variables that occasioned the demise of the northwest Laurentide Ice Sheet, such as sea level change, paleoclimate, and regional ice sheet dynamics. Understanding the complex interplay among these variables during the last deglaciation will bear on current model projections of the dynamics of the Greenland and Antarctic ice sheets. In addition, quantifying past iceberg fluxes to the Arctic Ocean has implications for assessing the origin of deep ice scours in the Arctic Ocean Basin and the nature of rapid climate changes at the last glacial-interglacial transition.