

Wisconsinan glacial and sea-level history of Maritime Canada and the adjacent continental shelf: a correlation of land and sea events¹

R. R. Stea, D. J. W. Piper², G. B. J. Fader³ and R. Boyd³

The Wisconsinan glacial history of Maritime Canada records the interaction of land-based glaciers with the sea, which dissects the region along the deep embayments of the Bay of Fundy and the Laurentian Channel. Ice centres, collectively termed the Appalachian Ice Complex, shifted in a clockwise manner across the varied bedrock terranes of the region, producing cross-striated bedrock outcrops and compositionally distinct till sheets on land. Based on provenance, offshore glacial sediments can be correlated to their terrestrial counterparts, hence-establishing crucial land-sea links in the glacial record. Five glacier flow events have been recognized.

During the Caledonia Phase in the Early to Mid Wisconsinan, ice from eastern Appalachian upland sources crossed Nova Scotia and extended to the continental shelf edge where a calving margin was established. Slumping at this margin produced proximal-wedge-shaped bodies of diamicton that interfinger with glaciomarine sediments. The Caledonia Phase glacier retreated during the Mid Wisconsinan to the inner Scotian Shelf. During the Escuminac Phase in the Late Wisconsinan (22-19 ka) an ice centre formed over the Magdalen Shelf (Escuminac Ice Centre) and transported large quantities of local red-bed material southward to the outer shelf/slope margin. This glacier retreated about 18 ka to a tidewater margin at Sable Island Bank and Banquereau. Sea level during this time period was falling as a result of isostatic recovery from earlier Escuminac Phase maximum ice loads. Just after 18 ka, ice wasted back across the mid-shelf basins to the tidewater margin of the Scotian Shelf end moraine complex and was stabilized by falling sea levels. Escuminac ice was reorganized into the Scotian Ice Divide (Scotian Phase) over mainland Nova Scotia and the continental shelf south of Cape Breton Island. Between 15 and 13 ka another period of glacier retreat ensued, and the margin settled close to the present day land areas. Between 13 and 12.5 ka an ice margin was established from local terrestrial ice centres in northern Nova Scotia (Chignecto Phase) into the Bay of Fundy and just beyond the present day Atlantic coast. Responding to increasing climatic warming, these smaller glaciers dissipated and their margins retreated landward. A sea-level lowstand of -65 m on the inner shelf occurred ca. 11.7 ka. Isolated terrestrial remnants of Chignecto Phase glaciers were re-activated as a result of cooling during the Collins Pond Phase (Younger Dryas) ca. 10.8 ka.

Enhanced ice rafting, evident in the North Atlantic deep oceanic record, appears to correlate with periods of glacier retreat in the Appalachian Ice Complex. During melting and sea-level rise, both the quantity and thickness of icebergs increased due to grounding-line retreat within the Magdalen Shelf, thereby increasing the net flux of hematite-stained quartz to the North Atlantic.

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²Geological Survey of Canada (Atlantic), P. O Box 1006, Dartmouth, Nova Scotia, Canada B2Y 4A2

³University of Newcastle, New South Wales, 2308, Australia