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See table of contents

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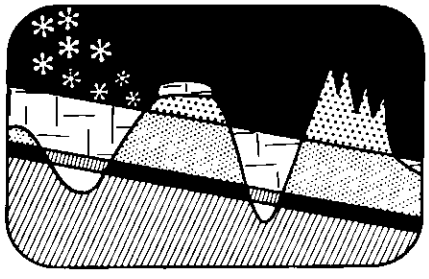

Limits of Wisconsinan Glaciation in Eastern and Northern Canada

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A symposium with the above title was held on October 26, 1978 at "Toronto '78", a joint annual meeting of GAC-MAC and GSA. Sixteen papers were delivered, focussing on the geologic evidence of limits reached by major glacial advances during the last glaciation over an area extending from Banks Island, N.W.T. to the Atlantic Provinces and northern New England. The purpose of the symposium was to expose results of recent research which have generally tended to support a return to the views current in the first three decades of this century. Broadly stated, these were that, firstly, in the last glacial phase, glaciers and ice sheets in the coast-bordering highland regions of northeastern America, reached relatively restricted terminal positions and elevations, leaving much of the offshore area, as well as narrow present-day coastal regions, and often extensive highland areas, ice-free. Secondly, that, at that time, glacial ice was deployed from multiple local outflow centres as well as from the Laurentide Ice Sheet.

The day opened with four papers by staff (J.D. Ives and G.H. Miller) and students (A.R. Nelson and W. Locke III) of the Institute of Arctic and Alpine Research (INSTAAR), University of Colorado, Boulder. Ives briefly reviewed the history of changing concepts of the limits attained by glacier termini and surfaces during the last glaciation (see also Ives, 1978). He called for objective mapping of limits of multiple glaciation and openness of interpretation to avoid seductive similarities between widely-spaced regions.

Nelson reported that sediment of cycles of marine and glaciomarine deposition exposed in coastal cliffs on Qivitu Peninsula, eastern Baffin Island. These record glacier advances, maxima, and retreats over the hinterland, with accompanying glacio-isostatic effects on sea level. In discussion the next day J.T. Andrews (INSTAAR) reinforced the need to distinguish between glacial histories inferred from sea level data and those directly evidenced by glacial deposits. Hiatuses commonly found between marine deposits dating greater than 40ka and less than 10ka in the eastern Arctic could record ice cover or marine regression. Correct interpretation bears strongly on the question of glacier limits.

Locke pointed out the ambiguity in the use of "Wisconsinan" in the symposium's title, since it is strictly a chronostratigraphic term coined in the U.S. Midwest and loosely applied more widely as a glacio-climatic term for the last generation. In Baffin Island that glaciation has been called "Foxe" for the past ten years (Andrews, 1968). Locke's work near Cape Dyer, eastern Baffin Island reveals an Early Foxe (ca. 115ka) maximum extent of glaciers, a mid-Foxe (ca. 80ka) slightly less extensive advance, and a restricted advance in Late-Foxe times (ca. 11-7ka) to positions not far beyond present glacier termini.

Miller, as well as identifying maximum extent of Foxe Glaciation beyond the coast of Hall Peninsula, Baffin Island as Mid-Foxe (ca. 80ka) in age, recognizes a Late Foze (ca. 11ka) advance of the Laurentide Ice Sheet which produced the "Warwick Moraine", and a Cockburn-equivalent advance of local ice to form the "Hall Moraine" at ca. 8.5 ka. He noted that precipitation from different sources is required to activate Laurentide, versus local Baffin Island, ice masses.

There followed a group of three papers on Arctic Island glacial history by staff of the Terrain Sciences Division (GSC). A.S. Dyke has found that the uplands of Western Somerset Island are devoid of evidence of recent glaciation. However, beneath mass-wasted gneissic grus on the upland an earlier till records extensive, perhaps complete, glacierization of the island. Later Laurentide ice flowing from west of the island was warm-based, and coalesced with a local ice mass, cold-based in its central area but warm-based on its periphery. Marine deposits greater than 38ka up to 180 m relate to wastage of this local ice during a mid-Wisconsinan interstede. Holocene strandlines dip down to the east, recording a dominant "Late Wisconsinan" ice load to the west.

D.A. Hodgson, working in the north-central Queen Elizabeth Islands, on the Ringnes and adjacent small islands, has found no features related to "Late Wisconsinan" glacierization, even by cold-based ice. A 9 ka water plane marks the transition from marine trans-

gression to regression. Emergence results from deflection by upland ice on islands from Bathurst east to Ellesmere and north to Axel Heiberg, rather than from a more extensive Innuitian Ice Sheet.

J-S. Vincent reported on simultaneously published (Vincent, 1978) results from Banks Island. He has evidence of three glaciations – two of them "pre-Sangamon" – represented by ice-marginal features and deglacial lacustrine and marine deposits. No "Late Wisconsinan" glacial features are in evidence, but a marine transgression at 10-11ka may represent flooding of a narrow east coastal fringe isostatically depressed beyond an ice margin further east. This newly-revealed complexity of glacial history might well act as a standard for comparison throughout central and western Arctic Canada.

Four papers on Appalachian Canada glacial history opened the afternoon session. J.T. Gray and G. Borduas (Université de Montréal) have found no evidence of Late Wisconsinan glacial cover above 1100m within the McGerrigle Batholith of the Chic Choc Mountains on the Gaspé Peninsula, Québec. Patches of diamicton above that level could represent an earlier till. Late Wisconsinan ice flowed deployed from a summit plateau which was either ice-free or covered only by a "snow dome"

C.M. Tucker and S.B. McCann (McMaster University) reported on restricted Late Wisconsinan ice cover near Burin Peninsula, SE Newfoundland. Earlier, more extensive ice covers are represented by tills from the interior of Newfoundland and by pre-Late Wisconsinan striae directed onshore from the adjacent shelf.

I.A. Brookes (York University) commented on the relative utility of criteria used to distinguish "weathering zones" in west Newfoundland. He also reported on till and soil stratigraphy within a plateau-top moraine which possibly confirms a pre-Sangamon age for glaciation of the highest of three zones identified by Grant (1977).

C. Gauthier (Univ. of Western Ontario) attempted to resolve the conflicting hypotheses of limited, weakly erosive vs extensive vigorously erosive ice in northeastern New Brunswick, hypotheses both seemingly supported by different lines of evidence there. He called for Laurentide ice to cross the Gaspésie highlands, with prior evacuation of basal debris northeastwards down the St. Lawrence trough; possible freezing of basal south-moving ice to the topographic highs of Gaspésie and northern New Brunswick (thus preserving an assemblage of castellate weathered bedrock features); and radial flow of late, local, warm-based ice from highland fringes to produce landscapes of strong glacial erosion and thick till deposition in lower areas.

Two papers on adjacent Maine followed. P.T. Davis (INSTARR) concluded from evidence of northerly-derived erratics, preserved glacially abraded surfaces, and limited soil development that Mt. Katahdin's 1605m summit was overridden by the Laurentide Ice Sheet in Late Wisconsinan time. This drew partial support from H.W. Borns, Jr. (University of Maine) who reported evidence for the invasion of northern Maine by this ice at that time.

The glacial history of the Atlantic shelf received attention in two papers from Atlantic Geoscience Centre (GSC). R.H. Fillon reported evidence of repeated grounding of outlet glacier tongues in eastern Hudson Strait from acoustic profiles of bottom sediments. G. Vilks and P.J. Mudie have found evidence in pollen and forams from cores on southern Labrador Shelf that Late Wisconsinan glacial cover there was less extensive than hitherto proposed. The eustatically lowered sea surface was apparently free of sea ice in summer at 21ka while pollen indicates a sedge-shrub tundra (on the exposed narrow shelf) between 21 and 13ka.

The day ended with a treatment of post-glacial land and sea level changes in Atlantic Canada, interpreted through a model incorporating mantle-lithosphere-ice load terms, which was presented by G. Quinlan (Dalhousie University). Problems of spatial resolution and input data on sea level change loomed large.

Approximately 20 people attended an informal discussion the next day. The problems raised included criteria for defining glacial limits, distinguishing eustatic and glacio-isostatic influences on sea level in areas where marine sediments form the only record of glacial fluctuations, and finding independent support for "cold-ice" vs "warm-ice" explanation of geomorphic features.

The symposium brought together many lines of evidence to show that the concept of extensive Late Wisconsinan (Late Last Glaciation) ice has been succeeded in the minds of many researchers by one of more limited, and often local, ice cover, as visualized by early workers such as Chalmers, Coleman, and Daly, and strongly propounded in more recent times by Ives and Andrews and their students. If the symposium failed in any way it was in not hearing any vehemently expressed contrary views that could not be accommodated by the recently emerged scheme supported by the day's papers.

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