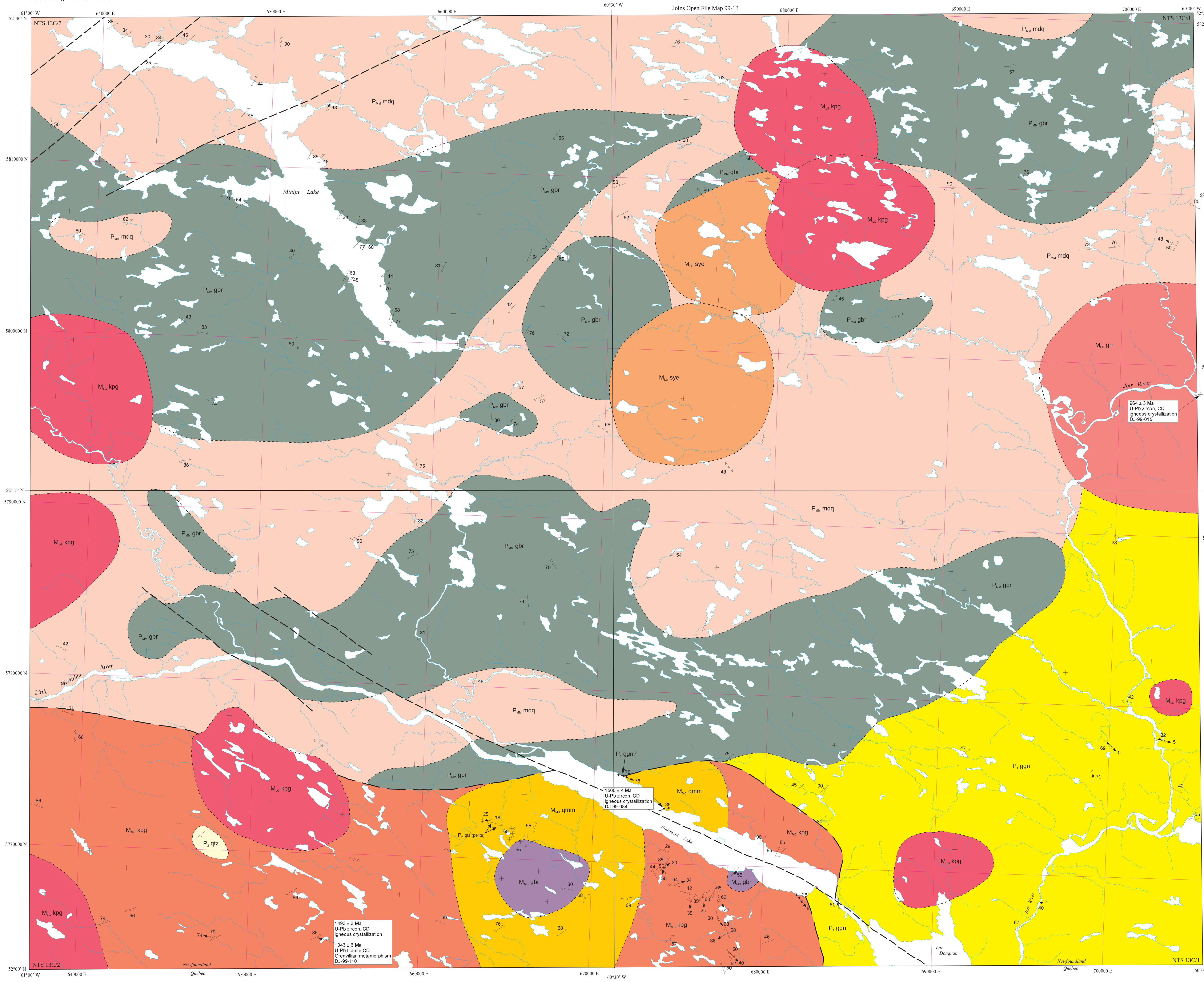
Joint project of the Geological Survey of Newfoundland and Labrador and the Geological Survey of Canada.

GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
Department of Mines and Energy
Geological Survey

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Geology by D.T. James (Geological Survey of Newfoundland and Labrador) and L. Nadeau (Geological Survey of Canada, Québec), 1999.

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This map represents a preliminary interpretation of the geological field data and is subject to change without notice. Comments regarding revisions or errors are invited and should be directed to the Director, Geological Survey of Newfoundland and Labrador, P.O. Box 8700, St. John's, Newfoundland, Canada. A1B 4J6

NOTE: This map supercedes Open File 013C/0041 (James, D.T. and Nadeau, L. 2000. Geology of the Minipi Lake area (NTS 13C/South), Grenville Province, southern Labrador. Geological Survey of Newfoundland and Labrador, Department of Mines and Energy, Open File 013C/0041, 1:100 000-scale map with descriptive notes.)

**BEDROCK GEOLOGY**

**OPEN FILE 013C/0043**

**MAP 2001-19**

# GEOLOGY OF THE FOURMONT LAKE AREA (NTS 13C/SE), GRENVILLE PROVINCE, SOUTHERN LABRADOR.

scale: 1:100 000

0 1 2 3 4 5
kilometres

DATA POSITIONING

On this map, structural and outcrop data are plotted in the position where the data were collected in the field (i.e., symbols representing tectonic structures or primary features are not offset from the outcrop location). The centre of the symbol representing a planar fabric element (e.g., foliation or gneissosity) or a planar primary feature (e.g., bedding or igneous layering) is plotted in the position where the data were collected in the field. The + symbol represents an outcrop that has a massive (i.e., isotropic) structure or one that does not contain a measurable fabric (e.g., frost heave or an extensively fractured outcrop).

Data are plotted using a NAD 1927 projection, UTM Grid Zone 20.

## LEGEND

### MESOPROTEROZOIC

Late- to post-Grenvillian intrusive rocks

- $M_{LG}$ kpg — Porphyritic granite: mainly K-feldspar porphyritic biotite granite, locally non-porphyritic; mainly isotropic, although has a local, weak foliation (relict igneous foliation ?)
- $M_{LG}$ grn — Granite: mainly coarse- and medium-grained biotite granite, locally K-feldspar porphyritic granite; mainly isotropic, although contains a local, weak foliation (relict igneous foliation?)
- $M_{LG}$ sye — Syenite and monzonite: pink- to orange-weathering clinopyroxene-bearing syenite and monzonite; mainly coarse grained and massive.

### MESOPROTEROZOIC and PALEOPROTEROZOIC (?)

MECATINA TERRANE (MECT)

Petit Mecatina (AMCG) Intrusive Suite

- $M_{MC}$ gbr — Gabbro: fresh to variably recrystallized and deformed gabbro and gabbronorite
- $M_{MC}$ kpg — Porphyritic granite: recrystallized, foliated and locally gneissic (augen gneiss) K-feldspar porphyritic granite; igneous age - 1493 ±3 Ma; contains deformed gabbro dykes
- $M_{MC}$ qmm — Quartz monzonite: foliated, maple-sugar-bronze-weathering quartz monzonite and monzonite containing blue quartz; igneous age - 1500 ±4 Ma

Pre-Petit Mecatina supracrustal rocks (Wakeham Group equivalents ?)

- $P_2$ qtz — Quartzite: orthoquartzite, local high-grade pelitic gneiss ($P_2$ qtz pelite), and possible metamorphosed mafic volcanic rocks ($P_2$ qtz mvol)

### PALEOPROTEROZOIC

Mealy Mountains Intrusive Suite (MMIS)

- $P_{MM}$ gbr — Gabbro and gabbronorite: variably foliated, recrystallized and deformed to locally fresh gabbro and gabbronorite; contains minor amounts of leucogabbro, melagabbro, pyroxenite and rare olivine-bearing gabbro; biotite-bearing gabbro is common in the western part of NTS 13C/06
- $P_{MM}$ mdq — Monzodiorite and monzonite: heterogeneous and undivided unit consisting of recrystallized, variably foliated and locally gneissic monzodiorite, monzonite, quartz monzonite, granodiorite and diorite; contains minor amounts of metamorphosed gabbro (equivalent to $P_{MM}$ gbr ?); igneous emplacement ages of protoliths are undetermined

Pre-MMIS gneissic rocks (igneous emplacement ages uncertain)

- $P_1$ ggn — Orthogneiss: white- and pink-weathering orthogneiss, granitoid migmatite and extensively recrystallized granitic rocks; common amphibolite boudins

Geological contact: assumed

Ductile, high-strain zone (Grenvillian): assumed

Late- to post-Grenvillian fault (Neoproterozoic ?): assumed

Outcrop (massive or no fabrics measured)

Foliation (inclined, vertical)

Gneissosity (inclined, vertical)

Mineral elongation lineation

Planar, mylonitic fabric in ductile high-strain zone; inclined

Bedding (tops known, tops unknown)

Igneous layering (tops known, tops unknown)

## GEOCHRONOLOGICAL DATA

| | |
|---|---|
| 1500 +/-4 Ma<br>U-Pb zircon, CD<br>igneous crystallization<br>DJ-99-084 | age<br>isotopic system and mineral analysed, CD - concordant age, UI - upper intercept age<br>interpretation of age<br>sample number |

U-Pb geochronological analyses by S. Kamo, Royal Ontario Museum, Toronto (*see* James, Kamo and Krogh, 2001).

Shown on the map are the results of U-Pb geochronological analyses for samples DJ-99-084 (unit $M_{MC}$ qmm), DJ-99-110 (unit $M_{MC}$ kpg), and DJ-99-015 (unit $M_{LG}$ grn). For all three samples, the reported ages for igneous crystallization are based on concordant or nearly concordant data from zircon. Growth of new titanite, estimated at 1043 ±6 Ma, in sample DJ-99-110 is interpreted as the age of Grenvillian metamorphism.

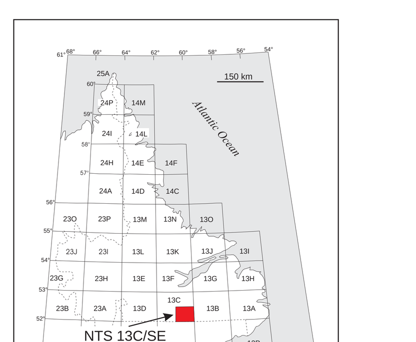


Figure 1. Index map of Labrador showing location of the NTS 13C/SE area.

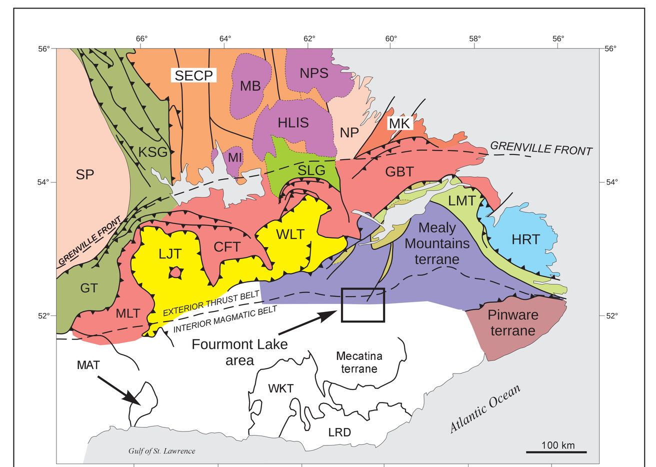


Figure 2. Location of the Fourmont Lake area (NTS 13C/SE) in relation to the tectonic and major lithotectonic units of northeastern Laurentia. Grenville Province: HRT - Hawke River terrane, LMT - Lake Melville terrane, GBT - Groswater Bay terrane, WLT - Wilson Lake terrane, CFT - Churchill Falls terrane, LJT - Lac Joseph terrane, MLT - Molson Lake terrane, GT - Gagnon terrane, MAT - Matamec terrane, WKT - Wakeham terrane, LRD - La Romaine domain. Archean divisions: SP - Superior Province, NP - Nain Province (Hopedale Block). Archean and Paleoproterozoic divisions: MK - Makkovik Province, SECP - Southeastern Churchill Province (core zone), KSG - Kaniapiskau Supergroup (2.25-1.86 Ga). Mesoproterozoic units: NPS - Nain Plutonic Suite, HLIS - Harp Lake intrusive suite, MB - Mistastin batholith, MI - Michikamau Intrusion, SLG - Seal Lake Group.

## DESCRIPTIVE NOTES

### INTRODUCTION

The southeastern part of NTS map area 13C (Figure 1) was mapped at a scale of 1:100 000 in a six-week field season in 1999. The area includes 1:50 000-scale NTS map areas 13C/1, 13C/2, 13C/7 and 13C/8. In general, bedrock in the study area is very poorly exposed; outcrops are found mainly on hilltops or along small streams. Contacts between rock units are not exposed; in some cases contacts are interpreted from aeromagnetic anomaly patterns. The area is thickly vegetated or is covered by extensive areas of bog. Some of the northeastern and southern parts of the area, especially the Little Mecatina River valley, contain thick accumulations of Quaternary glaciofluvial sand. Lakes and rivers are shallow, rocky, and generally lacking in shoreline outcrops. Mapping was accomplished almost entirely by helicopter landings on isolated outcrops. A very minor amount of the mapping, in the area south of Fourmont Lake, involved ground traversing.

NTS map area 13C was previously mapped by Stevenson (1967). Preliminary results of the 1999 mapping program were reported by James and Nadeau (2000). The northern boundary of this map joins Open File Map 99-13 (James, 1999; and *see* James and Lawlor, 1999). To the west, NTS 13C/SW was mapped by James and Nadeau (2000, 2001). NTS map area 13C/NW was mapped by Wardle *et al.* (1990, 2000).

### REGIONAL SETTING

The area is situated in the northeastern Grenville Province and includes parts of the Mealy Mountains (MMT) and Mecatina (MECT) terranes (Figure 2). The terranes are Grenvillian (ca. 1000 Ma) tectonic divisions.

The MMT (Gower and Owen, 1984) consists primarily of late Paleoproterozoic (Labradorian-age) crust of the Mealy Mountains intrusive suite (MMIS) (*see* Emslie, 1976; Emslie and Hunt, 1990; Krogh *et al.*, 1996), minor amounts of Paleoproterozoic pre-Labradorian crust, and Pinwarian (1510 to 1450 Ma) and late- to post-Grenvillian intrusions (Gower, 1996). The MMIS consists mainly of an older group of anorthositic, leucogabbroic and leucotroctolitic rocks, not present in NTS 13C/SE, and a younger group of pyroxene-bearing monzonite and quartz monzonite intrusions. Emplacement ages for units of MMIS monzodiorite orthogneiss, porphyritic quartz monzodiorite and pyroxene-bearing monzonite, occurring in the Kenamu River area (NTS 13C/NE) and determined by U–Pb geochronology of zircon, are 1659 ± 5 Ma, 1650 ± 1 Ma, and 1643 ± 2 Ma, respectively (James *et al.*, 2000). In addition, pyroxene monzonite and pyroxene granite, inferred to be from the younger group of MMIS rocks and occurring in the northeastern part of the MMIS, have emplacement ages of 1646 ± 2 Ma and 1635 +22/ 8 Ma (Emslie and Hunt, 1990), respectively. Emplacement ages of MMIS rocks overlap with regionally significant tectonothermal and magmatic events of the Labradorian Orogeny, which occurred in northeastern Laurentia in the interval between 1720 and 1600 Ma (*see* Gower, 1996).

Rocks in the western part of the MMT, including the NTS 13C/SE area, are variably foliated and locally gneissic. In general they have northeast- to east-northeast-striking planar fabrics that are inferred to be Labradorian in age (James and Nadeau, 2000). However, the local occurrence of deformed Pinwarian-age (ca. 1514 Ma) granite in the Kenamu River area (James *et al.*, 2000) demonstrates the western part of the terrane has also been locally affected by Pinwarian and/or Grenvillian deformation.

The MECT has not been studied in much detail. The oldest rocks, which make up a very minor amount of the terrane, are upper amphibolite-facies supracrustal rocks provisionally correlated with the >1500 Ma Wakeham Group, which make up a significant component of the Wakeham terrane (Figure 2). The supracrustal rocks are intruded by granitoid orthogneiss, deformed granitic and monzonitic rocks, gabbro, anorthosite and local troctolite. The igneous rocks are assigned as part of the Petit Mecatina intrusive suite. The principal foliation and gneissosity in MECT rocks are mainly west-southwest- to west-northwest-striking. On the basis of U–Pb geochronological data, metamorphism and attendant deformation of MECT rocks are interpreted to be Grenvillian (James *et al.*, 2001).

The location of the boundary between the MMT and the MECT terrane is uncertain. In the Fourmont Lake area (NTS 13C/1), rare occurrences of mylonitic rocks having an undetermined kinematic history, suggest the boundary is a south-dipping high-strain zone, possibly Grenvillian in age. However, the area inferred to contain the terrane boundary is very poorly exposed and reliable field data are lacking.

The MMT and the MECT are intruded by plutons consisting of unmetamorphosed, massive to weakly foliated granite. These plutons are interpreted to be part of a widespread suite of 980 to 950 Ma granitoid intrusions occurring in the northeastern Grenville Province (*see* Gower, 1996).

### DESCRIPTION OF ROCK UNITS

**MEALY MOUNTAINS TERRANE**
***Orthogneiss ($P_1$ ggn)***

The southeastern part of NTS 13C/1 is underlain by a unit consisting of upper amphibolite-facies, white- or pink-weathering granitoid orthogneiss, and meta-granitoid rocks. The unit is interpreted to be the oldest in the MMT, although contact relations with surrounding units are not exposed. On the basis of lithology, the unit is provisionally correlated with other units of pre-Labradorian orthogneiss occurring elsewhere in the MMT (e.g., Krogh *et al.*, 1996, and references therein).

White-weathering orthogneiss is common in the western parts of Unit $P_1$ ggn. Rocks have a fine- to medium-grained, granoblastic tonalite paleosome, and contain less than 20 percent, white, tonalite or granitic leucosome. Gneissosity in the paleosome is defined by layers containing relatively high concentrations of biotite, although in general, layering is diffuse and poorly defined. The tonalite leucosome is discordant to gneissosity in the paleosome, but is itself deformed. One occurrence of white orthogneiss at the outlet of Fourmont Lake (UTM 684486E, 5767937N), consists of medium-grained, biotite- and hornblende-bearing metatonalite containing isoclinally folded layers of amphibolite. The amphibolite layers, which make up approximately 20 percent of the outcrop, are generally less than 20 cm thick, although layers greater than 1-m thick also occur. The amphibolite layers are interpreted as pre-metamorphic mafic dykes.

The northeastern parts of the unit are most commonly comprised of pink-weathering granitic orthogneiss. Rocks consist of pink- to grey-weathering granitic paleosome and pink, granitic leucosome. The paleosome contains biotite and locally has a texture suggesting the protolith was a K-feldspar porphyritic granite. Up to 20 percent of outcrops consist of one or two phases of granitic leucosome distinguished on the basis of texture and crosscutting relationships. The older phase is fine grained and forms thin layers, and streaky, discontinuous lenses. The younger phase, which crosscuts the older phase, is coarse grained and forms thin sheets (less than 30 cm thick); both the older and younger phases are deformed. The pink orthogneiss commonly contains boudins of medium-grained biotite amphibolite interpreted to be relicts of pre-metamorphic mafic dykes. Also included in the unit are occurrences of pink-weathering, foliated meta-granite containing biotite and amphibolite boudins that are identical to those found in the gneissic rocks.

In the southeastern part of NTS 13C/1, outcrops occurring along the Joir River consist of pink granitic orthogneiss containing amphibolite boudins, although the rocks are extensively recrystallized and the gneissosity is commonly obliterated. In general, rocks have very fine-grained granoblastic textures and indistinct foliations. They contain less than 10 percent biotite and locally have relict K-feldspar porphyritic textures.

**Mealy Mountains Intrusive Suite (MMIS)**
***Monzodiorite, Quartz Monzodiorite and Monzonite ($P_{MM}$ mdq)***

Unit $P_{MM}$ mdq is a compositionally and texturally varied unit making up a significant part of the western MMIS. It includes monzodiorite, quartz monzodiorite, monzonite, diorite, granodiorite, quartz monzonite and granite. In fact, it is defined in NTS 13C/SE to include all MMIS rocks that cannot be mapped as either monzonite (Unit $P_{MM}$ mzt) or gabbronorite (Unit $P_{MM}$ gbr). The unit probably consists of many intrusions having relatively uniform composition and texture, although rocks are so poorly exposed the unit cannot be subdivided at the present scale of mapping. U–Pb zircon dating of a weakly gneissic quartz monzodiorite from the unit gave a preliminary age of 1659 ± 5 Ma (James *et al., 2000*), interpreted to be the age of igneous emplacement.

Unit $P_{MM}$ mdq rocks are texturally varied, even at the outcrop scale, from massive and having complete preservation of igneous textures, to recrystallized and foliated; gneissic varieties also occur. However, in general, rocks are fine to medium grained, and they are most commonly recrystallized and foliated. The unit includes a wide variety of rock types, although almost all rocks from the unit contain some proportion of clinopyroxene, which is variably replaced by hornblende and biotite. Magnetite is a common accessory mineral.

Gneissic versions of $P_{MM}$ mdq rocks have a gneissosity defined by concentration of mafic minerals, they contain clinopyroxene and are relatively poor in quartz. By comparison, granitoid orthogneisses of Unit $P_1$ ggn have a gneissosity defined by layers of granitic leucosome, do not contain clinopyroxene and have more than 20 percent quartz.

***Gabbro and Gabbronorite ($P_{MM}$ gbr)***

Mafic intrusive rocks in the MMIS are collectively defined as Unit $P_{MM}$ gbr. The unit has a wide range in composition, textures, structures, and aeromagnetic signatures suggesting it consists of a number of different intrusions. However, it could not be subdivided at the present scale of mapping. Unit $P_{MM}$ gbr rocks are correlated with mafic intrusive rocks of the MMIS on the basis of lithology, and that they can be traced from the study area into better defined parts of the MMIS proper, to the northeast (*see* Gower, 1999).

Unit $P_{MM}$ gbr consists mainly of gabbro and gabbronorite. It contains subordinate amounts of leucogabbro, leucogabbronorite, pyroxenite, diorite and very minor amounts of monzogabbro, monzogabbronorite and amphibolite. Rocks consist of varied amounts of clinopyroxene, orthopyroxene and plagioclase. Rocks contain rare olivine occurrences. Locally, plagioclase is pale pink on fresh surfaces. Biotite is a common accessory mineral; biotite-bearing rocks are most common in the western part of NTS 13C/7. Trace amounts to several percent of pyrite are common throughout the unit.

Rocks are varied from massive and unrecrystallized, containing preserved igneous mineral textures, to foliated and pervasively recrystallized. Locally, rocks display relict igneous layering defined by concentration of mafic minerals. In some rocks, the foliation may represent a modified relict igneous lamination. The reason(s) for the wide variety of textures and structures in the unit are somewhat unclear. A model proposing that Unit $P_{MM}$ gbr consists of mafic intrusions that predate and postdate a deformation event (Labradorian ?) might be apropos in some cases. However, wide variations in strain and degree of recrystallization are, in some instances, very local and occur over several metres. These local variations cannot be easily explained by intrusions of different ages. Rather, they may be explained by heterogeneous strain; the state of strain perhaps being influenced by original textures or variations in grain size.

Some parts of the unit have a distinctive aeromagnetic signature. Of note is a gabbronorite intrusion southeast of Minipi Lake (in NTS 13C/7 and 13C/8), marked by an anomalously high, circular aeromagnetic anomaly, 9 km in diameter. This intrusion is very poorly exposed and the contacts are defined entirely by the aeromagnetic anomaly pattern. Three outcrops within the circular pattern consist of recrystallized gabbronorite containing several percent pyrite. The rocks have a weak layering, interpreted as igneous layering that appears to be concentric to the outer margin of the intrusion and dipping toward the centre of the body.

**MECATINA TERRANE (MECT)**
***Metasedimentary Rocks ($P_2$ qtz)***

Metasedimentary rocks occurring in the MECT, southwest of Fourmont Lake, are defined as Unit $P_2$ qtz. The unit includes quartzite and pelitic gneiss. Field relations demonstrate that the pelitic gneiss ($P_2$ qtz pelite) is intruded by quartz monzonite ($M_{MC}$ qmm). The contact between quartzite and the K-feldspar porphyritic granite unit ($M_{MC}$ kpg) is not exposed but is also assumed to be intrusive. On this basis, the metasedimentary rocks are interpreted to be the oldest rocks in the MECT, in NTS 13C/SE. Age and affinity of the supracrustal rocks is speculative, although they are provisionally correlated with pre-1500 Ma metasedimentary rocks of the Wakeham Group. Units of quartzite, pelitic schist and gneiss, also interpreted to have depositional ages older than 1500 Ma, occur also in the Pinware terrane (Gower *et al.*, 1994, Gower, 1996).

Several occurrences of Unit $P_2$ qtz quartzite form a hilltop, 20 km west southwest of Fourmont Lake (UTM 647090E, 5770848N). Rocks are white on the fresh and weathered surfaces, fine to medium grained, recrystallized and consist almost entirely of quartz, minor amounts of biotite and magnetite.

A zone of pelitic gneiss, less than 100 m wide and several hundred metres long, occurs 5 km southwest of Fourmont Lake (UTM 664135E, 5772083N). Rocks are rusty-, grey- and white-weathering and contain the assemblage biotite + garnet + sillimanite ± cordierite. Sillimanite is abundant suggesting protoliths were aluminous shales or wackes. Rocks contain two phases of white-weathering leucosome; the older phase is fine grained and forms thin layers and lenses, whereas the younger phase is coarser grained, forms thick layers (up to 1 m) and contains coarse-grained garnet. Leucosome makes up less than 20 percent of outcrops. Also included in the unit are gossanous pelitic gneisses containing less than 10 percent pyrite.

***Quartz Monzonite and Monzonite ($M_{MC}$ qmm)***

An intrusion consisting of quartz monzonite and monzonite, occurring in the Fourmont Lake area, is defined as Unit $M_{MC}$ qmm. The unit is intruded by units $M_{MC}$ kpg (granite) and $M_{MC}$ gbr (gabbro). U-Pb data from zircons collected from a sample of the unit gave an igneous crystallization age of 1500 ±4 Ma (James *et al.*, 2001). Locally, Unit $M_{MC}$ qmm contains inclusions of Unit $P_2$ qtz pelitic metasedimentary rocks. At one locality, on the north shore of Fourmont Lake (UTM 674127E, 5773188N), the unit is intruded by northeast- and northwest-striking, fresh diabase dykes. The northwest-striking dyke cuts the northeast-striking dyke.

The unit consists of quartz monzonite and, less commonly, monzonite. Rocks are maple-sugar bronze to pink on the fresh and weathered surfaces, and contain pale-blue quartz. They are medium to coarse grained, and K-feldspar porphyritic to equal grained. Typically, they are variably recrystallized and foliated, although massive rocks also occur. Rocks contain less than 10 percent clinopyroxene, which is variably replaced by hornblende and biotite, and accessory magnetite. Outcrops commonly contain small (less than 50-cm-long), flattened, fine-grained mafic xenoliths.

Unit $M_{MC}$ qmm rocks are easily distinguished from MMIS monzonite (Unit $P_{MM}$ mzt). The latter do not contain quartz, are equal grained, massive, and have a distinctive red to orange colour on the weathered surface.

***Porphyritic Granite ($M_{MC}$ kpg)***

The MECT includes a widespread unit of recrystallized and foliated, K-feldspar porphyritic granite, defined as Unit $M_{MC}$ kpg. U-Pb data from zircons, collected from a sample of the granite, gave an igneous crystallization age of 1493 ±3 Ma (James *et al.*, 2001). Foliated and recrystallized gabbro dykes and intrusions of uncertain size (equivalent to Unit $M_{MC}$ gbr gabbro ?), occur throughout the granite but are too small to be shown on the map.

The rocks are light pink on the fresh and weathered surfaces. They consist of abundant, coarse-grained K-feldspar phenocrysts and finer grained quartz, plagioclase, biotite and local hornblende. Rocks contain less than 10 percent combined biotite and hornblende. The unit has a remarkably consistent composition throughout the area. In every outcrop, rocks are recrystallized and have a foliation defined by elongated K-feldspar phenocrysts and biotite. Many rocks have an augen texture defined by extensively recrystallized and elongated phenocrysts up to 15 cm long. Foliation in the unit is west-northwest striking.

***Gabbro ($M_{MC}$ gbr)***

Two bodies of fresh to variably recrystallized gabbro occurring in the MECT are defined as Unit $M_{MC}$ gbr. Unit $M_{MC}$ gbr gabbro intrudes the $M_{MC}$ qmm quartz monzonite and $M_{MC}$ kpg granite units, and on this basis, the gabbro is interpreted to be Mesoproterozoic.

The body of Unit $M_{MC}$ gbr gabbro contained within the $M_{MC}$ qmm quartz monzonite unit mainly consists of fresh to locally recrystallized and foliated gabbro and melagabbro. Rocks are medium grained and have an intergranular texture defined by plagioclase laths and intergranular clinopyroxene. Relict intergranular textures are preserved in the recrystallized rocks.

Outcrops of fresh, undeformed Unit $M_{MC}$ gbr gabbro at Fourmont Lake (UTM 679881E, 5771505N) contain spectacular examples of layering and igneous crossbedding structures. Layering is defined by plagioclase concentration. The rocks at Fourmont Lake also have an igneous lamination defined by alignment of plagioclase laths.

**MESOPROTEROZOIC UNITS**
**Late- to post-Grenvillian intrusive rocks**
***Syenite and Monzonite ($M_{LG}$ sye)***

The western part of NTS 13C/8 includes two plutons consisting of clinopyroxene-bearing syenite and monzonite. Contacts of the plutons are unexposed and age relationships with surrounding units are uncertain, although assumed to be intrusive. The unit consists of distinctively pink- to orange-weathering syenite and monzonite. Rocks are medium to coarse grained and massive. They contain less than 10 percent clinopyroxene and accessory magnetite. The unit has a consistent texture and composition. Outcrops lack inclusions or dykes.

***Granite ($M_{LG}$ grn and $M_{LG}$ kpg)***

The MMT and MECT include plutons mainly consisting of medium- to coarse-grained granite (Unit $M_{LG}$ grn) and K-feldspar porphyritic granite (Unit $M_{LG}$ kpg). The units are defined primarily on the basis of texture. Both contain rocks that are mainly undeformed and have fresh, phaneritic textures, although weakly foliated rocks occur locally. Of particular distinction, rocks contain unrecrystallized quartz. Some outcrops contain a prominent horizontal jointing. Based on correlation of rock types, the similarity of aeromagnetic signatures, and that the rocks are essentially undeformed, Units $M_{LG}$ grn and $M_{LG}$ kpg are correlated with bodies of late- to post-Grenvillian granite that occur to the east of NTS 13C/SE, in the Mealy Mountains and Pinware terranes. Where dated, these intrusions have emplacement ages between ca. 980 and 950 Ma (*see* Gower, 1996; Gower *et al.*, 1991). U-Pb data from zircons from a sample of $M_{LG}$ grn granite, occurring on the Joir River (in NTS map area 13B/5), gave an igneous crystallization age of 964 ±3 Ma (James *et al.*, 2001).

The medium- to coarse-grained granite unit ($M_{LG}$ grn) consists of pink-weathering biotite syenogranite. Rocks contain less than 10 percent biotite. Equal-grained rocks are most common, although K-feldspar porphyritic rocks also occur. In general, outcrops have a consistent composition, texture and lack xenoliths. However, some outcrops are composites and include two or more separate granite phases that can be distinguished on the basis of grain size and subtle compositional differences. The large bodies of Unit $M_{LG}$ grn granite, occurring southeast of Guines Lake (in NTS 13C/SW) and east of the Joir River, have a subdued magnetic expression.

The K-feldspar porphyritic granite unit ($M_{LG}$ kpg) consists of pink-weathering biotite syenogranite identical in composition to the $M_{LG}$ grn granite. Phenocrysts are up to 5 cm long, and locally display concentric zoning. In rare occurrences, phenocrysts display a weak igneous lamination. In contrast to the $M_{LG}$ grn granite, plutons of $M_{LG}$ kpg porphyritic granite are commonly marked by prominent magnetic highs.

The area also includes pink- to white-weathering granite pegmatites that intrude all of the map units. The pegmatites do not form map units at the present scale of mapping and are not shown on the map. They locally contain very coarse-grained K-feldspar crystals up to 30 cm long. The pegmatites are massive, undeformed and commonly occur around, or within $M_{LG}$ grn and $M_{LG}$ kpg granite intrusions. They are interpreted to be late- to post-Grenvillian on the basis of their undeformed and unrecrystallized character.

### STRUCTURE AND METAMORPHISM

MMT orthogneisses ($P_1$ ggn) are metamorphosed to upper-amphibolite facies, containing granitic metamorphic leucosome, and biotite and hornblende in the paleosome. Foliation and gneissosity are mainly east-northeast striking and moderately north-northwest dipping. The timing of migmatization and deformation are undetermined, but assumed to be Labradorian.

MMIS rocks are variably recrystallized and deformed, although in general they cannot be characterized as having a strong or ubiquitous tectonic fabric. Relict igneous textures and minerals are very common in foliated rocks throughout units $P_{MM}$ mdq and $P_{MM}$ gbr. In some occurrences of foliated gabbronorite, for example, plagioclase and pyroxenes that preserve a relict intergranular texture are pseudomorphed by granoblastic plagioclase and pyroxene, respectively. The fact that these rocks retain their original textures and minerals may suggest they were deformed and recrystallized immediately following or during the late stages of emplacement. Thus, fabrics in these rocks may be igneous fabrics or accentuated igneous fabrics more related to emplacement processes than having a tectonic origin. Of note, Unit $P_{MM}$ mzt (monzonite and syenite) rocks are unrecrystallized and appear undeformed. However, there are pervasively recrystallized and well-foliated $P_{MM}$ mdq and $P_{MM}$ gbr rocks that do not retain igneous textures; the fabrics in these rocks are interpreted as entirely tectonic. In addition, some Unit $P_{MM}$ mdq rocks have a weak gneissosity, which is most easily interpreted as a thermotectonic feature.

Planar fabric elements, whatever their origin in MMIS rocks, are east-northeast to north-northeast striking. The age of the tectonic fabric is uncertain but presumed to be Labradorian. However, the fact that the MMT in NTS map area 13C/NE includes an occurrence of foliated Pinwarian granite, and that the late- to post-Grenvillian granite plutons have a local, weak foliation, leaves open the possibility that some fabrics in MMIS rocks are Grenvillian.

In the MECT, the K-feldspar porphyritic granite ($M_{MC}$ kpg) is extensively recrystallized, having an augenitic to locally gneissic structure and a well-developed west-northwest-striking foliation that, in general, dips steeply to the north-northeast. Foliation is defined by recrystallized K-feldspar phenocrysts, biotite and hornblende. In marked contrast, the quartz monzonite ($M_{MC}$ qmm) and gabbro ($M_{MC}$ gbr) units are not as pervasively recrystallized or as well foliated as the porphyritic granite. The quartz monzonite and gabbro are massive to foliated, mainly having west-southwest- to west-northwest-striking planar fabrics. Tectonic fabrics in MECT rocks are tentatively interpreted as Grenvillian. Growth of new titanite at 1043 ±6 Ma (U-Pb data) in a sample of foliated $M_{MC}$ kpg granite is consistent with this interpretation (James *et al.*, 2001).

Metasedimentary rocks (Unit $P_2$ qtz), which occur as inclusions in Unit $M_{MC}$ qmm quartz monzonite and Unit $M_{MC}$ kpg porphyritic granite, are foliated and locally gneissic. Pelitic rocks contain K-feldspar-bearing granitoid leucosome and the assemblage biotite + garnet + sillimanite ± cordierite. The ages of metamorphism and the structures in the metasedimentary rocks are undetermined but they may be Grenvillian and the same age as the foliation in the host $M_{MC}$ kpg porphyritic granite.

Two occurrences of mylonitic rocks at Fourmont Lake, are inferred to define the boundary between the MMT and the MECT. (The nature of the terrane boundary west of Fourmont Lake is uncertain because of lack of exposure, although it is interpreted to be tectonic everywhere.) The southeastern occurrence of mylonites (UTM 671796E, 5774961N) forms a zone that is at least 75 m wide; the mylonites appear to be derived from K-feldspar porphyritic granite (Unit $M_{MC}$ kpg). The highly strained rocks have a varied but mainly northwest-striking mylonitic planar fabric and a shallow, southeast-plunging mineral elongation lineation. Kinematic indicators were not observed. In addition, granitoid orthogneisses (Unit $P_1$ ggn), occurring 2 km southeast of the mylonitic rocks, are themselves highly strained; contained amphibolite layers are transposed and isoclinally folded about a strong, north-striking foliation. The strength and attitude of the foliation in these $P_1$ ggn rocks is in marked contrast to the mainly northeast-striking gneissosity occurring elsewhere in Unit $P_1$ ggn orthogneiss. On the map scale, the terrane boundary separates MMT rocks mainly having northeast-striking, Labradorian planar fabrics, from MECT rocks mainly having west-northwest- to west-southwest-striking Grenvillian planar fabrics.

Mylonitic and ultramylonitic rocks occurring along the terrane boundary, near the northwest end of Fourmont Lake (UTM 682168E, 5768233N), appear to be derived from Unit $P_1$ ggn orthogneiss. The rocks have a west-northwest-striking mylonitic planar fabric and a steeply plunging, east-southeast-trending mineral elongation lineation. Kinematic indicators were not observed. The age of deformation along the terrane boundary is undetermined but assumed to be Grenvillian. Deformation must predate intrusion of the late- to post-Grenvillian granite plutons, which stitch the terrane boundary.

### EXPLORATION POTENTIAL

The Grenville Province of southern Labrador is under explored, although the region has some exploration potential (*see* Swinden *et al.*, 1991; Gower, 1992; and Gower *et al.*, 1995). Paleoproterozoic and Mesoproterozoic gabbro and gabbronorite intrusions in NTS 13C/SE have potential to host Ni-Cu sulphide and PGE mineralization. Several outcrops in the study area contain a few percent pyrite, although no significant sulphide occurrences were discovered during mapping in 1999.

Granitic rocks may also be of some exploration interest. Late- to post-Grenvillian granite plutons in southwestern Norway, similar to those in NTS 13C/SE, host Mo mineralization and are locally anomalous in U and F. Also associated with these intrusions are fault-controlled polymetallic (Au–Ag–Cu–Pb–Zn) veins (*see* Gower, 1992). There is no known Mo mineralization in the late- to post-Grenvillian granite plutons in NTS 13C/SE, although typically these intrusions are very poorly exposed and have not been mapped in any detail.

Supracrustal rocks (Unit $P_2$ qtz) may have some potential for base- and precious-metal mineralization. Correlative rocks of the Wakeham Group, in the Wakeham terrane, locally contain anomalous gold mineralization associated with extensive tourmaline alteration in quartzite, and copper (massive-sulphide SEDEX) mineralization in pelitic metasedimentary rocks.

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