Glacial retreat and relative sea-level changes in Maritime Canada[1]

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The Scotian Shelf End Moraine Complex, formed between 18 - 15 ka at the tidewater margin of a glacier centered over Nova Scotia (Scotian Ice Divide). Isostatic rebound from a more extensive ice sheet at the Late Wisconsinan (Escuminac Ice Centre) helped stabilize this ice margin. These moraines are found between 170 - 85 m below sea level. Depth variation can be attributed to differential uplift and proximity to post-Scotian Phase late-glacial ice centres, assuming that the moraines all formed at the same critical buoyancy depth. Raised marine deposits formed between 14 - 12.5 ka following rapid ice retreat in the Gulf of Maine and Bay of Fundy. Post-glacial emergence patterns over Maritime Canada are controlled by rates of glacier retreat and variations in ice loads over the region. AMS dating of basal lake sediments and buried organic sections show that glaciers persisted over mainland Nova Scotia until 11 ka, several thousand years after ice was removed from the Gulf of Maine and the Bay of Fundy. Marine limits decline towards local centres of ice flow, reflecting diachronous emergence under low-profile or smaller ice caps. At 11.6 ka, relative sea-level along the inner Scotian Shelf of Nova Scotia stood at -65 m below sea level. A shoreline developed, marked by the abrupt transition from moraines and drumlins to truncated landforms and muted topography, terraces and cliffs, and deltaic deposits. In contrast to earlier, tilted emerged shorelines, this inner shelf lowstand shoreline is relatively undeformed and can be traced along the entire length of eastern mainland, Nova Scotia. Recently collected seismic reflection data from Browns Bank show prominent bank-edge deltas with upper layout contacts between 40 - 70 m. Terraces, clinoforms and significant erosional unconformities on glaciomarine sediments below 90 m may also indicate greater sea-level lowering in the offshore banks and the Bay of Fundy. The patterns of post-glacial relative sea-level change in Nova Scotia and Maine are similar, if emergence under late-melting ice is considered. The high amplitude and short wavelength of relative sea-level curves are not consistent with geophysical models of sea-level change that emphasize slow-response mantle deformation.

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