GEOLOGICAL SURVEY OF CANADA | COMMISSION GÉOLOGIQUE DU CANADA

DEPARTMENT OF ENERGY, MINES AND RESOURCES
MINISTÈRE DE L'ÉNERGIE, DES MINES ET DES RESSOURCES

GEOLOGY OF NORTHERN MELVILLE PENINSULA

Summary of Geology

Melville Peninsula is a northerly trending horst of mid-Paleozoic age which has raised variably deformed Precambrian basement above flanking, flat-lying, early Paleozoic sediments (Trettin, 1973; Sanford, 1977).

The Precambrian basement is tilted about an east-northeast axis so that the north-northwest side exposes rocks with the structural and petrologic characteristics of a much deeper crustal level than exposed in the southeast corner of the map area. The deep crustal rocks are represented by high grade pyroxene-bearing granitic gneisses (1a) of probable Archean age which are succeeded to the south by Archean complexes at middle amphibolite grade and of different protolith and origin. Granitic gneiss (6) has no obvious protolith, whereas gneisses with felsic supracrustal components, such as quartzite, marble and quartz-rich iron formation (3), or with basic supracrustal components such as feldspathoric amphibolites, talc or chloritic amphibolite, or soapstone (4), were probably formed in part from older supracrustal units exposed farther to the south. In the southern half of the map area Archean plutons (8) cut folded lower amphibolite to upper greenschist grade supracrustals with volcanic component (2) and associated metagabbro sills (3) overlying possible amphibolite grade basement (1). These units are cut by mafic dykes (9,4) and unconformably overlain by an early Proterozoic platformal supracrustal succession (10). The rocks in the southernmost part of the map area have been sheared, folded and intruded by biotite-bearing granite plutons (11) during early mid-Proterozoic time to form the northern boundary of the Foxe Fold Belt (Henderson, 1982; Taylor and Jackson, 1972).

Farther north, on the west coast of the peninsula, a mid-Proterozoic platformal succession (13) rests unconformably upon the Archean units there and are cast into open folds in contrast to the tight folds in the older rocks. Many, well-spaced, east-west faults, most with a small amount of dextral apparent movement, of Proterozoic age, cut the peninsula. Along some of these faults are emplaced small granitic stocks (12), some as intrusive breccias, others bearing miarolytic cavities.

At the northern tip of the peninsula a gently dipping, late Proterozoic arenite succession (15,16) rests unconformably upon, and is in fault contact with, the Archean units exposed there. Basic dykes (14), possibly coeval with the deposition of northern sediments, were emplaced, and a later Proterozoic basic dyke (17) swarm cut previous units. The platformal Paleozoic succession (18) is variably exposed in the differently tilted blocks which formed when the horst was formed.

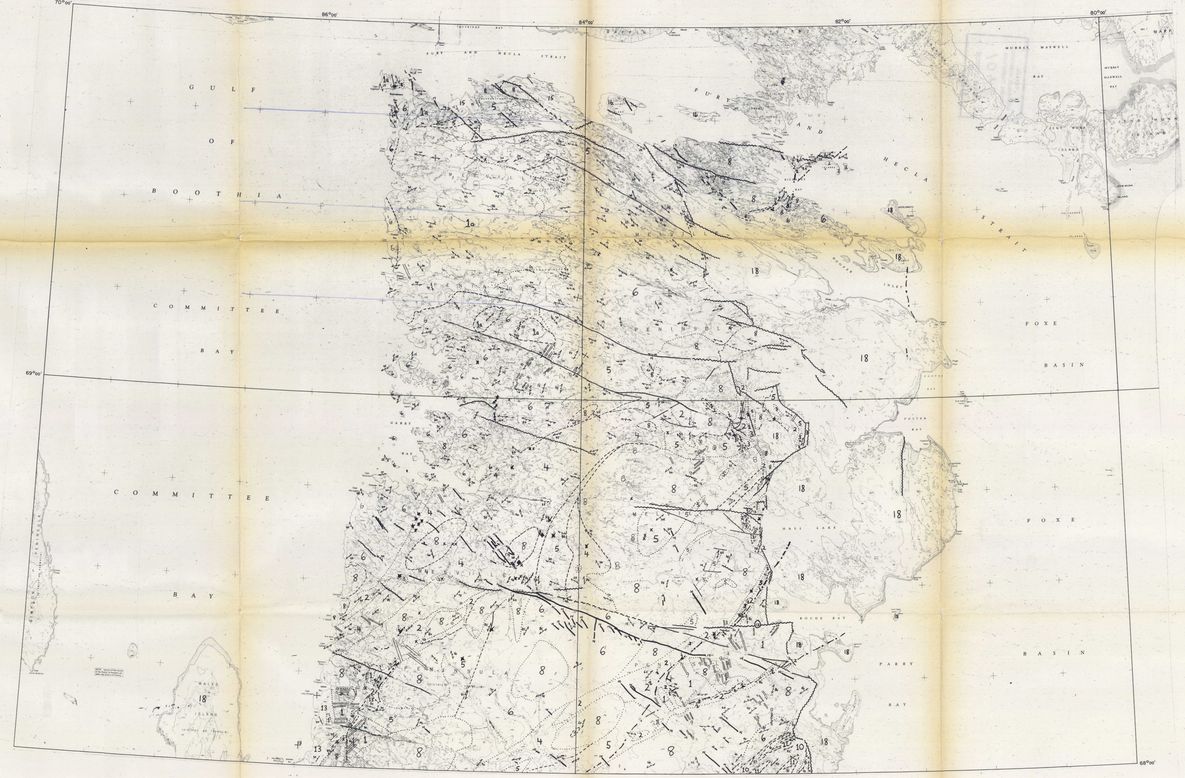
In summary, the possibility that the horst formed almost normal to a previously tilted portion of crust is suggested by the distribution of the units. The tilting would have started in early Proterozoic time, possibly as the Penrhyn Group was being deposited to the south. It had proceeded sufficiently so that granulites were exposed at surface prior to the late Proterozoic time of deposition of the Fury and Hecla Formation. The tilting and the east-west faults may have been related to each other. This tectonic style of tilting blocks may also have operated nearby on Baffin Island.

Gravity maps show that the northwest area of the map currently interpreted to be of a lower crustal level is more dense than the higher level rocks to the south-southeast. The specific gravity of a small but representative sample set indicates the anomaly can be explained in terms of distribution of exposed rock types as predicted rather than appealing to an undetermined subcrustal origin.

Aeromagnetic maps show that the magnetite-bearing iron formation of unit 2 shows as thin, very positive, anomalies surrounded by flanking lows. Some of the anomalies can be traced under the Paleozoic cover rocks. The lower crustal level rocks (1A) are generally lower in magnetite than the remaining units. The magnetic compass is unreliable in this area due to the proximity of large iron formations and nearness to the magnetic pole.

The iron formations in unit 2 are widespread, thick, and extensive, intruded by gabbro, and locally contain pyrite or hematite. They constitute the largest potentially economic deposits in the area. Gossans, with or without attendant sulphides, are widespread in the amphibolite grade rocks, but apparently are scarce in the pyroxene gneisses. Soapstone of good quality has been noted by Heywood (1976b) other localities are found in units 2 and 4, but of lesser quality.

The topography for this map was reproduced from 1:250,000 topographical map sheets published by the Department of Energy, Mines and Resources, Ottawa.



A preliminary map of Melville Peninsula north of 68
(NTS 47A, 47B, 47C, 47D) at a scale of 1:500000

LEGEND

PHANEROZOIC

18 Paleozoic sandstone, limestone, and dolostone

PROTEROZOIC

17 Franklin diabase

16 Autridge Formation, siltstone and limestone

15 Fury and Hecla Formation, redbeds, quartzites, minor siltstone and basalt

14 Mackenzie dykes, possible feeders to above basalt

13 Folster Lake Group,mainly arkose

12 Miarolytic granite stocks

11 Biotite granite to granodiorite, locally sheared

10 Penrhyn Group, metamorphosed shale,limestone, and arenite

9 Metamorphosed basic dykes

ARCHEAN

8 Granite to granodiorite, includes Kingora Plutonic Complex, also agmatite and septa

7 Metamorphosed basic dykes

6 Granitic gneisses

5 Gneisses with felsic supracrustal component, includes Melville Peninsula Gneiss Complex

4 Gneisses with mafic supracrustal component

3 Tasijuaq Gabbro and related sills, metamorphosed leuco to mela gabbro

2 Prince Albert Group, metamorphosed acid to basic volcanics, local komatiite, iron formation, and clastic rocks

1 Basement Complexes, includes Ajaqutaliq Complex, granitoid gneisses with complex history
includes pyroxene gneisses

1a includes pyroxene gneisses

BEDDING

FOLIATION,UNDIFFERENTIATED

FOLD AXES

FAULTS

GOSSAN,GOSSAN WITH SULPHIDE

IRON FORMATION, AEROMAGNETIC TRACE

SOAPSTONE

GEOLOGY by

Blackadar, 1960

Chandler,pers comm

Frisch, 1976, 1975, 1982

Heywood, 1967, 1976

Mazurski, 1980

Okulitch, 1978

Sandford, 1977

Schau, 1975

Trettin, 1973

COMPILED by

Schau, 1984

Corrections or additional information is welcomed by compiler.

OPEN FILE
DOSSIER PUBLIC
1046
GEOLOGICAL SURVEY OF CANADA
COMMISSION GÉOLOGIQUE DU CANADA
OTTAWA
1984

REFERENCES

Barnes, C.F., Barnes, C.S., Boucot, A.J., Copeland, M.J., and Norford, B.S.
1971: Foxe Bay and Baffin Islands Area, District of Franklin, report, correlation chart, 17 maps, various sizes and scales, by H.P. Trettin, Field Work 1968, GSC Open File 64.

Blackadar, R.G.
1963: Additional notes to accompany Map 3-1958 (Fury and Hecla Strait map-area) and Map 4-1958 (Foxe Basin North amp-area); Geological Survey of Canada, Paper 62-35, 26 p.

Bolton, T.E., Sanford, B.V., Copeland, M.J., Barnes, C.R., and Rigby, J.K.
1977: Geology of Ordovician Rocks, Melville Peninsula Region Southeastern district of Franklin, Geological Survey of Canada, Bulletin 269.

Boydell, A.N., Drabinsky, K.A., Netterville, J.A., and Tarnocai, C.
1976: Biophysical land classification, Boothia Peninsula and Northeast Keewatin, by C. Tarnocai et al., Geological Survey of Canada, Open File 390, 17 maps, 1-125000.

Campbell, F.H.A. and Schau, M.
1976: Facies distruction and development in the Prince Albert Group, District of Franklin and Keewatin in Program with Abstracts GAC/MAC Annual Meeting, 1976. p. 17.

Chernis, P.J., Hutcheon, I.E., and Mazurski, M.
1978: Geology of Amitoke Peninsula, by M. Mazurski, I.E. Hutcheon, and P.J. Chernis, Geological Survey of Canada, Open File 523.

Craig, B.G.
1963a: Surficial geology, operation Wagner, Northeast District of Keewatin and Melville Peninsula, District of Franklin, GSC Paper 63-1, p. 17-21.

1963b: Notes on moraines and radiocarbon dates in northwest Baffin Island, Melville Peninsula and northeast District of Keewatin, GSC Paper 63-20, 7 p.

Delpierre, M.E.
Uranium in granites anomaly "60": A uraniferous granite pluton on Melville Peninsula, N.W.T., GSC Paper 81-23, p. 115-118.

Eckstrand, O.R.
1976: Nickel potential of the Prince Albert Group, NWT by O.R. Eckstrand, GSC Open File 237, p. 52-56.

1975: Nickel potential of the Prince Albert Group, N.W.T.: in Report of Activities, Part A, April to October, 1974, Geological Survey of Canada, Paper 75-1, p. A, p. 253-255.

Fahrig, W.F., Irving, E., and Jackson, G.D.
1971: Paleomagnetism of the Franklin Diabases on Journal Earth Science 8, p. 455-467.

Frisch, T.
Precambrian Geology of the Prince Albert Hills, western Melville Peninsula, Northwest Territories, GSC Bulletin 346, 70 p.

1973: Granitic and associated rocks of the Committee Bay area, Districts of Keewatin and Franklin, by T. Frisch, Geological Survey of Canada, Report of Activities, Paper 73-1A, p. 145.

1976: Geological studies in Prince Albert Hills, western Melville Peninsula, District of Franklin: in Report of Activities, Part A, April to October 1973, Geological Survey of Canada, Paper 74-1A, p. 163-164.

1980: Tonalite gneisses, western Melville Peninsula, District of Franklin, Geological setting and interpretation by T. Frisch, Geological Survey of Canada, Current Research, Part C, Paper 80-1C, p. 217-219.

Frisch, T. and Goulet, N.
1975: Geological studies in western Melville Peninsula, District of Franklin, by T. Frisch and N. Goulet, Geological Survey of Canada, Report of Activities, Paper 75-1A, p. 323-326.

Frisch, T. and Jenner, G.A.
1975: Metamorphosed Ultramafic Lavas of the Prince Albert Group, western Melville Peninsula, N.W.T., Canada: in Abstracts with Programs, G.S.A., vol. 7, no. 6, p. 758.

Fryer, B.J. and Jenner, G.A.
1978: Geochemistry and origin of the Archean Prince Albert Group volcanics western Melville Peninsula, N.W.T. Canada. Geochimica at Cosmochinica Acta, vol. 42, p. 1643-1656.

Gordon, T., Henderson, J.R., Hutcheon, I.E., Okulitch, A.V., and Turay, M.
1978: Geology of the Barrow River and Hall Lake map-areas, Melville Peninsula, District of Franklin, by A.V. Okulitch et al., Geological Survey of Canada, Current Research, pt. A, Paper 78-1A, p. 159-161.

Heywood, W.W.
1966: Geological notes on operation wager, Northwest Territories, by W.W. Heywood, Geological Survey of Canada, Paper 66-10.

Heywood, W.W.
1967: Geological notes, northeastern District of Keewatin and southern Melville Peninsula, District of Franklin, Northwest Territories (parts of 46, 47, 56, 57), Geological Survey of Canada, Paper 66-40, 20 p.

Heywood, W.W.
1976a: Geological reconnaissance of Northern Melville Peninsula, District of Franklin, by W. Heywood, Report of Activities, Pt. A, Apr.-Oct. 1973, p. 381, Geological Survey of Canada, Paper 74-01A.

Heywood, W.W. and Schau, M.
1978: A subdivision of the northern Churchill Structural Province, G.S.C. Paper 78-1A, Current Research, Pt. A, p. 139-143.

Jackson, G.D. and Taylor, F.C.
1972: Correlation of Major Aphebian Rock units in the Northeastern Canadian Shield, Canadian Journal of Earth Sciences, v. 9, no. 12, p. 1650-1669.

Jamieson, R.
1826: Notes on the Geology of the countries discovered during Captain parry's Second Expedition 1821-1823. Appendix to Parry's Journal of the third voyage... 1824-1825; John Murray, London.

Laporte, P.J.
1974a: North of 60. Mineral Industry Report 1969 and 1970, Volume 2, N.W.T. East of 104° West Longitude Indian and Northern Affairs, 1974, 191 p.

Laporte, P.T.
1974b: Mineral industry report, 1971 and 1972, vol. 2 of 3, N.W.T. East of 104° West Longitude. Indian and Northern Affairs, 1974, 88 p.

Matthiassen, T.
1933: Report of the Fifth Thule Expedition 1921-24, vol. 1, no. 1.

Maurice, Y.T.
1979: A preliminary assessment of the uranium potential of southern Melville Peninsula, District of Franklin, by Y.T. Maurice, Geological Survey of Canada, Current Research, Paper 79-1A, p. 281-287.

National Geochemical Reconnaissance
Melville Peninsula, Northwest Territories GSCOP 738, p. 1-7.

National Geochemical Reconnaissance Release NGR 32A
1977: Regional Lake sediment and water geochemical reconnaissance data, Melville Peninsula, Northwest Territories, Geological Survey of Canada, Open File 521A, 1978, Data displayed as symbols.

National Geochemical Reconnaissance Release NGR 32B
1977: Regional Lake sediment and water geochemical reconnaissance data, Melville Peninsula, Northwest Territories, Geological Survey of Canada, Open File 521B, 1978, Data displayed as element concentration values next to sample sites.

National Geochemical Reconnaissance Release NGR 33A
1977: Regional Lake sediment and water geochemical reconnaissance data, Melville Peninsula, Northwest Territories, Geological Survey of Canada, Open File 522A, 1978, Data displayed as symbols.

National Geochemical Reconnaissance Release NGR 33B
1977: Regional Lake sediment and water geochemical reconnaissance data, Melville Peninsula, Northwest Territories, Geological Survey of Canada, Open File 522B, 1978, Data displayed as element concentration values next to sample sites.

Okulitch, A.V., Gordon, T., Henderson, J.R., Hutcheon, I.E., and Turay, M.
1978: Geology of the Barrow River and Hall Lake Map areas, Melville Peninsula, District of Franklin in Current Research, Part A, Geological Survey Paper 78-1A, p. 159-161.

Parry, W.E.
1824: Journal of a second voyage for the discovery of a Northwest passage; John Murray, London.

Schau, M.
1976a: Volcanogenic rocks of the Prince Albert Group, Melville Peninsula (47A-D), District of Franklin, by M. Schau, GSC Open File 237, p. 55-7.

A preliminary geological map of the Prince Albert Group on Eastern Melville Peninsula, N.W.T., GSCOP 787.

1975a: Volcanogenic rocks of the Prince Albert Group, Melville Peninsula (47A-D) District of Franklin, Geological Survey of Canada, Paper 75-1, Part A, p. 359-361.

1977: Komatiites and Quartzites in the Archean Prince Albert Group. Geological Association of Canada, Sp. Paper No. 16, p. 341-356.

Sim, V.W.
1960: Maximum Post Glacial Marine Submerges in Northern Melville Peninsula, p. 178-193, v. 13.

Trettin, H.P.
1969: Geology and petroleum potential of Lower Paleozoic Sediments – Foxe Basin, Northeastern Melville Peninsula and parts of Northern and Central Baffin Island, by H.P. Trettin, Geological Survey of Canada, Report of Activities, Paper 69-1A, p. 246-252.

Wilson, Ian, D.H. and Underhill, Douglass, H.
1971: The discovery and geology of major new iron deposits on Melville Peninsula, Eastern Arctic. Canadian Mining Journal, July 1971, p. 40-46.

Aeromagnetic maps
7938G, 7939G, 7959G, 7960G.
8257G–8266G
8272G–8279G
8288G–8294G
8303G–8310G
8310G–8326G

Gamma-Ray Spectrometry Series
33637G, 33647G, 33247G, G35147G

Geophysical Map Series
Gravity Map series map 145, Melville North at 1:500 000.

DINA Mineral Assessment Files
Available for viewing c/o Tom Caine, 8th Floor, 10 Wellington St., Hull, P.Q.
Numbers:
019502, 019903, 060064, 060270, 060638, 060744, 061359, 061536, 061873, 061970, 062044, 062056, 062116, 062133, 080643, 081271.