

LEGEND

- UNCLASSIFIED** - includes areas excluded from hyperspectral analysis (water, vegetation, thick glacial cover, ice, and snow) as well as areas with lower matches to training spectra
- AREAS OF STRONG IRON OXIDATION**
- WHITE GRANITE (PLHw)**
- GRANITOID - Type 1 (Pfm)**
- GRANITOID - Type 2 (Pfm and/or Pfm)**
- CARBONATE ROCKS (PLHC)**
- PSAMMITE, SEMPELITE (PLP) AND PSAMMITE SUB-UNIT (PSPb)**
- OTHER SEDIMENTARY ROCKS**
- QUARTZITE (QLC) AND PSAMMITE SUB-UNIT (PSPb)**
- LEUCODIOLITE, TONALITE (PLHd)**

BEDROCK UNITS

- STRUCTURAL LEVEL 3 PALEOPROTEROZOIC**
- Cumberland Batholith**
- Pcd** Hornblende-orthopyroxene-clinopyroxene quartz diorite; locally layered with compositions ranging from leucodiorite to anorthosite
- Pcmo** Orthopyroxene-biotite monzonite to syenogranite; locally with K-feldspar megacrysts
- Lake Harbour Group**
- PLH** White biotite-garnet leucogranite, monzonite; commonly interlayered with metasedimentary rocks
- PLHm** Metaleucodiorite, metaleucite
- PLHd** Metagabbro, amphibolite, metapelite, layered metapelite-metagabbro, metapelite
- PLHu** Metapelite, metaproxymite, melanite
- PLHc** Marble, calc-silicate; minor siliclastic layers, white biotite-garnet leucogranite pods and seams
- PLHs** Dominantly psammite, feldspathic quartzite; semipelite, orthoquartzite, pelite; minor marble and calc-silicate; white biotite-garnet leucogranite pods and seams
- ARCHEAN AND PROTEROZOIC**
- Ramsay River Orthogneiss**
- Pfm** Orthopyroxene-biotite-hornblende monzonite-tonalite orthogneiss; hornblende-biotite-clinopyroxene-orthopyroxene quartz diorite; orthopyroxene-biotite-hornblende monzonite to syenogranite veins

STRUCTURAL LEVEL 2 PALEOPROTEROZOIC

- Narsajuaq Arc**
- Pfm** Orthopyroxene-biotite-hornblende monzonite, layered orthopyroxene-biotite hornblende-garnet orthopyroxene tonalite, granodiorite and quartz diorite gneiss; hornblende anorthosite layers, amphibolite, hornblende and metaproxymite enclaves; orthopyroxene-biotite-hornblende monzonite to syenogranite veins
- Sugluk Group**
- Pss** Dominantly semipelite; pelite; minor quartzite and amphibolite

STRUCTURAL LEVEL 1 PALEOPROTEROZOIC

- Povungnituk Group**
- Ppov** Amphibolite, quartzite, semipelite; pelite; metapelite, metaproxymite
- ARCHEAN**
- Superior Craton**
- Asmt** Biotite-hornblende-orthopyroxene-clinopyroxene-garnet tonalite; pyroxenite, amphibolite and hornblende enclaves; biotite monzonite veins
- Asm** Layered hornblende-biotite-orthopyroxene mafic tonalite and hornblende-biotite orthopyroxene-clinopyroxene quartz diorite gneiss; pyroxenite, amphibolite and hornblende enclaves; biotite monzonite to syenogranite veins

TECTONOSTRATIGRAPHIC UNITS (LEVEL 1)

- Superior craton (unit As1-Asm)**
- Biotite-hornblende-orthopyroxene-clinopyroxene-garnet tonalite gneiss (unit As5)** is the dominant lithology in the Archaean basement exposed at the lower structural levels of southern Baffin Island (Level 1, Fig. 1). It is a grey, medium-grained, and equigranular. On Big Island (Fig. 1), the tonalite unit displays a well-developed gneiss foliation and in some outcrops rocks granulite facies minerals (orthopyroxene, clinopyroxene) can be observed mantled by amphibolite-facies assemblages (hornblende, garnet). Mafic enclaves are locally abundant and entrained within the gneiss foliation. The medium-grained mafic gneiss is hornblende-biotite-orthopyroxene-bearing and tonalite volumetrically composes 60 to 70% of the layered unit. Layers of hornblende-biotite-orthopyroxene-clinopyroxene quartz diorite range in thickness from 1-5 m and are often faulted. Replacement of the medium-grained mafic gneiss by hornblende-biotite-orthopyroxene-bearing and tonalite volumetrically composes 60 to 70% of the layered unit. Layers of hornblende-biotite-orthopyroxene-clinopyroxene quartz diorite range in thickness from 1-5 m and are often faulted. Replacement of the medium-grained mafic gneiss by hornblende-biotite-orthopyroxene-bearing and tonalite volumetrically composes 60 to 70% of the layered unit.

DESCRIPTIVE NOTES

TECTONOSTRATIGRAPHIC UNITS (LEVEL 2)

Narsajuaq arc (unit Pfm)

Orthopyroxene-bearing, compositionally layered metaplutonic rocks (i.e. layered monzonite-granodiorite-tonalite gneiss; monzonite gneiss) occur at the intermediate structural levels (Level 2, Fig. 1) exposed along the Meta Ingotina Peninsula and specifically in the eastern Soper Lake area. The metaplutonic rocks have been dated between 1.88-1.85 Ga by Scott (1997), Wodicka and Scott (1997), and Scott and Wodicka (1998). These authors have correlated the Level 2 metaplutonic rocks with similar units in the 1.88-1.82 Ga Narsajuaq arc of northern Quebec (St-Onge et al., 1992; Duray and Ludden, 1998). Crosscutting field relationships indicate that the oldest Narsajuaq arc plutonic unit is a layered, fine- to medium-grained, grey to buff, orthopyroxene-biotite-hornblende-garnet tonalite orthogneiss with subordinate grey orthopyroxene-biotite-hornblende monzonite and pink monzonite sheets and veins (unit Pfm). Compositional layering in the orthogneiss is typically a few centimetres in thickness and is continuous laterally for several tens of metres. The tonalite, granodiorite, and monzonite components are crosscut by concordant to discordant veins of coarse-grained hornblende-biotite-orthopyroxene syenogranite. Large areas of Narsajuaq arc (Fig. 1) are underlain by medium-grained orthopyroxene-biotite-hornblende monzonite gneiss that intrudes the layered tonalite-monzonite unit described above. These rocks weather light grey to pink, and are composed of variably foliated, less than 10 cm thick layers that differ primarily in biotite content. The scale of mapping did not allow the monzonite gneiss to be mapped separately from the tonalite-monzonite unit it intrudes and consequently both are included in the composite (unit Pfm) on the existing bedrock maps for southern Baffin Island (St-Onge et al., 2001).

The Sugluk Group (unit Pss) comprises highly deformed quartzite, semipelite, pelite and amphibolite, which predominantly outcrop along the northern shore of Big Island and on islands in White Strait (Fig. 1). Semipelite is the most abundant rock type, whereas quartzite, pelite and amphibolite are relatively rare. The quartzite rocks occur in bands of relatively limited width (<1 km) but significant strike lengths (up to 20 km). Some of the bands of Sugluk Group are intruded by adjacent plutonic units, and therefore are interpreted as large, map-scale screens between Narsajuaq arc plutons. However, most of the metaplutonic units are concordant with the younger Lake Harbour Sugluk Group rocks. This observation, coupled with evidence for local truncation of units, suggests that at least some of the contacts between sedimentary and plutonic rocks are tectonic.

TECTONOSTRATIGRAPHIC UNITS (LEVEL 3)

Ramsay River orthogneiss (unit Pfm)

Buff to pink-weathering, layered orthopyroxene-biotite-hornblende monzonite-tonalite orthogneiss (unit Pfm) occurs in the western Soper Lake area. The orthogneiss unit is in physical continuity with metaplutonic gneiss mapped to the west (St-Onge et al., 2001) and dated by Scott and Wodicka (1998) at ca. 1.85 Ga. In most of the monzonite-tonalite gneiss is interlayered with subordinate, banded and discontinuous layers of quartz diorite. All components of the gneiss are crosscut by pink biotite monzonite and syenogranite veins that range from well isolated to massive and from a few centimetres to more than ten metres thick. Similarities in rock type, mineral assemblage, and strain suggest that the monzonite and syenogranite veins are related and possibly co-magmatic with the plutons of the Cumberland batholith (see below), which include this unit throughout southern Baffin Island (Fig. 1). The orthogneiss may represent the stratigraphic basement to Lake Harbour Group units described below. However, it is difficult to evaluate in the field as all observed contacts between orthogneiss and supracrustal units are tectonic. Nevertheless, the age of the orthogneiss and its spatial association with the younger Lake Harbour Group, both restricted to level 3 (Fig. 1), suggest that a primary stratigraphic link is possible.

Lake Harbour Group (units PLH-Ps)

The marble, psammite, and semipelite units in the Soper Lake area belong to the Lake Harbour Group as defined in the type area by Jackson and Taylor (1972). Within these supracrustal rocks, two lithologically and geographically distinct successions are recognized. Along the southern coast line and river valleys between Crooks Inlet and 68°W (Fig. 1), the Lake Harbour Group comprises interlayered garnetiferous psammite, orthoquartzite, semipelite, and pelite (unit PLH) and on islands by prominent, laterally continuous to boudinaged bands of pink grey to white marble and calc-silicate rocks (unit PLHc) (formal sequence of Scott et al. (1997)). The orthoquartzite and semipelite (Fig. 1), exposures of the Lake Harbour Group are dominated by garnetiferous psammite interlayered with semipelite and pelite (unit PLH) and are essentially devoid of marble and calc-silicate rocks (Markham Bay sequence of Scott et al. (1997)). Both successions are intruded by generally concordant sheets of mafic to ultramafic rocks (units PLHu, PLHd).

Within the PLH unit, semipelite is generally rusty, thinly layered at the centimetre scale, and characterized by abundant graphite. Garnetiferous clinopyroxene pelite typically occurs as thin layers within the garnetiferous semipelite. Compositional layers in psammite range from centimetres to tens of centimetres in thickness, and can be traced for as much as hundreds of metres along strike. The layers are defined by variations in the modal abundance of quartz, biotite, ilmenite, cordierite, sillimanite, and granitic melt pods. Semipelite and pelite are generally subordinate within the psammite and both are generally rusty weathering and characterized by trace amounts of disseminated graphite, pyrite, chloritoid, and pyrrhotite. Orthoquartzite occurs as discrete layers with total thicknesses of several metres. It is often graphite bearing, locally contains minor plagioclase, and is strongly recrystallized. Primary sedimentary features such as crossbedding are only rarely preserved within the siliclastic rocks. White monzonite, rich in ilmenite, is a ubiquitous constituent within the siliclastic package, occurring as concordant layers or pods less than 0.5 m thick. Locally, the white garnetiferous monzonite outcrops as discrete tabular bodies several hundred metres thick. Some bodies (unit PLHs) are large enough to show on maps such as the Soper Lake area.

Most of the calcareous rocks (unit PLHc) are medium- to coarse-grained and are locally characterized by compositional layering defined by varying modal proportions of calcite, forsterite, hornblende, diopside, tremolite, phlogopite, sericite, wollastonite, and at least in the Kimmirut area (Fig. 1) corundum (sapphirine). Individual layers range from centimetres to metres in thickness and can be traced for tens of metres along strike. Calc-silicate rocks are commonly interlayered with siliclastic rocks and are generally associated with marble. Thicknesses of individual calcareous rock sequences range typically between about 200 m north of Kimmirut and in the Canon Inlet area to about 200 m at 68°W. Individual marble units can be traced from 5 to 40 km along strike. Primary structures were not observed in the calcareous rocks.

Generally concordant sheets of medium- to coarse-grained, mafic to ultramafic rocks occur within both successions of the Lake Harbour Group. Individual bodies are typically 10-20 m thick, but range up to a few hundred metres thick, and continue up to several kilometres along strike. Metagabbro textures and compositional layering defined by variations in modal abundance of clinopyroxene, orthopyroxene, hornblende, and plagioclase are commonly preserved in the mafic bodies (unit PLHu). The concordant nature, tabular shape, and sharp contacts suggest that these bodies are sills. Several ultramafic bodies (unit PLHd), either clinopyroxene-orthopyroxene-hornblende metaproxymite or olivine-clinopyroxene orthopyroxene metapelite were observed. Metaleucodiorite sills and metaleucite bodies (unit PLHu) are also emplaced in the siliclastic rocks of the Lake Harbour Group.

Cumberland batholith (unit Pcd-Pcmo)

Coarse- to medium-grained, massive to foliated metaplutonic rocks northeast of Markham Bay, in the western Soper Lake area, around Froebler Bay, and at 68°W (Fig. 1) occur along strike from and are continuous with extensive regions underlain by the 1.88-1.85 Ga Jackson et al., 1990; Wodicka and Scott, 1997; Scott, 1999) Cumberland batholith on southern Baffin Island (Fig. 1; Blackadar, 1987; Jackson and Taylor, 1972). The principal rock type mapped within the Cumberland batholith in the Soper Lake area is a buff to pink-weathering orthopyroxene-biotite monzonite (unit Pcmo) that is massive to weakly foliated. Sheets of hornblende-orthopyroxene-clinopyroxene diorite (unit Pcd), 10-500 m wide and up to several km long, are broadly coplanar with the dominant foliation in the host monzonite and are therefore interpreted as sills. These sheets are typically found along the southern margin of the batholith and highlight local interference geometries between Markham Bay and Froebler Bay (Fig. 1).

Along a number of well exposed contacts, sills of monzonite truncate Ramsay River orthogneiss and Lake Harbour Group host rocks, indicating intrusion following initial juxtaposition of the orthogneiss and the supracrustal units. Isolated, kilometre-scale plutons of pink orthopyroxene-biotite monzonite northeast of Crooks Inlet and north and east of Kimmirut (Fig. 1), one of which has been dated at 1.85 Ga (Wodicka and Scott, 1997), are interpreted as part of the Cumberland magmatic system.

ACKNOWLEDGEMENTS

The Landsat-7 (ETM+) data has been orthorectified to a horizontal accuracy of better than 20 m. The new orthorectification procedure developed at the Canada Centre for Remote Sensing minimizes the accumulation of planimetric errors that accompanies traditional resampling, orthorectification and geographic registration steps and furthermore preserves the radiometric integrity of the spectral data. Since the Landsat-7 mosaic is more accurate than the existing topographic base (1:250 000) data which the original digital geologic data used, the geology has been warped to fit the Landsat data.

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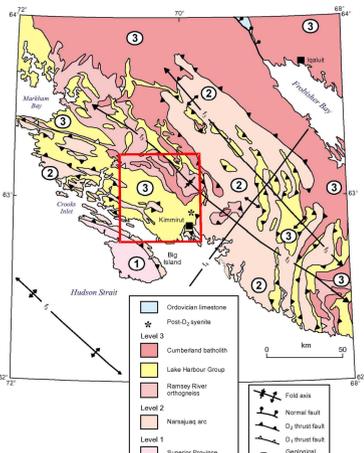


Figure 1. Generalized geology of southern Baffin Island between 68°W and 72°W, Meta Ingotina Peninsula, Nunavut (after St-Onge et al., 2001), and identification of the principal structural levels (1-3) and crustal scale folds (F1-F3) described in the text. Red outline corresponds to the area covered by the Open File map.

OPEN FILE 5055
HYPERSPETRAL UNITS
SOPER LAKE
 BAFFIN ISLAND
 NUNAVUT

Scale 1:100 000/Échelle 1/100 000

kilomètres 2 4 6 8 kilomètres

UNIVERSAL TRANSVERSE MERCATOR PROJECTION
 North American Datum 1983
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PROJECTION TRANSVERSE UNIVERSALE DE MERCAUTOR
 Système de référence géodésique nord-américain, 1983
 © Sa Majesté la Reine du chef du Canada 2008

LOCATION MAP

NATIONAL TOPOGRAPHIC SYSTEM REFERENCE AND INDEX
 SYSTÈME GÉOLOGIQUE DU CANADA

Authors: Peskko, M., Harris, J., Budkwitsh, P., St-Onge, M.R., McGregor, R., Hitchcock, R., and Daneyeva, D.

Geology by M.R. St-Onge, D. Scott, and N. Wodicka, 2001

Hyperspectral units by M. Peskko, J. Harris, P. Budkwitsh, M.R. St-Onge, R. McGregor, R. Hitchcock, 2004

Digital cartography by D. Everett, Earth Sciences Sector Information Division (ESS Info)

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

Magnetic declination 2006, 31°07'W, decreasing 27.3' annually. Readings vary from 30°31'W in the SW corner to 31°35'W in the NE corner of the map

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Sheet 1 of 2, Hyperspectral units

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SHEET 1 OF 2 FEUILLE 1 DE 2

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