

Evidence for a ~13 ka Glacier Advance in Atlantic Canada¹

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Was there a significant late-glacial advance correlative with the Port Huron event of the mid continent in Atlantic Canada? Data from Nova Scotia and the offshore supports the idea of an ice advance that occurred approximately 13 ka.

The Appalachian Ice Complex was a series of Wisconsinan ice centres, spatially and temporally distinct, that advanced and retreated producing a palimpsest of erosional and depositional glacial landforms. Four main phases of ice flow have been recognized, with the youngest event termed the Chignecto Phase. This flow was largely directed into marine bays bordering Nova Scotia, although striae relating to this phase are found on 300 m highland areas near the former ice centres. These southwestward flow patterns can be traced to ice marginal deposits in southwest Nova Scotia, northern Nova Scotia and the inner Scotian Shelf. Ages of the ice margins were established by direct dating of a glaciomarine delta and by bracketing ages through AMS dating of lake sediment cores beyond and behind the margins. The timing of deglaciation was established using a linear regression model of AMS ages vs depth of organic gyttja beneath a distinctive Younger Dryas marker horizon.

The average basal accumulation age of four lakes behind the onshore Chignecto Phase margins is 11.6 ka, whereas five lakes beyond the margin averaged 12.9 ka. Three shell fragments from a glaciomarine delta beyond the margin averaged 13.5 ka. The minimum age can be significantly increased by considering a deglaciation age of 12 ka from buried peat at the head of the Bay of Fundy, and adding 200 varve years of glacial lake sediment that pre-dated the peat formation. The best estimate of the age of this margin would be between 12.2 and 13.0 ka. On the inner Scotian Shelf the age of the Chignecto Phase margin was bracketed between 12.7 and 14 ka, based on sequence stratigraphy, age dates, and foraminiferal assemblages of a proglacial glaciomarine section. Combining both areas, a reasonable estimate for the time of formation of the Chignecto Phase margin is between 12.7 and 13 ka.

What caused the Chignecto Phase? Drawdown may only be part of the answer as the Chignecto Phase centres were located at or near ice streams of the previous Scotian Phase. Studies off the Scotian Slope have revealed a significant cooling and ice rafting event ca. 13 ka which may have resulted from renewed ice stream activity in the Gulf of St. Lawrence. It is possible that this event fits into a 1500 year millennial oscillation cycle, defined by Bond (1997), in which the next major event was the Younger Dryas.

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