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GEOLOGICAL SURVEY OF CANADA | COMMISSION GÉOLOGIQUE DU CANADA

DESCRIPTIVE NOTES

Previous work

Although remote from the usual routes taken by early explorers into Hudson Bay, Melville Peninsula has been the subject of geological and geophysical investigations since 1821 (Parry, 1824, Jameson, 1826). The Fifth Thule expedition (Mathiassen, 1933, 1945) provided important topographical and paleontological data regarding the lower Paleozoic rocks of the Foxe Basin (Teichert, 1937). A geological overview (Blackadar, 1963), emphasized the presence of late Proterozoic sandstones in the region. It was not until 1964 and 1973 that the crystalline basement rocks of the peninsula were systematically investigated in two of the great postwar helicopter surveys of the Canadian North (Heywood, 1966, 1967, 1974; Schau and Heywood 1984). The geology has been mapped in greater detail in selected areas (Bolton et al., 1977; Chernis et al. 1978; Frisch, 1982; Schau, 1975; in press [a,b]; Schau and Ashton, 1985; Schau and Becket, 1986; Schau and Digel 1989; Trettin, 1975). Regional geophysical and geochemical surveys have been conducted over parts of the peninsula (see lists below). Mineral potential studies have focussed on selected lithologies (cf iron formations, Wilson and Underhill, 1971; meta-ultramafic rocks, Eckstrand, 1975; uraniferous granites, Delpierre, 1982).

Early mineral exploration pursued iron, nickel and copper potential (Laporte, 1974a,b). Mineral exploration in the eighties, on the other hand, focussed on gold potential of the iron formations. Selected assessment file numbers are listed below.

The coverage is not systematic, and consequently unit 10, which represents undivided basement gneisses, is in part bounded by arbitrary straight lines and abruptly terminates geological elements mapped in adjacent areas. Early integrations of the geology include Jackson and Taylor, 1972; Schau, 1977; Heywood and Schau, 1978; Henderson,1984; Schau and Ashton, 1988. Topical studies have focussed on the two supracrustal sequences, the Prince Albert (Frisch and Jenner, 1975; Fryer and Jenner, 1978; Schau, 1977, 1981) and the Penrhyn Groups (Mazurski, 1982; Henderson, 1983, 1988), and on regional dyke sets (Fahrig and Jones, 1969, Fahrig et al., 1971; LeCheminant and Heaman, 1991).

This open file map release is a summary of the additional geological work of the nineteen eighties and is an update of Open File Map 1046. It is a companion map to Geological Survey of Canada Open File 2995 displaying metamorphic grade.

General Geology

Northern Melville Peninsula consists of basement gneisses forming a horst bounding the flat-lying cratonic Paleozoic carbonate rocks of the Foxe Basin Lowlands. The basement gneisses contain evidence of a long and complex history. Two supracrustal groups, and several dyke sets serve as markers to help unravel the sequence of events.

The oldest rocks consist of partially retrograded tonalite-granodiorite gneisses (unit 1), especially near the Ajaqutalik River and in the northwest, where they are cut by leucogranites (unit 2) and the earliest metamorphosed mafic sills and dykes recognized (unit 3). Associated supracrustal and/or hypabyssal rocks that possibly unconformably overlie units 1-3, include the Prince Albert Group (unit 4), a volcanogenic sequence containing meta-ultramafic rocks, metabasalt, acid volcanic rocks, quartzite, banded iron formations, as well as more common pelitic and other clastic metasedimentary rocks. The Tasiiuaq Suite (unit 5), is a metagabbroic suite with both leucogabbroic and metagabbroic members, as well as a characteristic ovoid plagioclase bearing porphyritic gabbro called "football gabbro" or "leopard" rock. Units were deformed together in a complex series of events starting with initial thrusting and interleaving of gneisses and supracrustals, followed by folding, plutonism and metamorphism. In many places the orogenesis generated well layered granitoid gneisses (unit 6) cut by early metadiabase dykes (unit 7). These units were in turn intruded by rocks of the Archean Hall Lake Plutonic Complex and related plutons (unit 8). The pluton contain septa of granitic gneiss or has been deformed to yield granitic gneisses which may also contain unseparated unit 8 and/or unit 14 (unit 9). In the northeast and southwest, unit 10, which represents undivided gneisses from units 1 through 9, is shown, indicating areas in which more detailed geological mapping is necessary. Inmost of the region, lithologic boundaries, gneissosities and foliations have steep northeasterly trends, although dip reversals and shallow gneissosities are locally important. These northeasterly trends locally deform earlier structures and contain several sets of lineations indicating complex history during Archean deformation. Metamorphism reached amphibolite grade throughout most of this region although small regions near the east coast reached only greenschist grade.

Granulite and upper amphibolite grade gneisses in the northwestern part of the peninsula form shallow north plunging, open fold marked by shallow dipping gneissosities above the hanging wall of a shallow, west dipping thrust fault believed to be active in latest Archean-earliest Proterozoic time. Late metadiabase dykes (unit 11) traverse the area, especially along parts of the Ajaqutalik River.

The Penrhyn Group (unit 12), is a quartzite, carbonate, and pelite sequence, exposed mainly in southern Melville Peninsula, which rests with apparent unconformity on the gneisses mentioned above. It has been deformed at least twice with northeasterly trending structures, has been intruded (unit 13) and metamorphosed to amphibolite grade. The northwest contact of the Penrhyn Group is a northeast trending high strain zone, and other narrow northeast trending high strain zones (unit 14) cut the northestern map-area.

The exposed rocks were uplifted in mid-Proterozoic time and latitudinal faults with local hydrothermal alteration cut the region. Roche Bay granites (unit 15) are small miarolitic granite stocks emplaced in and near faults. Low grade, mid Proterozoic Foister Lake Formation, a sandstone rich sequence (unit 17), on the west coast, and an unnamed quartzite (unit 16) near the east coast, rest unconformably on the gneisses. In the north, the Fury-Hecla Supergroup (19), an orthoquartzite rich sequnce, was deposited later in the Proterozoic and it is little deformed. Mackenzie Dykes (18) were intruded at this time. Faults were reactivated, and fault blocks variably tilted. In the late Proterozoic, the Autridge Sill (unit 20) and, the Franklin Dyke Swarm (unit 21) were emplaced, especially in the north of the region. Ordovician carbonates (units 22, 23, 24) were deposited in shallow seas. Devonian and cretaceous faulting probably formed the horst. Glacial sediments cover parts of the region (Dredge, 1991, in press).

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Digital map compilation by Mikkel Schau, Geological Survey of Canada

Digital cartography by R.L. Allard, with assistance from M. Methot, Gelogical Survey of Canada

Any revisions or additional geological information known to the user would be welcomed by the Geological Survey of Canada

Digital base map at the scale of 1:1 000 000 revised and assembled from the Digital Chart of the World by the Geological Survey of Canada

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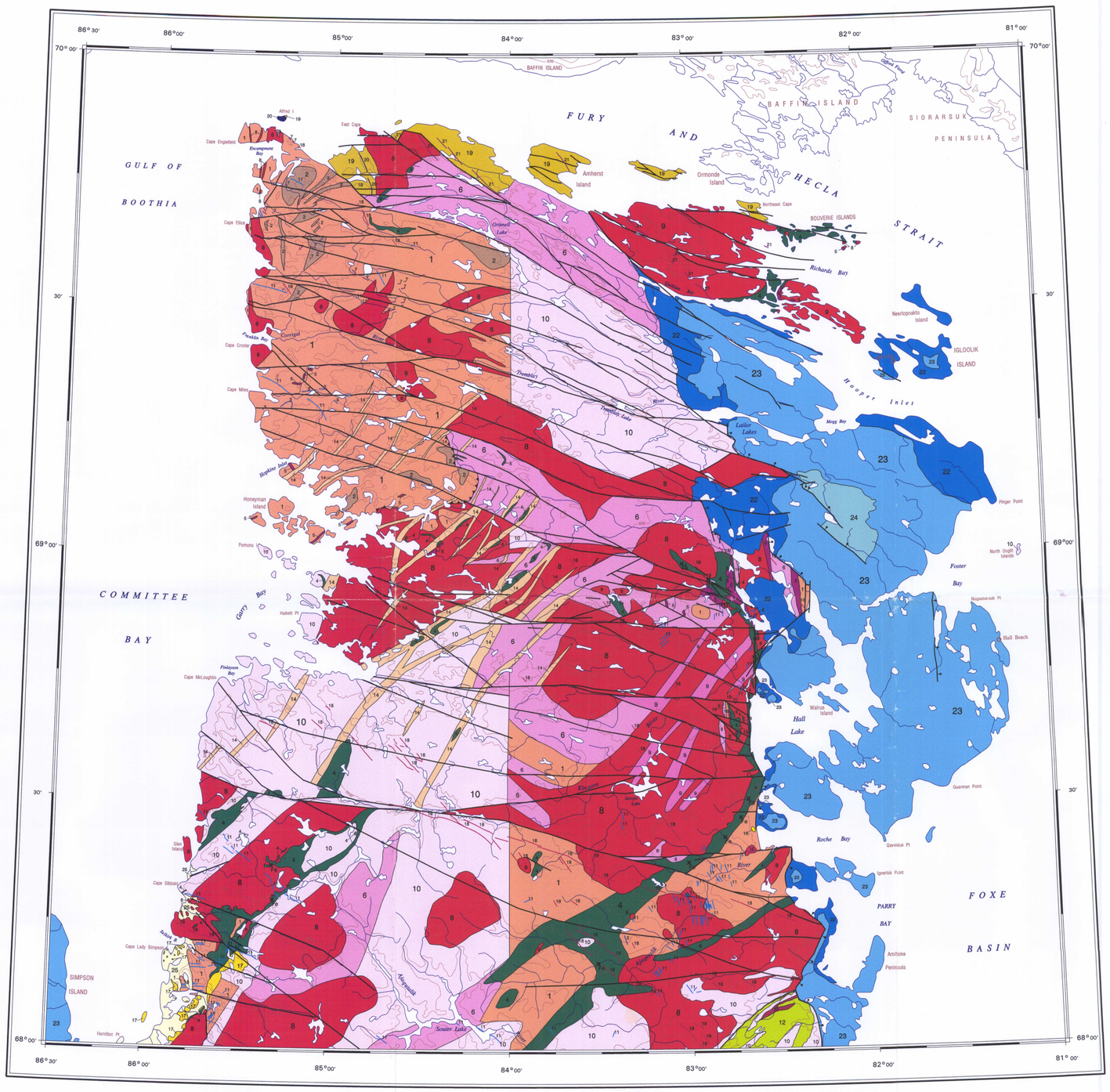
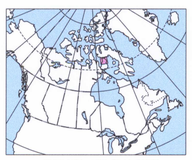
Mean magnetic declination 1992, 42°46' West, decreasing 20.5' annually. Readings vary from 34°53' West in the SW corner to 49°36' West in the NE corner

Elevation in feet above mean sea level

Geographical names subject to revision





INDEX MAP - LIEU DE LA CARTE

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GEOLOGY

NORTHERN MELVILLE PENINSULA

DISTRICT OF FRANKLIN

NORTHWEST TERRITORIES

Scale 1:500 000 - Échelle 1/500 000

Kilometres 10 0 10 20 30 40 Kilomètres

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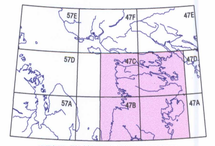

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LEGEND

CENOZOIC

25 *Unconsolidated cover*

PALEOZOIC
ORDOVICIAN

24 *Foster Bay Formation*

23 *Frobisher Bay and Amadjuak Formations: undivided*

22 *Ship Point Formation*

PROTEROZOIC
NEOPROTEROZOIC
CRYOGENIAN (.65-.85 Ga)

21 *Franklin dykes*

TONIAN (.85-1.00 Ga)

20 *Autridge Sill and related sills*

MESOPROTEROZOIC
ECTASIAN-STENIAN (1.0-1.4 Ga)

19 FURY-HECLA SUPERGROUP: *sandstone*

18 *MacKenzie dykes and local sills in above group*

CALYMMIAN (1.4-1.6 Ga)

17 *Folster Lake Formation: sandstone; schist, conglomerate*

16 *Quartzite*

PALEOPROTEROZOIC
STRATHERIAN (1.6-1.8 Ga)

15 *Roche Bay granites*

OROSIRIAN (1.8-2.05 Ga)

14 *Black Inlet ductile strain zones, straight gneisses*

RHYACIAN (2.05-2.3 Ga)

13 *Amitioke Gneiss Complex and associated granites*

12 PENRHYN GROUP: *undivided marbles, calcic gneisses, quartzite, and schists*

SIDERIAN (2.3-2.5 Ga)

11 *Late metadiabase dykes*

ARCHEAN
NEOARCHEAN (2.5-2.8 Ga)

10 *Melville Peninsula gneiss complex undivided 6,7,8 and 9*

9 *Granitoid gneisses, may include units 8 and 14*

8 *Hall Lake PLUTONIC COMPLEX and related plutons, porphyritic and massive granite-granodiorite*

7 *Metadiabase dykes*

6 *Granitoid gneisses; well layered gneisses, part supracrustal*

MESOARCHEAN (2.8-3.2)

5 *Tasiiuaq Gabbro Suite, includes porphyritic, leuco- and metagabbbro*

4 *Prince Albert Group: undifferentiated metasediments and metavolcanics including ultramafic units, quartzites, iron formations, includes some unit 5*

3 *Mafic sills and dykes*

2 *Leucogranites*

1 *Tonalite-granodiorite gneisses*

Geological contact . . . . . ——

Fault . . . . . ——

Normal fault (solid circle on hanging wall) . . . . . ——•——

Thrust fault (teeth on hanging wall) . . . . . ——▲▲▲▲——

Iron showing . . . . . Fe ×

Recommended Citation:
Schau, Mikkel
1993: Geology of northern Melville Peninsula; Geological Survey of Canada Open File 2594, scale 1:500,000.

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