Figure 1. End moraines and glacially scoured terrain formed along the west flank of the Brodeur Ice Cap. Note the large marine-limit delta

north of the moraines. NAPL A16081-216.



Figure 2. Lobate end moraine formed at the limit of a readvance of the south margin of the Brodeur Ice Cap after recession of Laurentide ice in Bernier Bay. A marine-limit delta is attached to the south part of the moraine. Recessional moraines formed behind the terminal moraine. NAPL A16081-22.

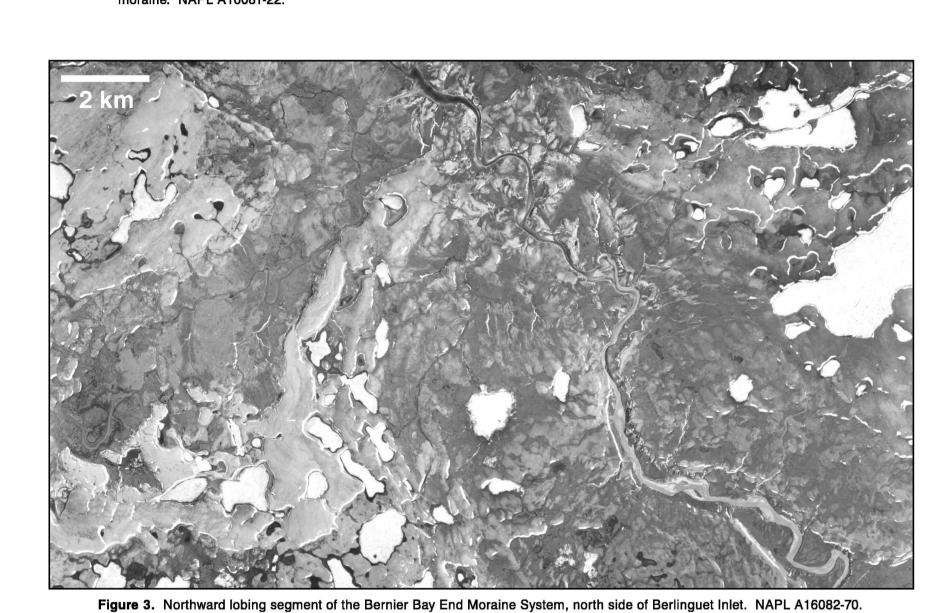


Figure 4. Segment of the Bernier Bay End Moraine System with associated outwash to the north and smaller recessional

moraines to the south. NAPL A16081-181.

NAPL A16080-163.



Figure 5. Segment of the Bernier Bay End Moraine System with five sequential ridges, south side of Bernier Bay.

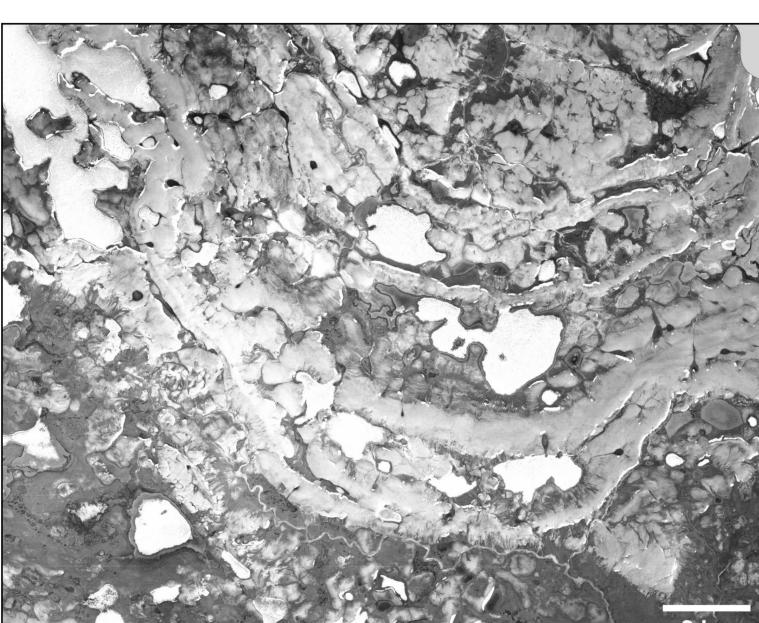
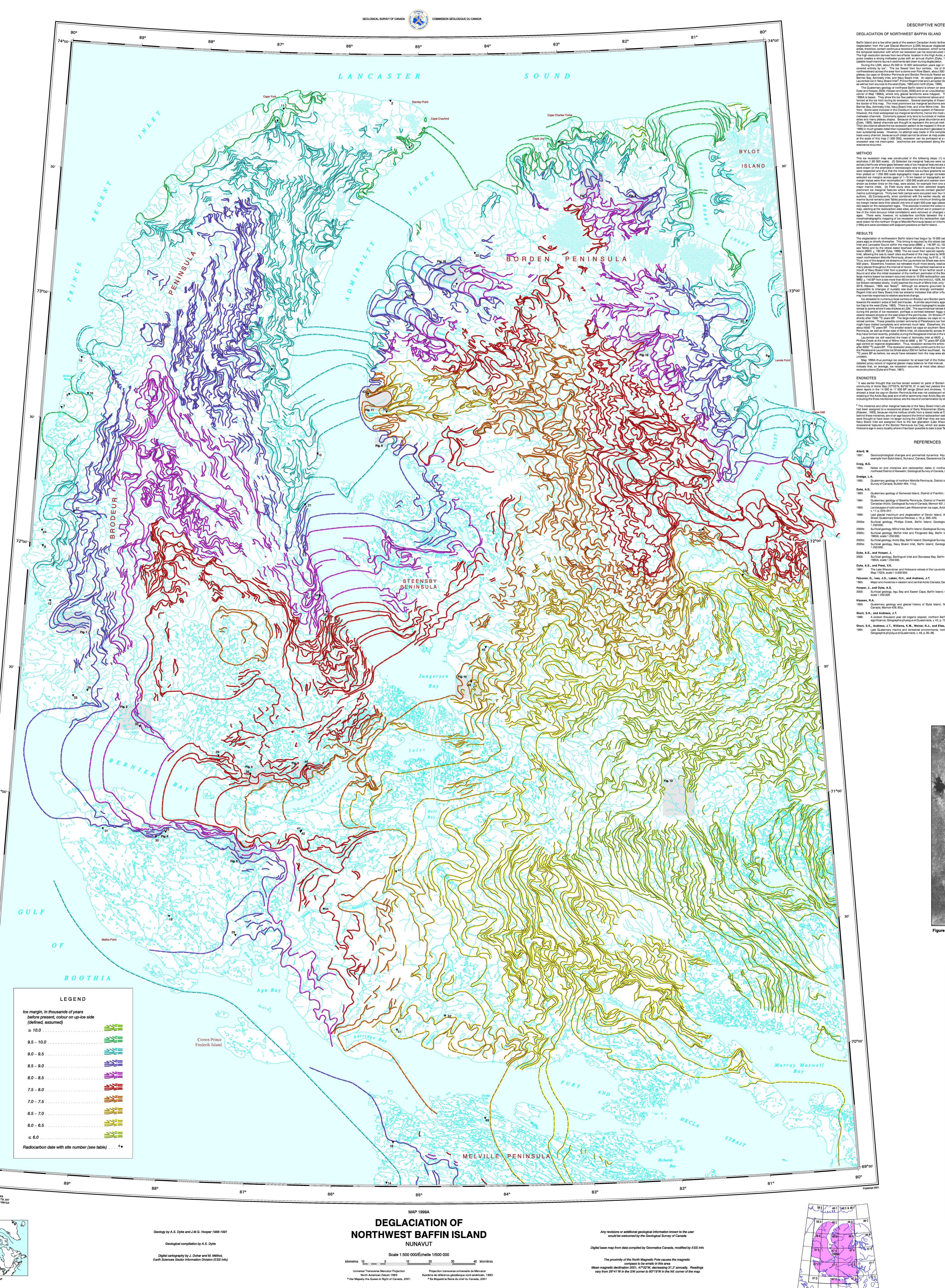


Figure 6. Segment of the Bernier Bay End Moraine System with nine sequential ridges, south side of Bernier Bay. NAPL A16125-20.



## DESCRIPTIVE NOTES

Baffin Island and a few other parts of the eastern Canadian Arctic farther north contain exceptionally long records of deglaciation from the Last Glacial Maximum (LGM) because deglaciation remains incomplete at present. These areas, therefore, contain continuous records of ice recession, which is mainly a climate-driven process. Furthermore, the temporal resolution with which ice recession can be reconstructed is greater in this region than in most others. the temporal resolution with which ice recession can be reconstructed is greater in this region than in most others. The high resolution derives from two effects: location in the High Arctic, where the pronounced summer temperature pulse creates a strong meltwater pulse with an annual rhythm (Dyke, 1993); and location in a coastal zone rich in datable fossil marine fauna in sediments laid down during deglaciation.

During the LGM, about 25 000 to 10 000 radiocarbon years ago in this region, northwestern Baffin Island was covered entirely by ice<sup>1</sup>. The ice flowed from four centres. Ice of the continental Laurentide Ice Sheet flowed northwestward across the area from a dome over Foxe Basin, about 200 km south-southeast of the map area. Large plateau ice caps on Brodeur Peninsula and Borden Peninsula flowed seaward and coalesced with Laurentide ice in Bernier Bay, Admiralty Inlet, and Navy Board Inlet. An alpine glacier complex on Bylot Island also coalesced with Laurentide ice in Navy Board Inlet<sup>2</sup>. Prince Regent Inlet and Lancaster Sound carried ice streams from these sources as well as from sources to the west (Dyke, 1984) and north (Dyke, 1999).

The Quaternary geology of porthwest Baffin Island is shown on seven maps at 1:250 000 scale (Dyke, 2000a-e). as well as from sources to the west (Dyke, 1984) and north (Dyke, 1999).

The Quaternary geology of northwest Baffin Island is shown on seven maps at 1:250 000 scale (Dyke, 2000a-e; Dyke and Hooper, 2000; Hooper and Dyke, 2000) and on an unpublished manuscript of an eighth map (the southeast corner of Map 1999A), where only glacial landforms were mapped. These maps contain the data on which Map 1999A is based. They show the ice flow patterns mentioned above and the various landforms and glacial lakes that formed at the ice front during its recession. Several examples of these landforms are illustrated by the airphotos in the border of this map. The most prominent ice marginal landforms are the large belts of end moraines that border Bernier Bay, Admiralty Inlet, Navy Board Inlet, and inner Milne Inlet. Some of these represent readvances of the ice front. Some were included in the Cockburn moraine system of Falconer et al. (1965) and discussed by Craig (1965). However, the most widespread ice marginal landforms, hence the most useful for mapping ice recession, are lateral meltwater channels. Commonly spaced only tens to hundreds of metres apart, these channels inscribe most valley sides and many plateau slopes. Because of their great abundance and other considerations discussed elsewhere (Dyke, 1993), lateral channels are thought to represent the annual melt cycle where they form closely spaced sets. Their abundance allows the ice recession pattern to be mapped in this area and in adjacent areas (Dyke, 1983, 1984, 1999) in much greater detail than is possible in most southern glaciated regions; indeed, annual resolution is possible over substantial areas. However, no attempt was made in this compilation or on the Quaternary geology maps to trace every channel, because such detail cannot be shown at map scales of less than 1:50 000. Nevertheless, even at the scale of this map (1:500 000), recession can be portrayed at a resolution that is as fine as decadal where recession was not interrupted. Isochrones are comp

This ice recession map was constructed in the following steps: (1) Ice marginal features were mapped on the airphotos (1:60 000 scale). (2) Selected ice marginal features were correlated from valley side to valley side and across interfluves where gaps between sets of ice marginal features are a few kilometres at most. These ice margins were drawn on the airphotos in stereoscopic view to ensure that local morphostratigraphic sequences of landforms were respected and thus that the most realistic ice-surface gradients were used. (3) These ice margin traces were then plotted on 1:250 000 scale topographic maps and longer correlations were made by connecting segments of selected ice margins across gaps of 1–10 km based on topography and distance down ice flowlines. (4) The ice margin traces were then recompiled at 1:500 000 scale and coarser correlations, mostly across gaps of > 10 km and shown as broken lines on the map, were added, for example from one side to the other of lobate ice margins in the major marine inlets. (5) Field study sites were then selected largely for the anticipated opportunity of dating prominent ice marginal features where these features contact glaciomarine sediments at the postglacial limit of marine submergence. Thirty-two field camps were occupied over four field seasons (1988–1991), 16 by each of the authors. (6) Consequently, when combined with the earlier results, about 50 radiocarbon age determinations on marine faunal remains (see Table) provide actual or minimum limiting dates on deglaciation in the map area. (7) The ice margin traces were then placed into one of eight 500-year age classes or into a ninth class (less than 6000 years old) based on the radiocarbon ages. This exercise involved the colour-coding of ice margin traces as shown on this map, starting at the radiocarbon ages. This exercise involved the colour-coding of ice margin traces as shown on this map, starting at the radiocarbon ages. This exercise involved the colour-coding of ice margin traces as shown on this map

The deglaciation of northwestern Baffin Island had begun by 10 000 radiocarbon years ago (about 11 000 calendar years ago) or shortly thereafter. This timing is required by the oldest dated marine shells that colonized Navy Board Inlet and Lancaster Sound within the map-area (9860 ± 140 BP, UL-1028, Allard, 1997; 9780 ± 90 BP, GSC-4694, see Table) and by the oldest dated bowhead whales to occupy the north shore of the Lancaster Sound on Devon Island (9920 ± 180 BP, Dyke, 1999). The ice cover then opened rapidly along Lancaster Sound and Prince Regent Inlet, allowing the sea to reach sites southwest of the map area by 9430 ± 210 BP (GSC-2093, Dyke, 1984) and to reach northwestern Melville Peninsula, shown on this map, by 9110 ± 100 BP (GSC-4324, Dredge, 1995; see Table). Thus, one of the largest ice streams of the Laurentide Ice Sheet was removed over a length of about 1000 km in about 500 years. Elsewhere, however, ice retreated much more slowly, readvancing and pausing to build end moraines in many places throughout the interval of record. The earliest readvance was by Laurentide ice, which expanded to the mouth of Navy Board Inlet from a position at least 10 km farther south after the recession of ice in outer Lancaster Sound and after the initial recession of the northern perimeter of the Borden Peninsula Ice Cap. This advance by a large marine-based ice stream occurred close to 10 000 radiocarbon years ago, based on a minimum limiting date of 9860 ± 140 BP from a site more than 60 km behind the limit (UL-1028, Allard, 1997). Afterwards the Navy Board Inlet Ice Stream retreated slowly. It still reached the mouth of Milne Inlet, only 130 km to the south at 9530 ± 180 BP (GSC-3318, Klassen, 1993; see Table)<sup>2</sup>. Although ice streams grounded below sea level are generally thought to be susceptible to changes of eustatic sea level, the strongly contrasted behaviour of the Lancaster Sound-Prince Regent Inlet and Navy Board Inlet ice streams indicates that other influences of glacier mass balance and climate may ov Regent Inlet and Navy Board Inlet ice streams indicates that other influences of glacier mass balance and climate may override responses to relative sea level change.

Ice retreated to numerous local centres on Brodeur and Borden peninsulas. These centres were curiously offset towards the western sides of both peninsulas. A similar asymmetry appears in the recession of the Somerset Island loc Cap to the west (Dyke, 1983). There is no evident topographic explanation for this pattern, nor did the ice always retreat to points where it was thickest at LGM. The asymmetrical retreat thus implies some feature of regional climate during the period of ice recession, perhaps a contrast between foggy or cloudy windward shores on the west and clearer leeward shores on the east sides of the peninsulas. On Brodeur Peninsula final ice remnants probably melted shortly after 7500 <sup>14</sup>C years BP. The large extant plateau ice caps on northern Borden Peninsula appear to occupy retreat centres. These possibly contain remnants of Pleistocene ice from the LGM ice cap on the peninsula, or they might have melted completely and reformed much later. Elsewhere, the last ice remnants on the peninsula melted about 6500 <sup>14</sup>C years BP. The smaller extant ice caps on southern Borden Peninsula and on northeastern Brodeur Peninsula, as well as those east of Milne Inlet, sit discordantly across the deglaciation pattern, which indicates that they have formed recently, probably during the Neoglacial interval of the last 3000 years or so.

Laurentide ice still reached the head of Admiralty Inlet at 6620 ± 90 <sup>14</sup>C years BP (GSC-5073) and reached Phillips Creek at the head of Milne Inlet at 5890 ± 80 <sup>14</sup>C years BP (GSC-5289). The latter is our youngest current age control on regional deglaciation. Thus, recession across the entire southeastern part of the map area occurred after 6000 <sup>14</sup>C years BP. This recession presumably continued to the current margin of the Barnes Ice Cap, a relict of the Pleistocene Laurentide Ice Sheet about 200 km farther Map 1999A thus portrays ice recession for at least half of the Holocene (last 10 000 radiocarbon years). It is a detailed proxy record of regional glacier mass balance for that interval. The new radiocarbon dates displayed here indicate that, on average, ice recession occurred at most sites about 2000 years later than portrayed in earlier reconstructions (Dyke and Prest, 1987).

<sup>1</sup> It was earlier thought that ice-free terrain existed on parts of Borden Peninsula at LGM, because peat near the community of Arctic Bay (72°03'N, 85°02'W, 61 m asl) had yielded three radiocarbon age determinations from its lower layers in the 14 000 to 17 000 BP range (Short and Andrews, 1988). On that basis, Dyke and Prest (1987) showed a local ice cap on Borden Peninsula that was not coalescent with Laurentide ice to the south. Subsequent redating of the Arctic Bay peat and of other sediments near Arctic Bay shows that all dates of more than 10 000 years, including the three mentioned above, are the result of contamination by old carbon (Short et al., 1994). <sup>2</sup> The moraines and other marginal features of the Navy Board Inlet Lobe of Laurentide ice at the mouth of the inlet had been assigned to a recessional phase of Early Wisconsinan (Early Foxe) glaciation dated > 40 000 years ago (Klassen, 1993), because marine mollusc shells from a raised delta at Canada Point on Bylot Island, which lies well behind these moraines, are of an age beyond the limit of radiocarbon dating. Similarly, alpine glaciers on Bylot Island were thought to have been no larger during the LGM than they are today. The Laurentide features at the mouth of Navy Board Inlet are assigned here to the last glaciation (Late Wisconsinan–Holocene) because they crosscut recessional features of the Borden Peninsula Ice Cap, which are associated with a marine limit that has an early Holocene age in every locality where it has been possible to date it (see Table).

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- 1995: Quaternary geology of northern Melville Peninsula, District of Franklin, Northwest Territories; Geological Survey of Canada, Bulletin 484, 114 p. 1983: Quaternary geology of Somerset Island, District of Franklin; Geological Survey of Canada, Memoir 404,
- Quaternary geology of Boothia Peninsula, District of Franklin and northern District of Keewatin, central Canadian Arctic; Geological Survey of Canada, Memoir 407, 26 p. 1993: Landscapes of cold-centred Late Wisconsinan ice caps, Arctic Canada; Progress in Physical Geography, v. 17, p. 223–247.
- 1999: Last glacial maximum and deglaciation of Devon Island, Arctic Canada: Support for an Innuitian Ice Sheet; Quaternary Science Reviews, v. 18, p. 393–420. 2000a: Surficial geology, Phillips Creek, Baffin Island; Geological Survey of Canada, Map 1961A, scale Surficial geology, Milne Inlet, Baffin Island; Geological Survey of Canada, Map 1962A, scale 1:250 000.
   Surficial geology, Moffet Inlet and Fitzgerald Bay, Baffin Island; Geological Survey of Canada, Map 1963A, scale 1:250 000.
- 2000d: Surficial geology, Arctic Bay, Baffin Island; Geological Survey of Canada, Map 1964A, scale 1:250 000.
  2000e: Surficial geology, Navy Board Inlet, Baffin Island; Geological Survey of Canada, Map 1965A, scale Dyke, A.S., and Hooper, J.

  2000: Surficial geology, Berlinguet Inlet and Bourassa Bay, Baffin Island; Geological Survey of Canada, Map 1960A, scale 1:250 000.
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Site number	Age (14C years BP)1	Laboratory number	Locality	Latitude (N), longitude (W)	Elevation (m) sample/marine limit	Species dated
1	9860 ± 140	UL-1028	West Bylot Island	73°10' / 79°53'	15/35?	Mya truncata
2	9780 ± 90	GSC-4694	Stanley Point	73°49' / 85°27'	41/60	Hiatella arctica
3	9770 ± 150	S-3066	McBean Bay	72°36.5' / 89°40'	81.4	Balaena mysticet
4	9610 ± 100	GSC-4889	Cape Crauford	73°38' / 85°07.5'	40-50/55	Hiatella arctica
5	9530 ± 180	GSC-3318	Cape Hatt	72°27' / 74°49'	74/80	Mya truncata
6	9500 ± 110	GSC-4879	Cape York	73°43' / 87°01'	50-55/62	Hiatella arctica
7	9470 ± 110	S-9470	McBean Bay	72°32.5' / 89°44'	49.5	Odobenus rosma
8	9380 ± 100	S-3086	Fitzgerald Bay	72°01' / 89°53'	64	Odobenus rosma
9	9280 ± 80	GSC-5361	Lavoie Point	72°45' / 80°18'	53/53	Mya truncata
10	9280 ± 150	GSC-241	McBean Bay	72°45.2' / 89°32'	80/ca. 87	Hiatella arctica
11	9260 ± 130	GSC-5233	Cape York	73°46.5' / 86°55'	41/62	Hiatella arctica
12	9260 ± 150	GSC-392	Bourassa Bay	71°46' / 89°48'	85	Hiatella arctica, Mya truncata
13	9150 ± 80	GSC-4722	Vista River	72°45' / 87°00'	79.5/80	Hiatella arctica
14	9110 ± 100	GSC-4324	Baker Bay	69°30.5' / 85°21.9'	220/240	Mya truncata
15	9080 ± 100	GSC-4878	Kuuruluk River	72°24.5' / 86°18'	92-98/106	Mya truncata
16	8980 ± 90	GSC-4744	McBean Bay	72°37' / 89°26'	81/99	Hiatella arctica, Mya truncata
17	8970 ± 80	AA-5987	Strathcona Sound	73°04.6' / 84°21.8'	-230	benthic foraminife
18	8970 ± 90	GSC-4123	Brevoort River	69°39.8' / 85°17.8'	165/ca. 200	Mya truncata
19	8950 ± 120	GSC-4898	Mathe Point	70°33' / 88°00'	65/ca. 130	Hiatella arctica, Mya truncata
20	8920 ± 90	GSC-5436	Lavoie Point	70°54' / 80°32.5'	18/61	Mya truncata
21	8870 ± 100	GSC-4887	Tiriganialaaq River	72°12.5' / 86°29'	80-85/98	Hiatella arctica
22	8850 ± 100	GSC-5216	Baillarge Bay	73°13' / 84°13'	33/ca. 40	Hiatella arctica
23	8830 ± 170	GSC-183	Bernier Bay	70°53' / 88°06'	119/125	Hiatella arctica, Mya truncata
24	8800 ± 90	GSC-4704	Fitzgerald Bay	72°03' / 89°52'	77/102	Hiatella arctica
25	8630 ± 160	GSC-5223	Arctic Bay	73°03' / 85°05'	50/ < 60	Hiatella arctica
26	8630 ± 90	GSC-4742	Bernier Bay	71°26' / 89°07'	118/118	Hiatella arctica, Mya truncata
27	8620 ± 90	GSC-4785	Fitzgerald Bay	72°08' / 89°29'	64/79	Mya truncata
28	8550 ± 100	GSC-5072	Cape Charles Yorke	73°39' / 82°59'	14.5/22	Mya truncata
29	8540 ± 100	GSC-5086	Foss Fiord	70°29' / 87°11'	137.5/138	Hiatella arctica, Mya truncata
30	8470 ± 100	GSC-4721	Bernier Bay	70°52' / 88°12'	114/125	Mya truncata
31	8310 ± 100	GSC-4703	Bernier Bay	70°53' / 88°54'	91/116	Mya truncata
32	8240 ± 110	GSC-4695	Bernier Bay	71°18' / 88°28'	92/110	Mya truncata
33	8140 ± 110	GSC-4754	Bernier Bay	71°23' / 89°18'	95	Hiatella arctica
34	8060 ± 70	GSC-4888	Tikiraq River	71°51' / 86°18'	90/95	Mya truncata
35	8050 ± 90	GSC-4886	Tikiraq River	71°46.5' / 86°13'	78/95	Hiatella arctica
36	7910 ± 120	GSC-5090	Bernier Bay	71°08' / 87°05'	92.5/112	Hiatella arctica, Mya truncata
37	7690 ± 100	GSC-5435	Tremblay Sound	72°16.5' / 81°17'	48/79	Hiatella arctica
38	7680 ± 70	GSC-5325	Tremblay Sound	72°21' / 81°10'	33/71	Mya truncata
39	7640 ± 110	GSC-5091	Bernier Bay	71°12' / 87°29'	80.5/ca 112	Hiatella arctica, Mya truncata
40	7390 ± 70	GSC-5290	Koluktoo Bay	72°05' / 81°20'	50/61	Hiatella arctica
41	7260 ± 100	GSC-4894	Berlinguet Inlet	70°54' / 86°27'	73.5/130?	Hiatella arctica
42	7240 ± 150	GSC-304	Berlinguet Inlet	70°53' / 86°27'	90/130?	Hiatella arctica
43	7210 ± 110	GSC-5083	Eqalulik River	72°39' / 85°39.5'	25/41	Hiatella arctica
44	7120 ± 140	GSC-307	lvisarak Lake	70°36' / 86°08'	97/136?	Hiatella arctica
45	6890 ± 150	GSC-390	Magda River	71°39' / 84°13'	39/ca. 70?	Marine shells
46	6860 ± 100	GSC-5089	Berlinguet River	71°10.2' / 86°24'	64/111	Hiatella arctica, Mya truncata
47	6780 ± 90	GSC-4897	Saputing Lake	70°45' / 85°18'	69.5/92	Mya truncata
48	6620 ± 90	GSC-5073	Jungersen Bay	71°30.6' / 84°19.5'	60-66/72	Mya truncata
49	6520 + 70	GSC-4378	Purfur Cove	69°45.9' / 84°14.0'	121/160	Hiatella arctica

MINIMUM RADIOCARBON DATES ON DEGLACIATION AND MARINE LIMIT

<sup>1</sup> All GSC age determinations on marine mollusc shells (*Hiatella arctica* and *Mya truncata*), except those with laboratory numbers below GSC-392, have been corrected for measured carbon isotopic fractionation and adjusted by -400 years for the marine reservoir effect. The earlier GSC dates were not corrected for fractionation, which effectively builds in the same reservoir age adjustment, because fraction corrections are coincidentally close to +400 years. The same is assumed to be the case for UL-1028 (Université Laval Radiocarbon Laboratory). AA-5987 (Arizona AMS Laboratory) has a normalized age of 9380 ± 80 BP (Short et al., 1994); it is listed above with a -400 year reservoir correction, although it is not certain that the same correction should apply to benthic foraminifera as to shallow water mollusc shells. The Saskatchewan Research Council (S-) dates on marine mammal bone collagen (Balaena mysticetus [bowhead whale] and Odobenus rosmarus [walrus]) are not corrected for either carbon fractionation or for the marine reservoir effect. \* Exact location unclear; not plotted on map.

49 6520 ± 70 GSC-4378 Purfur Cove 69°45.9' / 84°14.0' 121/160 Hiatella arctica

6400 ± 150 GSC-328 Phillips Creek 71°52' / 80°55' 46 Hiatella arctica,

6350 ± 100 | GSC-5331 | Autridge Bay | 70°08' / 85°16' | 65/114 | *Mya truncata* 52 | 6310 ± 80 | GSC-5372 | Whyte Inlet | 70°11' / 84°41' | 71/114 | Mya truncata

53 | 5890 ± 80 | GSC-5289 | Phillips Creek | 71°52' / 80°51' | 32/48 | Hiatella arctica

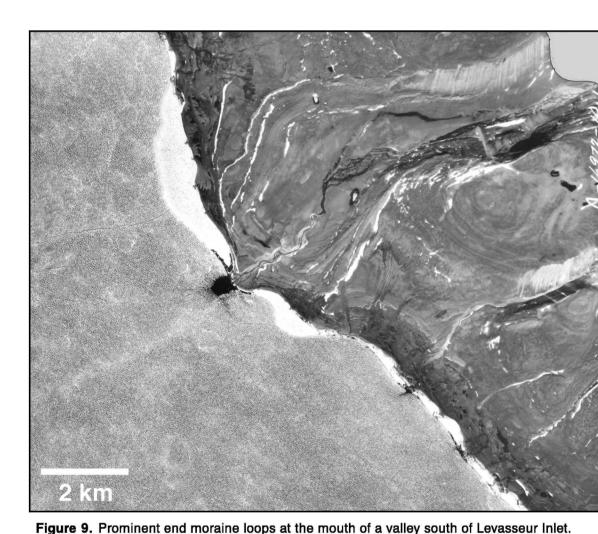


Figure 9. Prominent end moraine loops at the mouth of a valley south of Levasseur Inlet. These formed along the western side of the Borden Ice Cap, probably following a readvance after recession of Laurentide ice from Admiralty Inlet. NAPL A16972-10.

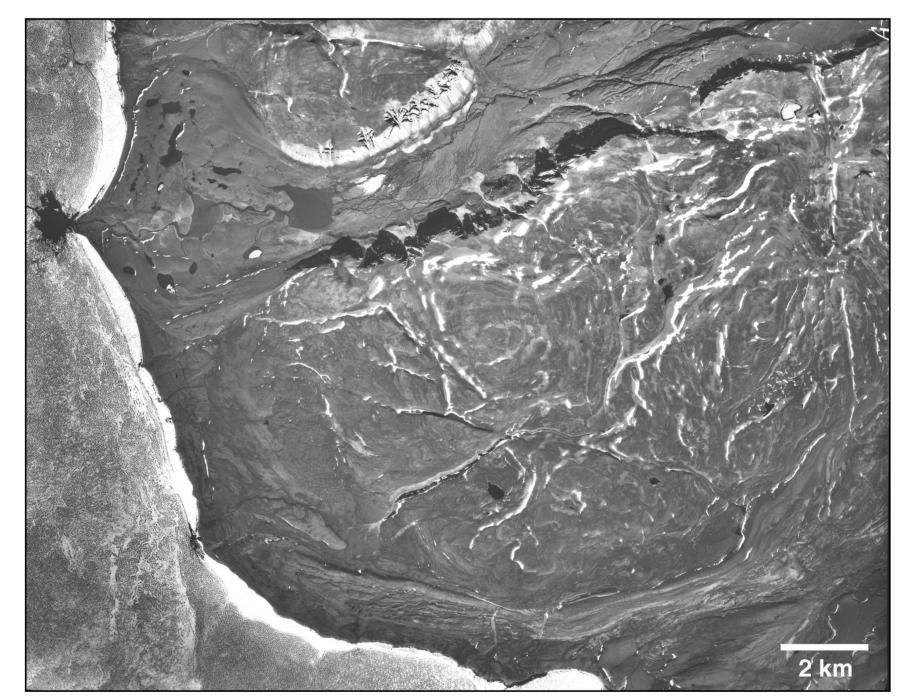


Figure 11. Lateral moraine along Levasseur Inlet and a prominent end moraine loop at the mouth of the valley to the north. These formed along the western side of the Borden Ice Cap, probably following a readvance after recession of Laurentide ice from Admiralty Inlet.

NAPL A16972-14.

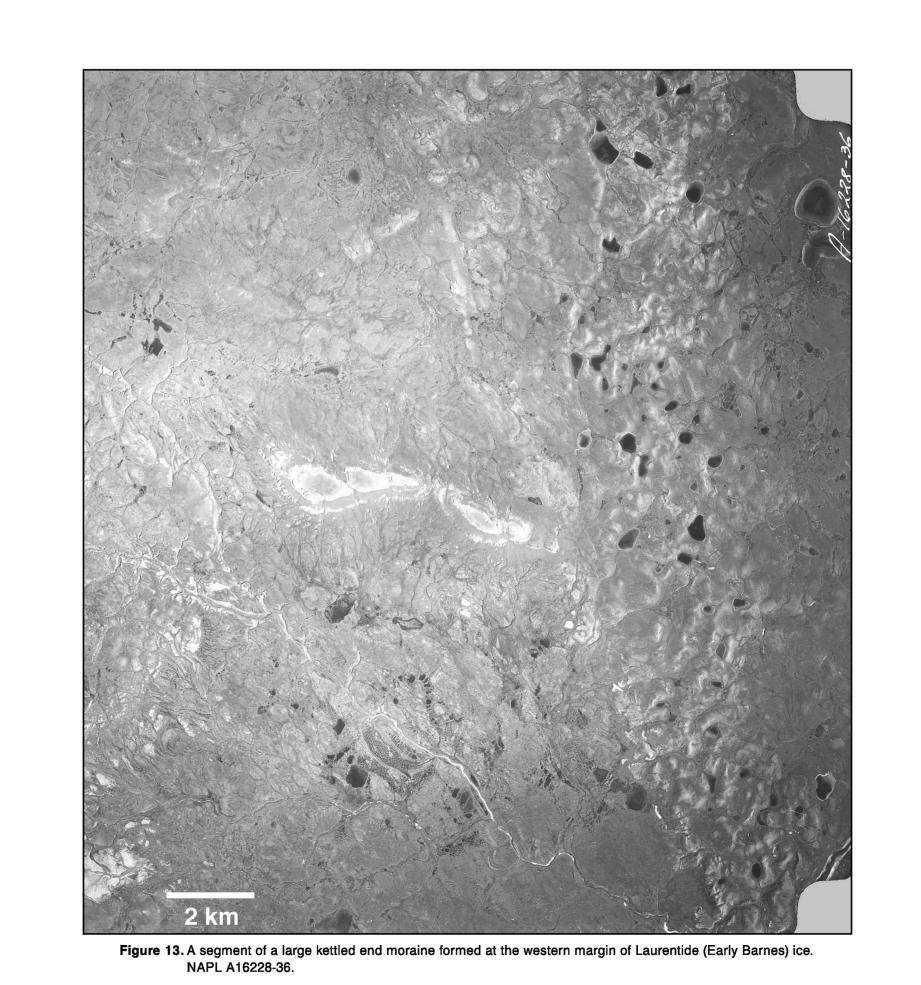


Figure 7. Lateral meltwater channels formed nearly continuously along a valley on northern Borden Peninsula. NAPL A16260-104.

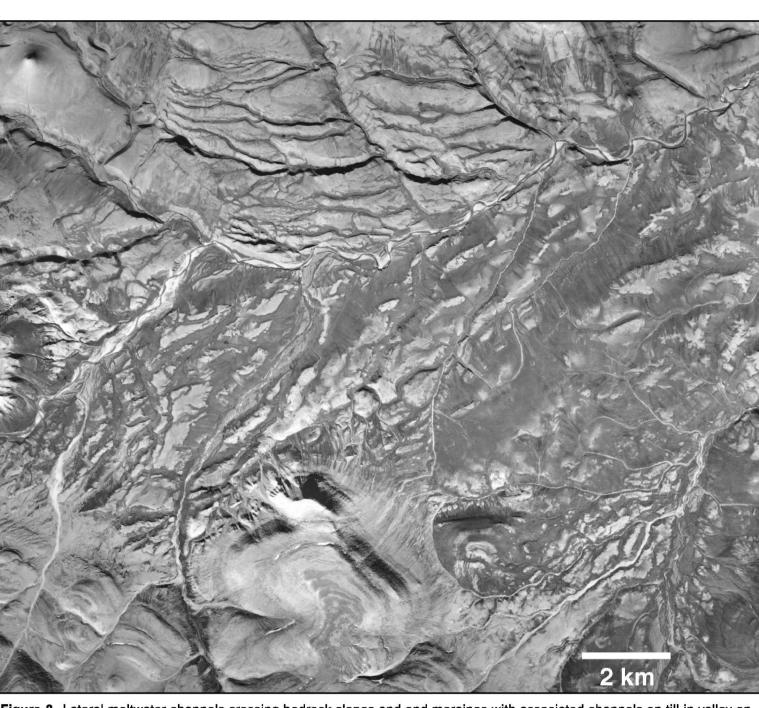


Figure 8. Lateral meltwater channels crossing bedrock slopes and end moraines with associated channels on till in valley on central Borden Peninsula. NAPL A16263-80.

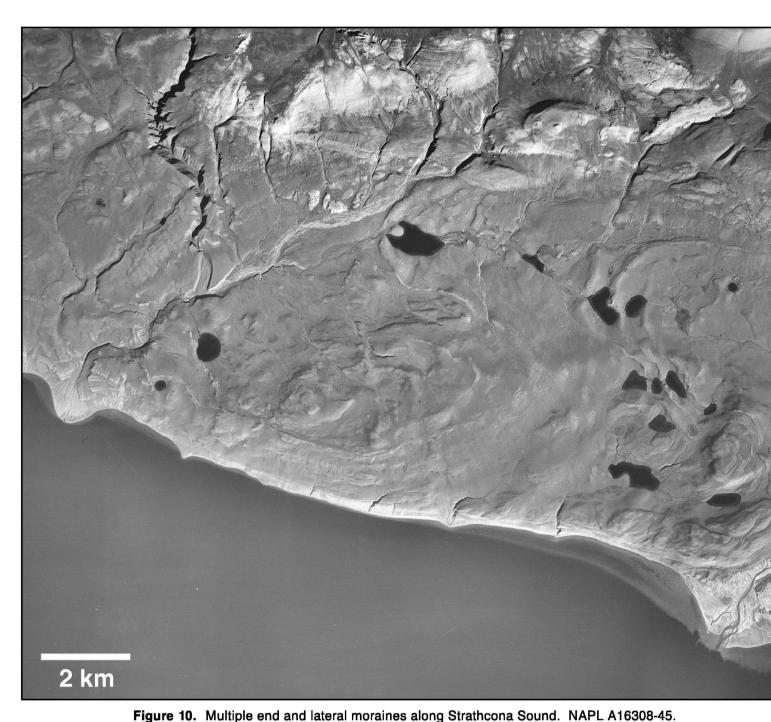


Figure 10. Multiple end and lateral moraines along Strathcona Sound. NAPL A16308-45.

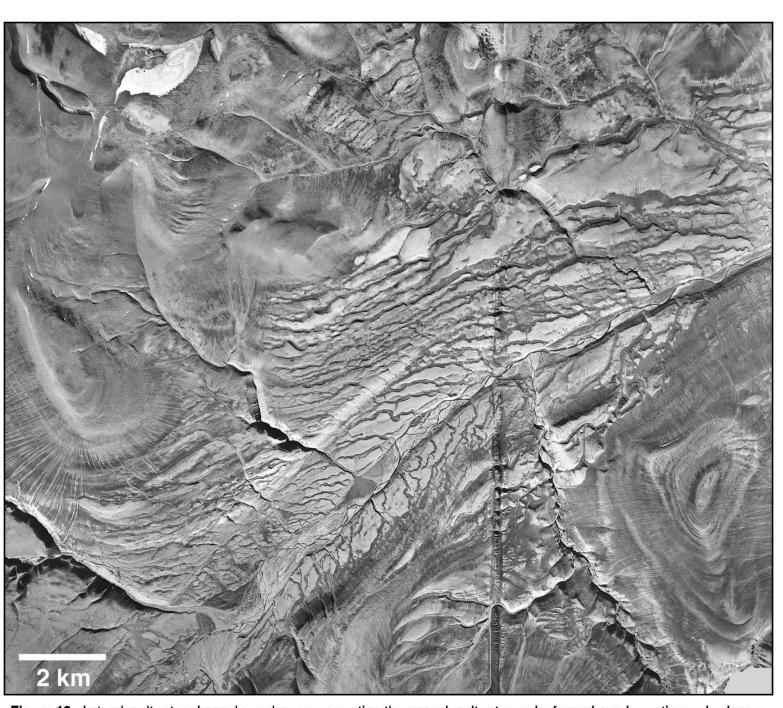


Figure 12. Lateral meltwater channels, perhaps representing the annual meltwater cycle, formed nearly continuously along a valley on eastern Borden Peninsula. NAPL A16263-92.

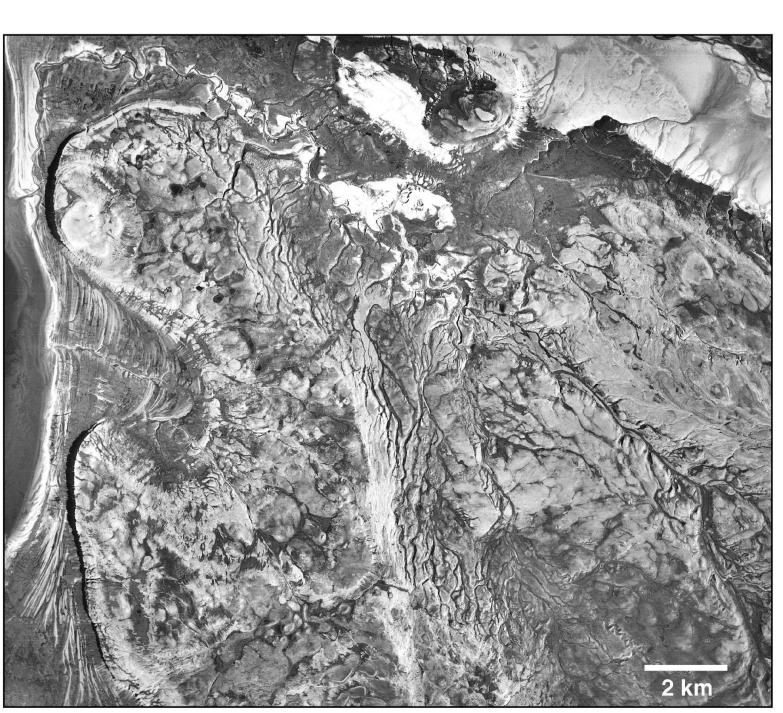


Figure 14. Lateral meltwater channels descending to marine limit at the head of Admiralty Inlet. NAPL A16259-20.

