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

Joins Open File Map 99-13

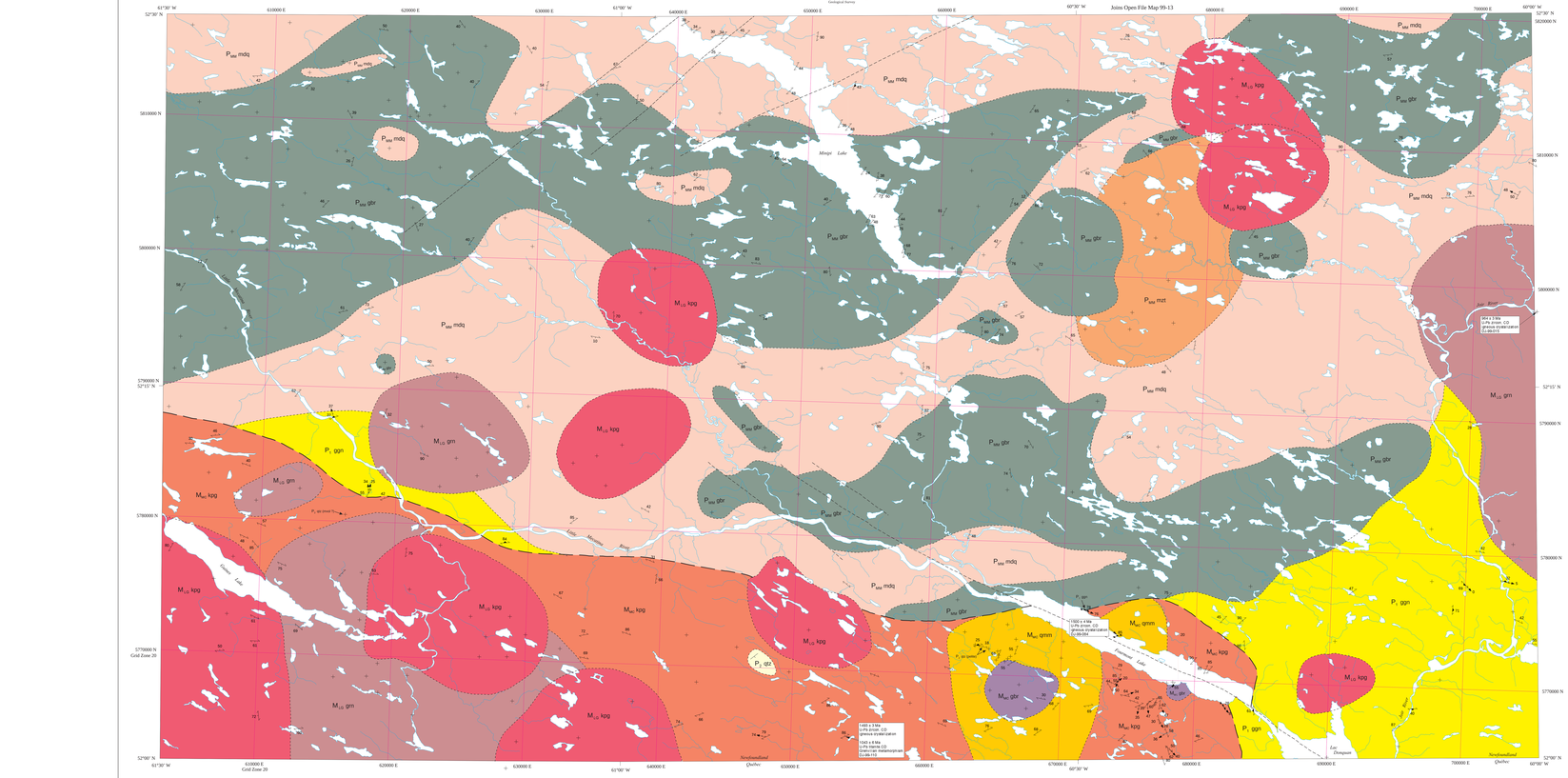
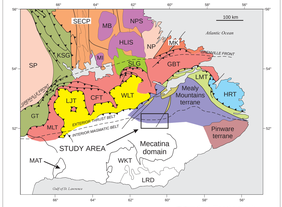


Figure 2. Location of the Minipi Lake study area in the context of major lithotectonic units of northeastern Laurentia. Grenville Province: HRT - Hawke River terrane, LMT - Lake Melville terrane, GBT - Groswater Bay terrane, WLT - Wilson Lake terrane, CFT - Churchill Falls terrane, LJT - Lac Joseph terrane, MLT - Molson Lake terrane, GT - Gagnon terrane, MAT - Manatenc 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, SLCP - Southeastern Churchill Province (core zone), KSG - Kanmantoo Supergroup (2.25-1.80 Ga), Mesoproterozoic units: NPS - Nain Plutonic Suite, HLIS - Harp Lake intrusive suite, MB - Mistastin batholith, MI - Michikamau Intrusion, SLG - Seal Lake Group.



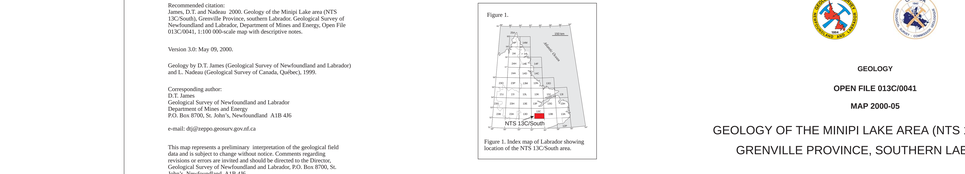


Figure 1. Index map of Labrador showing location of the NTS 13C/South area.

Recommended citation:
James, D.T. and Nadeau 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.

Version 3.0: May 09, 2000.

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

Corresponding author:
D.T. James
Geological Survey of Newfoundland and Labrador
Department of Mines and Energy
P.O. Box 8700, St. John's, Newfoundland A1B 4J6

e-mail: dtj@mpu.geonav.gov.nf.ca

This map represents a preliminary interpretation of the geological field data and is subject to change without notice. Corresponding regulatory 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, A1B 4J6

GEOLOGY

OPEN FILE 013C/0041

MAP 2000-05

GEOLOGY OF THE MINIPI LAKE AREA (NTS 13C/SOUTH), GRENVILLE PROVINCE, SOUTHERN LABRADOR.

scale: 1:100 000

0 1 2 3 4 5 10
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 structural measurements and features are not offset from the outcrop location). The centre of the symbol representing a planar fabric element (e.g., foliation or geneissic) or a planar geometry 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 measurable fabric (e.g., 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.

GEOCHRONOLOGICAL DATA

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

U-Pb geochronological analyses by S. Kamo, Royal Ontario Museum, Toronto (Unpublished data, March 2000).

Shown on the map are the results of U-Pb geochronological analyses for samples
D0-99-084 (unit M_{10} qtzmz), D0-99-110 (unit M_{10} kpg), and D0-99-015 (unit M_{10} 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 D0-99-110 is interpreted as the age of Grenvillian metamorphism.

LEGEND

MESOPROTEROZOIC

Late- to post-Grenvillian granitic rocks

- M_{10} kpg — Porphyritic granite - K-feldspar porphyritic biotite granite, local weak foliation (mainly has a high aeromagnetic signature)
- M_{10} grn — Granite - medium- to coarse-grained biotite granite, locally porphyritic, local weak foliation (mainly has a low aeromagnetic signature)

MESOPROTEROZOIC and PALEOPROTEROZOIC (?)

Intrusive rocks of uncertain affinity

- M_{ediz} gbr — Gabbro - fresh to variably recrystallized and deformed gabbro and gabbronorite
- M_{ediz} kpg — Porphyritic granite - recrystallized, foliated and locally gneissic (augen gneiss) K-feldspar porphyritic granite; contains deformed gabbro dykes
- M_{ediz} qtzmz — Quartz monzonite - foliated, maple-sugar-bronze weathering quartz monzonite and monzonite containing blue quartz

Metasedimentary rocks

- P_1 qtz — Quartzite - orthoquartzite, local high-grade pelitic gneiss (P_1 qtz pelite), and possible metamorphosed mafic volcanic rocks (P_1 qtz mvol)

PALEOPROTEROZOIC

Meaty Mountains Intrusive Suite

- P_{ediz} gbr — Gabbro and gabbronorite - variably foliated, recrystallized and deformed to locally fresh gabbro and gabbronorite; contains minor amounts of leucogabbro, metagabbro and pyroxenite
- P_{ediz} mzt — Monzonite - massive, coarse-grained pyroxene-bearing monzonite and syenite
- P_{ediz} mdq — Monzodiorite and monzonite - unsubdivided unit consisting of recrystallized, variably foliated and locally gneissic monzodiorite, monzonite, quartz monzonite and diorite

Gneissic rocks

- 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 ?)
- Neoproterozoic fault: assumed
- outcrop (massive or no measurable structures)
- foliation (inclined, vertical)
- gneissosity (inclined, vertical)
- mineral elongation lineation
- mylonite (mylonitic fabric in ductile high-strain zone; inclined)
- bedding (top known, tops unknown)
- igneous layering (top known, tops unknown)

DESCRIPTIVE NOTES

INTRODUCTION

With few exceptions, the geology of the Grenville Province in regions south and southwest of Goose Bay, including parts of NTS map-areas 13C, 13F, 13G and 13J (Figures 1 to 3), is known only from 1:250 000-or smaller scale reconnaissance mapping completed by the Geological Survey of Canada more than 30 years ago (cf. Stevenson, 1967). As part of a continuing and systematic program by the Geological Survey of Newfoundland and Labrador to upgrade the geological database for this region, most of the southern part of NTS map area 13C, including areas 13C/1, C/2, C/3, C/6, C/7 and C/8, representing an area of approximately 5500 km², was mapped at a scale of 1:100 000 in a six-week field season in 1999.

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 lineaments. Much of the study area is covered by a veneer of glacial sediments, except for the northeastern and southern parts of the study 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. Ground traversing is arduous and very inefficient. Thus, mapping was accomplished almost entirely by making helicopter landings on isolated outcrops. A very minor amount of the mapping, in the area south of Fourmont Lake, involved ground traversing.

This area was previously mapped by Stevenson (1967). NTS map area 13C/NW was mapped by Wardle *et al.* (1990). 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).

REGIONAL SETTING

The study area is divided into two domains on the basis of rock types. The northern domain, including units P_{ediz} mdq, P_{ediz} mzt, P_{ediz} gbr, comprises rocks belonging to the late Paleoproterozoic (Labradorian age) Meaty Mountains intrusive suite (MMIS). This conclusion is based on correlation of rock types (see James and Lawlor, 1999); there are no geochronological data from the study area to support this correlation. The MMIS consists mainly of an older group of anorthositic, leucogabbroic and leucomonzonitic rocks that are not present in the study area, and a younger group of pyroxene-bearing monzonite and quartz monzonite (e.g., units P_{ediz} mdq, P_{ediz} mzt). The southernmost part of the study area is underlain by a complex assemblage of rocks belonging to a group of MMIS rocks and occurring in the NTS 13C/NE area, have emplacement ages of 1650 ± 1 Ma and 1643 ± 2 Ma (James *et al.*, 2000), respectively. The MMIS is not an anorogenic AMCG suite. Emplacement ages overlap with regionally significant tectonothermal and magmatic events defined in the Labradorian Orogeny, which occurred in northeastern Laurentia in the interval between 1720 and 1600 Ma (see Gower, 1996).

The MMIS underlies much of the Meaty Mountains terrane (MMT) (Gower and Owen, 1984), one of several thrust-stacked Grenvillian terranes that make up the northeastern Grenville Province (Figure 2). The MMT is bounded by northwest-striking, southwest-dipping ductile shear zones. The MMT is a Grenvillian terrane (Gower, 1996), minor amounts Paleoproterozoic pre-Labradorian crust, Pinwarian (1510 to 1450 Ma) and late- to post-Grenvillian (ca. 980 to 950 Ma) intrusions. The terrane straddles the boundary between the Interior Magmatic Belt and Exterior Thrust Belt (see Gower, 1996) of the northeastern Grenville Province. The northwestern boundary of the MMT in a Grenvillian tectonic contact with the Wilson Lake terrane. The location and nature of the southern and western boundaries of the MMT are uncertain. The boundary between the MMT and the Pinware terrane (Gower *et al.*, 1980), occurring 200 km east of the study area, is a Grenvillian tectonic contact (Gower, 1996). The MMT has been variably overprinted by Labradorian (1720 to 1600 Ma), Pinwarian (1520 to 1450 Ma), and Grenvillian (ca. 1050 to 950 Ma) tectonothermal events.

The southern domain, including units P_1 ggn, M_{ediz} kpg, M_{ediz} gbr, and metasedimentary rocks (P_1 qtz), Units M_{10} grnm and M_{10} kpg have igneous crystallization ages of 1500 ± 4 Ma and 1493 ±3 Ma, respectively (S. Kamo, Royal Ontario Museum, unpublished data, March 2000). The local occurrence of mylonite rocks along the contact between the domains indicates the contact is tectonic, at least locally. These data suggest that the southern domain may not be part of the MMT; rather it may represent the northern extension of the Mecatina domain (Figure 2), or be part of an undefined Grenvillian terrane consisting primarily of Mesoproterozoic intrusive rocks and older (pre-1500 Ma ?) supracrustal rocks not found in the MMT.

DESCRIPTION OF ROCK UNITS

PALEOPROTEROZOIC UNITS

Orthogneiss (P_1 ggn)

The southeastern part of the area is underlain by a unit consisting of upper amphibolite-facies, white or pink-weathering orthogneiss, granitoid migmatite and granitic rocks. This unit is not present in the northern domain, 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 granite 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 and is not defined. One occurrence of white orthogneiss at the eastern boundary of Unit P_1 ggn contains 5 to 10 percent, 1 to 3 cm, euhedral garnets. Pink-weathering orthogneiss is metatonalite containing fanciformly 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 more commonly comprised of pink-weathering granitic orthogneiss. Rocks consist of pink- to grey-weathering granite, pegmatite and pink, granitic leucosome. The pegmatite contains biotite and locally has a texture suggesting the protolith was a K-feldspar porphyritic granite. The granitic leucosome is discordant to gneissosity and is not defined. Gneissosity is defined by layers of texture and crosscutting relationships. The older gneiss 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 relics 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.

Unit P_1 ggn includes a variety of rocks that are characterized by the presence of pink-weathering amphibolite boudins, although rocks in this area 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 have relic K-feldspar porphyritic textures, locally.

MEALY MOUNTAINS INTRUSIVE SUITE

Monzodiorite, Quartz Monzodiorite and Monzonite (P_{ediz} mdq)

Unit P_{ediz} mdq is a compositionally and texturally varied unit. It includes monzodiorite, quartz monzodiorite, monzonite, diorite, granodiorite, quartz monzonite and granite. Rocks are texturally varied, even at the outcrop scale. Even massive with complete preservation of igneous textures to recrystallized and foliated; gneissic varieties also occur. The unit probably consists of distinct intrusions of relatively uniform composition although it is poorly exposed that it cannot be subdivided at the present scale of mapping. However, this study informally defined the unit to include all Meaty Mountains intrusive suite rocks that cannot be assigned to units P_{ediz} mzt, P_{ediz} gbr, M_{ediz} kpg, M_{ediz} gbr, M_{ediz} qtzmz. Unit P_{ediz} mdq underlies most of the southern domain, and makes up a significant part of the western MMIS. It also occurs along 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.

In general, rocks are fine to medium grained. 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. Hornblende and biotite are also common. Magnetite is a common accessory mineral. Modal compositions of P_{ediz} mdq rocks have a gabbroic-to-granitic trend, and are characterized by concentration of mafic minerals, contain clinopyroxene and are relatively poor in quartz. By comparison, granitoid orthogneisses of Unit P_1 ggn have a granitoid trend, defined by layers of granitic leucosome, do not contain clinopyroxene and have more than 20 percent quartz.

Monzonite and Syenite (P_{ediz} mzt)

In the northeastern area, the MMIS includes a pluton consisting of pyroxene-bearing monzonite and syenite. Contacts of the pluton are unexposed and age relationships with surrounding units are uncertain. Pyroxene-bearing monzonite and syenite, identical to Unit P_{ediz} mzt, make up a significant portion of the western MMIS in areas north and northwest of the study area (James and Lawlor, 1999; Gower, 1999).

In the study area, the unit consists of distinctively red- to orange-weathering monzonite and syenite. Rocks are fine- to medium-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.

Gabbro and Gabbronorite (P_{ediz} gbr)

Mafic intrusive rocks in the southern domain are collectively defined as Unit P_{ediz} gbr. The unit has a wide range in composition, textures, structures, and aeromagnetic signatures, possibly indicating that it consists of intrusions of different ages. However, it could not be subdivided at the present scale of mapping. Unit P_{ediz} 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_{ediz} gbr consists mainly of gabbro and gabbronorite. It contains subordinate amounts of leucogabbro, leucogabbronorite, leucodiorite, diorite, and rocks of intermediate composition, monzogabbro, monzogabbronorite and anorthosite. Rocks consist of varied amounts of clinopyroxene, orthopyroxene and plagioclase. Locally, plagioclase is pale pink on fresh surfaces. Biotite is a common accessory mineral; biotite-bearing rocks are most common in the southwestern part of the study area. Trace amounts to several percent of pyrite are common throughout the unit. There are no occurrences of anorthosite in the study area.

Rocks are varied from massive and unmetamorphosed, containing preserved igneous mineral textures, to foliated and pervasively recrystallized, containing preserved igneous mineral textures and igneous layering defined by variations in modal composition (i.e., layering defined by alternating mafic and felsic layers, or layering defined by variations in modal composition of a single mineral, such as pyroxene, or layering defined by variations in grain size or lamination). The reason(s) for the wide variety of textures and structures in the unit are somewhat unclear. A model proposing that Unit P_{ediz} 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 being influenced perhaps by original textures or variations in grain size. For example, coarse-grained rocks commonly are less strongly deformed than fine-grained rocks. Intrusions that adjacent fine-grained rocks commonly contain coarse-grained leucosomes.

Some parts of the unit have a distinctive magnetic signature. Of note is a gabbronorite intrusion southeast of Minipi Lake, marked by an anomalously high, circular magnetic anomaly. It is about 5 km in diameter. Like most parts of Unit P_{ediz} gbr, this intrusion is very poorly exposed; the contacts are defined entirely by the magnetic 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, which appears to be concordant to the outer magnetic anomaly. The layering dips toward the centre of the body.

MESOPROTEROZOIC AND PALEOPROTEROZOIC(?) UNITS OF UNCERTAIN AFFINITY

Metasedimentary Rocks (P_1 qtz)

Metasedimentary rocks occurring in the southern domain, southwest of Fourmont Lake, are defined as Unit P_1 qtz. The unit includes quartzite and pelitic gneiss. Field relations demonstrate that the pelitic gneiss (P_1 qtz pelite) is intruded by quartz monzonite (Unit M_{ediz} qtzmz). The contact between quartzite and the K-feldspar porphyritic granite (Unit M_{ediz} kpg) is not exposed but assumed to be intrusive. On this basis, the quartzite is considered to be younger than the granite. The age of the quartzite is unknown. The age of pelitic rocks is speculative, although they may correlate with metasediments of the Lake Melville terrane occurring in the Pinware terrane(see *e.g.*, Gower *et al.*, 1994). Metasedimentary rocks in the Pinware terrane are hypothesized to have depositional ages older than 1500 Ma (Gower, 1996). A second possibility is that they may correlate with rocks of the (pre-1500 Ma) Wakeham Group, which occur in the Wakeham terrane (Figure 2).

Several occurrences of Unit P_1 qtz quartzite form a hilltop, 20 km west southwest of Fourmont Lake (UTM 647000E, 5770000N). Rocks are white, fine- to medium-grained, orthoquartzite and contain almost entirely of quartz, minor amounts of biotite and magnetite.

Pelitic gneiss (P_1 qtz pelite) occurs in a small, fault-bounded, isolated outcrop area 5 km southwest of Fourmont Lake (UTM 641125E, 5772000N). Rocks are rusty-, grey- and white-weathering and contain the assemblage biotite + garnet + sillimanite ± cordierite. Sillimanite is abundant suggesting protolithic 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_{ediz} qtzmz)

Unit M_{ediz} qtzmz includes all quartz monzonite occurring in the southern domain. The unit is bounded by Unit P_1 qtz to the west, and M_{10} grnm. The unit is intruded by units M_{10} kpg (granite) and M_{10} gbr (gabbro). U-Pb data from zircons from a sample of the unit gave an igneous crystallization age of 1500 ±4 Ma. Locally, Unit M_{ediz} qtzmz contains inclusions of Unit P_1 qtz pelitic metasedimentary rocks. At one locality, on the north shore of Fourmont Lake (UTM 674127E, 5771180N), the unit is intruded by northeast- and northwest-striking, fresh diabase dykes. The northwest-striking dyke cut 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 texturally recrystallized and foliated, although some rocks are massive. The unit is composed of quartz, K-feldspar, plagioclase, clinopyroxene, hornblende, biotite, and accessory magnetite. Outcrops commonly contain small (less than 50 cm-long), flattened, fine-grained mafic xenoliths.

Unit M_{ediz} qtzmz rocks are easily distinguished from monzonite (Unit P_{ediz} mzt) occurring in the northern domain. The latter do not contain quartz, are equal grained, massive, and have a distinctive red to orange colour on the weathered surface. Age and tectonic affinity of Unit M_{ediz} qtzmz are uncertain, although the unit may form part of the Peri Mecatina AMCG suite.

Porphyritic Granite (M_{ediz} kpg)

The southern domain is mainly underlain by a unit of recrystallized and foliated, K-feldspar porphyritic granite, defined as Unit M_{ediz} kpg. U-Pb data from zircons, collected from a sample of the granite, gave an igneous crystallization age of 1493 ±3 Ma. Foliated and recrystallized gabbro dykes and intrusions of uncertain size (equivalent to Unit M_{ediz} gbr, gabbro ?), occur throughout Unit M_{ediz} kpg granite but are too small to be shown on the map. Some of the gabbro dykes have tectonic contacts with surrounding Unit M_{ediz} kpg granite. The contact between Unit M_{ediz} kpg granite and MMIS rocks is interpreted to be tectonic on the basis of two occurrences of mylonitic granitoid rocks at Fourmont Lake (UTM 671796E, 5774961N and 682168E, 5782235N).

Unit M_{ediz} kpg granite is light pink on the fresh and weathered surfaces. It consists 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 study area. In every outcrop, rocks are recrystallized and foliated. Foliation is defined by elongated K-feldspar phenocrysts and biotite. Many rocks have an augen texture defined by extensively recrystallized and elongated phenocrysts. Augen can be up to 15 cm long. Foliation in the unit is west-northwest striking.

Gabbro (M_{ediz} gbr)

Two bodies of fresh to variably recrystallized gabbro occurring in the southern domain are defined as Unit M_{ediz} gbr. The gabbro has a composition similar to rocks in Unit P_{ediz} gbr; rocks M_{ediz} gbr and P_{ediz} gbr are essentially defined on the basis of their occurrence in southern and northern domains, respectively. On the basis of field relationships, Unit M_{ediz} gbr is interpreted to be Mesoproterozoic; the gabbro intrudes Unit M_{10} grnm quartz monzonite. The gabbro is also interpreted to intrude Unit M_{10} kpg granite, although contacts are not exposed. Unit M_{10} kpg granite contains common occurrences of gabbro dykes that may be the same age as the maps-scale units of M_{ediz} gbr.

The body of Unit M_{ediz} gbr gabbro contained within the quartz monzonite unit (M_{ediz} qtzmz) mainly consists of fresh to locally recrystallized and foliated gabbro and melagabbro. Rocks are medium grained and have an integranular texture defined by plagioclase laths and interpenetrate clinopyroxene. Relic integranular textures are preserved in the recrystallized rocks.

Outcrops of fresh, undeformed Unit M_{ediz} gbr gabbro at Fourmont Lake (UTM 678881E, 5771585N) contain spectacular examples of layering and igneous crosbedding structures. Layering is defined by plagioclase concentration. Rocks also have an igneous lineation defined by alignment of plagioclase laths. Thirty metres east of the layered outcrops are occurrences of medium- to coarse-grained and non-layered gabbro, locally having 'pillowed' structures defined by rounded (less than 1 m), gabbro pillows. The structure of the outcrop is evident as the margins of the 'pillows' are more resistant to weathering, compared to the cores.

MESOPROTEROZOIC UNITS

Late- to Post-Grenvillian Granitic Rocks (M_{10} grn and M_{10} kpg)

Rocks in the southern and southeast domains are intruded by plutons consisting mainly of medium- to coarse-grained granite (Unit M_{10} grn) and K-feldspar porphyritic granite (Unit M_{10} kpg). The units have similar compositions; they are defined on the basis of texture. Both contain rocks that are mainly undeformed and have fresh, phanneitic textures, although weakly foliated rocks occur locally. Of particular distinction, rocks contain unexcoriated 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_{10} grn and M_{10} kpg are correlated with bodies of late- to post-Grenvillian granite that occur in the Meaty 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_{10} grn granite, occurring on the Joir River (in NTS map area 13B/5), gave an igneous crystallization age of 964 ±3 Ma.

The medium- to coarse-grained granite (M_{10} grn) unit 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 compositeas and include two or more separate granite phases that can be distinguished on the basis of texture and mineralogy. Contacts between the phases are sharp. Unit M_{10} grn granite, occurring southeast of Gaines Lake and east of the Joir River, have a subhaloid magnetic expression.

The K-feldspar porphyritic granite (M_{10} kpg) unit consists of pink-weathering biotite syenogranite identical in composition to the M_{10} grn granite. Phenocrysts are up to 5 cm long, and locally display concentric zoning. In rare occurrences, phenocrysts display a weak igneous lineation. In contrast to the M_{10} grn granite, the bodies of porphyritic granite are commonly marked by prominent magnetic highs.

The study area also includes pink- to white-weathering granitic 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, the Units M_{10} grn and M_{10} kpg granite intrusions. For these reasons the pegmatites are interpreted to be late- to post-Grenvillian in age.

STRUCTURE AND METAMORPHISM

Orthogneisses (P_1 ggn) in the northern domain 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 dip moderately to the north-northwest. It is speculated that these rocks were pre-Labradorian emplacement ages, although the timing of metamorphism and deformation are undetermined. They may have been metamorphosed and deformed during the Labradorian Orogeny.

Meaty Mountains intrusive suite rocks are variably recrystallized and deformed, although, in general, they can be described as rocks that have undergone a single phase of deformation. Foliation, lineations and minerals are very common in foliated rocks throughout units P_{ediz} mdq and P_{ediz} gbr. In some occurrences of foliated gabbronorite, for example, plagioclase and pyroxenes that preserve a relic integranular 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_{ediz} mzt (monzonite and syenite) rocks are somewhat recrystallized and appear undeformed. However, there are pervasively recrystallized and well-foliated P_{ediz} mdq and P_{ediz} gbr rocks that do not retain igneous textures; the fabrics in these rocks are interpreted as entirely tectonic. In addition, some Unit P_{ediz} mdq rocks have a weak gneissosity, which is most easily interpreted as a thermomorphic feature.

Planar fabric elements, whatever their origin, are east-northeast to north-northeast striking in Units P_{ediz} mdq and P_{ediz} gbr. The age of the tectonic fabric is uncertain but presumed to be Labradorian. However, the fact that the southeastern part of 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 the possibility open that some fabrics in Units P_{ediz} mdq and P_{ediz} gbr are Pinwarian or Grenvillian.

In the southern domain, the K-feldspar porphyritic granite (Unit M_{ediz} kpg) is extensively recrystallized and foliated. The foliation is west-northwest striking and dips moderately to the north-northeast-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_{ediz} qtzmz) and gabbro (M_{ediz} 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 southern domain intrusive rocks are tentatively interpreted as Grenvillian. Growth of new titanite at 1043 ±6 Ma (U-Pb data) in a sample of Unit M_{ediz} kpg granite is consistent with this interpretation.

Metasedimentary rocks (P_1 qtz), which occur as inclusions in Unit M_{ediz} kpg porphyritic granite and Unit M_{ediz} qtzmz quartz monzonite, 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_{ediz} kpg porphyritic granite.

Two occurrences of mylonitic rocks at Fourmont Lake, are inferred to define at least part of the contact between the northern and southern domains. (The nature of the domain 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 forms a zone that is at least 75 m wide; the mylonites appear to be derived from K-feldspar porphyritic granite (Unit M_{ediz} kpg). The mylonites have a well-developed mineral elongation lineation striking mylonitic planar fabric and a shallow, southeast-plunging mineral elongation lineation. Kinematic indicators were not observed. Granitoid orthogneisses (Unit P_1 ggn), occurring 3 km southeast of the mylonitic rocks, are therefore highly strained, contained amphibolite layers are transposed and tectonically folded about a strong, north-striking lineation. The strength and attitude of the foliation is in marked contrast to the mainly northeast-striking gneissosity occurring elsewhere in Unit P_1 ggn orthogneiss. Indeed, on a much larger scale, the boundary separates MMIS rocks having mainly northeast-striking, Labradorian planar fabrics from the southern domain, which mainly has west-northwest- to west-southwest-striking Mesoproterozoic planar fabrics.

Mylonitic and ultramylonitic rocks occurring along the domain boundary, near the northwest end of Fourmont Lake, appear to be derived from Unit P_1 ggn orthogneiss. The rocks have a west-northwest-striking planar fabric and a steeply plunging, east-southeast-trending mineral elongation lineation. Kinematic indicators were not observed.

The full significance of the domain boundary remains to be determined, although based on the fact it separates different lithological domains containing different structures, and that it is marked by mylonitic rocks, it is interpreted to represent a major tectonic break defining the southern boundary of the Meaty Mountains terrane. The southern domain is of uncertain tectonic affinity although provisionally it correlates with the Mecatina domain. The age of deformation along the boundary is poorly constrained, although it must predate intrusion of the late- to post-Grenvillian granite plutons, which intuth the boundary.

REFERENCES

Emslie, R.F.
1976: Meaty Mountains complex, Grenville Province, southern Labrador. *In* Report of Activities, Part A, Geological Survey of Canada, Paper 76-1A, pages 165-170.

Emslie, R.F. and Hunt, P.A.
1990: Ages and petrogenetic significance of igneous-charnockite suites associated with massif anorthosites, Grenville Province. Journal of Geology, Volume 98, pages 213-231.

Gower, C.F.
1996: The evolution of the Grenville Province in eastern Labrador. *In* Precambrian Crustal Evolution in the North Atlantic Region. *Edited by* T.S. Brewer. Geological Society Special Publication No. 112, pages 197-218.
1999: Geology of the Crooks Lake map region, Grenville Province, eastern Labrador. *In* Current Research. Newfoundland Department of Mines and Energy, Geological Survey, Report 99-1, pages 89-98.

Gower, C.F. and Owen, V.
1984: Pre-Grenvillian and Grenvillian lithotectonic regions in eastern Labrador: correlations with the Sveconorwegian Orogenic Belt in Sweden. Canadian Journal of Earth Sciences, Volume 21, pages 678-693.

Gower, C.F., van Nostrand, T. and Lamoureux-Evans, D.
1994: Geology of the Pinware River region, southern Labrador. *In* Current Research. Newfoundland Department of Mines and Energy, Geological Survey, Report 94-1, pages 347-370.

Gower, C.F., van Nostrand, T. and Smyth, J.
1980: Geology of the St. Lewis River map region, Grenville Province, eastern Labrador. *In* Current Research. Newfoundland Department of Mines, Mineral Development Division, Report 80-1, pages 59-73.

James, D.T.
1999: Geology of the Kenamu River area (13C/NE), Grenville Province, southern Labrador. Geological Survey of Newfoundland and Labrador, Department of Mines and Energy, Open File 013C/0040, 1:100 000-scale map with descriptive notes.

James, D.T., Kamo, S. and Krogh, T.E.
2000: Preliminary U-Pb geochronological data from the Meaty Mountains Terrane, Grenville Province, southern Labrador. *In* Current Research. Newfoundland Department of Mines and Energy, Geological Survey, Report 2000-1, pages 169-178.

James, D.T. and Lawlor, P.M.
1999: Geology of the Grenville Province, Kenamu River area (NTS 13C/NE), southern Labrador: Preliminary observations of Labrador