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DEVELOPMENT OF GLACIAL EVENT-STRATIGRAPHY; SE QUEBEC AND N. NEW ENGLAND

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DEVELOPMENT OF GLACIAL EVENT-STRATIGRAPHY; SE QUEBEC AND N. NEW ENGLAND

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Research that Perry Stewart and Paul MacClintock carried out in the 1950’s and 1960’s on Laurentide Ice Sheet deposits in northern New York and in Vermont led them to propose a three-event glacial stratigraphy, which was imported into the Quebec Appalachians by Barrie McDonald in 1964. He adapted their stratigraphy to his and others’ observations of many multi-till sections in Southern Quebec. The author and associates ultimately confirmed the basic validity of these models by careful quantitative study of sections in the Chaudière River Valley and its tributaries, especially the critical Rivière des Plante sections. In the mid 1970’s, Robert Lamarche discovered that the end of the Lennoxville Glaciation was marked by a reversal of ice flow toward the north in the Quebec Appalachians. The Highland Front Moraine, originally described by Nelson Gadd, was deposited subsequently by an unnamed southerly readvance. Thus, Stewart and MacClintock’s Vermont stratigraphy eventually morphed into the Lennoxville Till/Gayhurst Formation/Chaudiere Till/Massawippi Formation/Johnville Till/Pre-Johnville sediments/Preglacial regolith stratigraphy that is presently established in Southern Quebec. It is the author’s opinion that the Lennoxville and Chaudiere Tills both represent deposition during Wisconsinan stades, separated by glaciolacustrine sediments of the Gayhurst interstade (~55ka). The non-glacial Massawippi Formation and at least part of the St. Pierre sequence are probably of Sangamon age, and the Johnville and Becancour Tills of Quebec and ‘older tills’ in Vermont are probably of Illinoian age; Pre-Johnville sediments (~181ka) are pre-Illinoian and are not clearly related to any identifiable glacial event. Extensive stratigraphic drilling and detailed examination of numerous sections in Southern Quebec, over many years, has revealed no evidence of any glacial deposits predating the Johnville Till; in fact, laminated lacustrine sediments, deposited by the advancing Johnville Glacier, lie directly on well-developed regolith with no components, mineral or otherwise, that could have been derived from the nearby Canadian Shield. This suggests that no ancestral Laurentide Ice Sheet covered this part of the Appalachians prior to deposition of the Johnville Till.
Development of Glacial Event-Stratigraphy; SE Quebec and N. New England

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Diagram of Grass River lock excavation, north face

Diagram of Eisenhower lock excavation, east end

Location of Till Fabric

Fabric Localities
Figure 4. Ascot River sections with till fabrics.
45 ± 5 ka
E V O L U T I O N  O F  E V E N T  S T R A T I G R A P H Y  

1
50’s
St. Lawrence Seaway
Champlain Sea
Ft. Covington Till
Lake Sediments
Malone Till

2
50’s & 60’s
Vermont
Champlain Sea
Burlington Till
Shelburne Till
‘Old Till’

Stewart and McClinock
Behling, Shlits

3
1955-1965
St. Lawrence Lowlands
Lakes and Champlain Sea
Highland Front Moraine
Gentilly Till
St-Pierre and Associated Beds
Becancour Till
Lake Sediments
Gadd, Karrow

4
1965-1970
Quebec Appalachians
Lakes and Champlain Sea
Highland Front Moraine
Lennoxville Till*
Gayhurst Fm
Chaudiere Till*
Massawippi Fm
Johnville Till*
Pre-Johnville Sediments
McDonald and Shlits,
Stewart and McClinock

5
1971-1983
Quebec Appalachians
Lakes and Champlain Sea
Highland Front Moraine
Reversal of Flow (N)*
Lennoxville Till*
Gayhurst Fm
Chaudiere Till*
Massawippi Fm
Johnville Till*
Pre-Johnville Sediments

Lamarche, Gauthier, Lorle,
Gadd, McDonald and Shlits,
Lasalle,
Shlits and Smith, Blais and Shlits,
Parent, Lamute, Caron

6
Present
Quebec Appalachians
Lakes and Champlain Sea
Lakes-ice front deposits
Readvance (S-SE)*
Reversal of Flow (N)*
Lennoxville Till*
Gayhurst Fm
Chaudiere Till*
Massawippi Fm
Johnville Till*
Pre-Johnville Sediments

* Letters in parentheses refer to major or characteristic directions of ice flow for glacial unit-first direction, early, last direction later.
110 ppm Ni

1250 ppm Ni

110 ppm Ni
SCHEMATIC CROSS SECTION OF BURIED BEDROCK VALLEYS
(profiles estimated from seismic refraction data and borehole depths)
Tertiary soil and saprolite development, weathering and erosion
Onset of glaciations with development of proglacial lakes in bedrock valleys
Deposition of Johnville Till and glacial erosion of Tertiary paleosols and weathered bedrock
Massawippi interstadial weathering, downcutting and fluvial erosion
Chaudière Glaciation deposited till over proglacial lake sediments
Lennoxville Till was deposited over lake sediments of the brief Gayhurst interstade.
UNRESOLVED

1. Why are there no known pre-Illinoian deposits in Quebec/New England (compared to Midwest)?

2. Why no evidence of weathering or Lake Gayhurst draining between Chaudiere and Lennoxville glaciations?

3. How do multiple till sections in Southern Vermont relate to these in Northern Vermont and Quebec?
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Thank You

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