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GEOLOGY OF THE TRAVERSPINE–MCKENZIE RIVERS AREA (13F/1 and F/2)

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ABSTRACT

The Traverspine–McKenzie rivers area is underlain predominantly by a granitoid plutonic suite containing numerous, variably sized enclaves of metagabbroic rock and their amphibolite equivalents. The granitoid suite, which is of overall quartz monzonitic composition but ranges from monzonite and syenite through to alkali-feldspar granite, is contiguous to the east with the Mealy Mountains Intrusive Suite, and may be of similar (ca. 1650 Ma) age. The nature of the host rock to these intrusions in the map area is only indicated by small enclaves of amphibolite gneiss, and rare clots of sillimanite interpreted as vestiges of digested metasedimentary gneiss.

The relationship between granitoid and metagabbroic rocks is suggestive of a regionally developed intrusion breccia, though the age and significance are uncertain. Aeromagnetic anomalies link the granitoid–metagabbroic rock association to the lithologically similar Dome Mountain suite to the north, and also suggest that the metagabbroic enclaves may be derived from a southerly extension of the North West River anorthositic suite.

Intensity of metamorphism and deformation increases from the southern and central parts of the area, where the plutonic rocks are only moderately to weakly deformed, to the northeast where they are of strongly foliated to gneissic aspect. The granitoid gneisses are proposed to be continuous with similar rocks to the north (Lower Brook metamorphic suite), and to represent the metamorphosed northeastern margin of the Mealy Mountains suite. The increase in deformational and metamorphic intensity is provisionally related to exposure of progressively deeper crustal levels to the northeast, culminating at a major, north-directed, ductile overthrust zone.

The plutonic rocks of the area are intruded by a suite of both deformed and undeformed mafic dikes of overall northeasterly trend. Some of the deformed dikes may be equivalent to the ca. 1380 Ma Mealy dike swarm; however, the fresh dikes are believed to be post-Grenvillian and likely related to development of the Lake Melville graben in the Late Precambrian–Early Paleozoic.

INTRODUCTION

The area mapped in the 1986 season lies in the interior Grenville Province of southern Labrador (Figure 1), where it adjoins ground covered to the north by previous work under this project (Wardle and Ash, 1986). The map area (Figures 2 and 3) is located south of the Churchill River and underlies a plateau deeply dissected by the Traverspine and McKenzie rivers. The northern part of NTS area 13 F/1 is a topographically flat-lying, muskeg- and tree-covered area devoid of exposure. Exposure in the remainder of the area is generally abundant but is largely obscured beneath a thick bush cover. Mapping was carried out by helicopter-emplaced ground traversing from a base in Goose Bay. Large lakes are scarce in the area and access is best made by helicopter.

Geological aspects of the area, notably the surficial deposits, received early mention by Low (1896) and Kindle (1924). The area was covered in reconnaissance fashion by Scott and Conn (1949), and was included in Gillet's (1956) thesis area; both Scott and Conn, and Gillet *(op. cit.)* recognized the widespread presence of syenitic to monzonitic rocks in the area. Surficial deposits were described by Fulton and Hodgson (1969), who included the area in their description of the surficial geology. The last major work in the area was by Stevenson (1967), who incorporated it into his reconnaissance geological map (1″=4 miles) of the Goose Bay region. In addition to the granitoid rocks mentioned by earlier authors, Stevenson (1967) also recognized a widespread gabbroic and metagabbroic suite. Work on the present project began in 1985 as part of a three-year program designed to complete 1:100,000 scale mapping of the Goose Bay (13F) map area. The results of mapping for 1985 have been reported in Wardle and Ash (1985, 1986), and have been combined with those for 1986 in a compilation map for 13F/SE at 1:100,000 scale by Wardle and Crisby (1986).

GENERAL GEOLOGY

General Statement

The map area consists predominantly of meta-igneous rocks that form a western continuation of an igneous suite in the Mealy Mountains area described by Emslie (1976).

The oldest rocks in the area occur as small inclusions, too small to be shown on the geological map (Figure 3), of amphibolite gneiss containing migmatitic fabrics that predate incorporation in the host gabbroic and granitoid rocks. The major part of the area is underlain by granitoid plutons, which

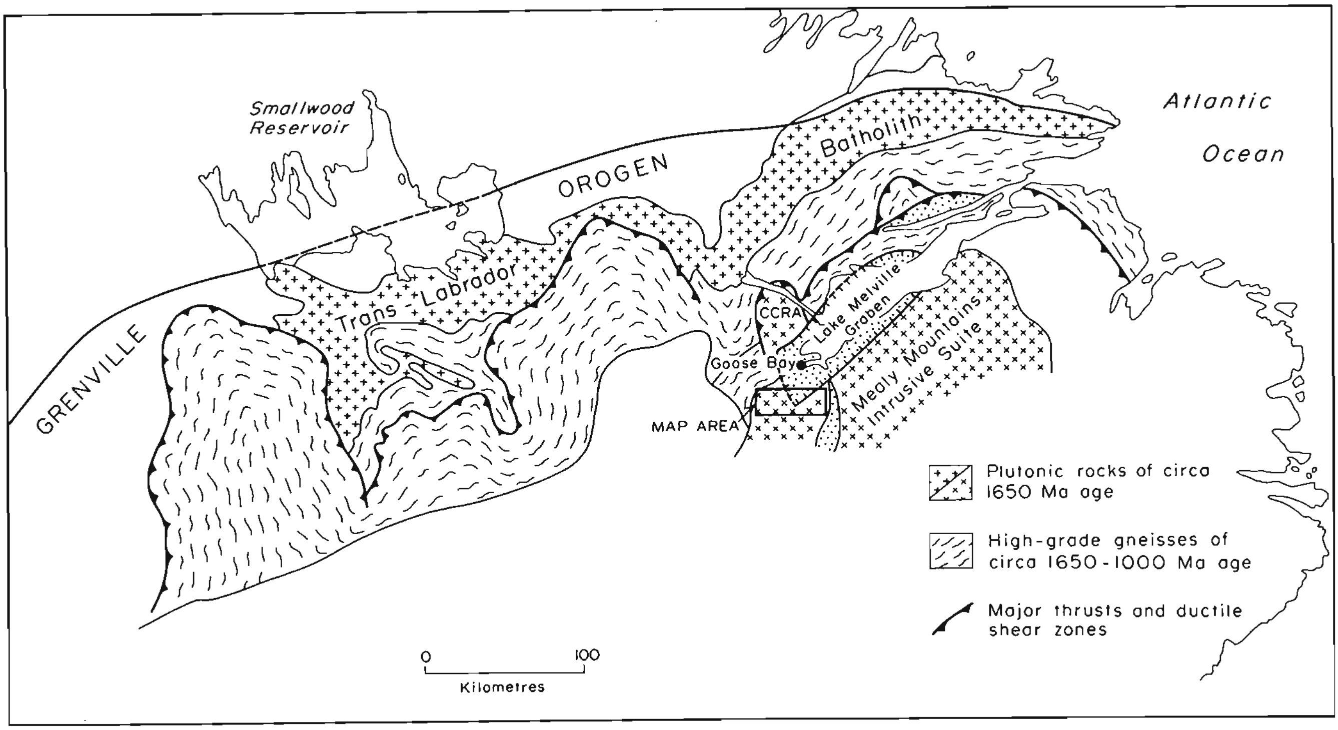


Figure 1: *Tectonic location map of east-central Labrador showing location of map area with respect to major tectonic elements of the Grenville Province.*

intrude and enclose a wide variety of metagabbroic rocks thought to represent the remnants of a once-widespread mafic igneous suite. This suite corresponds, in general, to the gabbroic rocks described by Stevenson (1967), but is now recognized to have a radically different areal distribution (Figure 3).

Both metagabbroic and granitoid rocks are intruded by suites of both fresh and metamorphosed diabase and gabbro dikes, which likely represent pre-Grenvillian and post-Grenvillian ages of intrusion respectively. Rocks of the Late Precambrian Double Mer Formation, interpreted to occupy a splay of the Lake Melville graben system, are inferred to extend into the area under the drift cover of the Churchill River valley.

Amphibolite Gneiss Enclaves

Amphibolite gneiss forms small (1 to 3 m^2) enclaves enclosed in metagabbroic and granitoid rocks exposed along river sections. The enclaves are characterized by a fine, migmatitic banding that is clearly truncated by the host pluton. In areas of poor exposure, it is locally difficult to distinguish these rocks from strongly metamorphosed amphibolites of Unit 1.

Metagabbroic Rocks and Amphibolite Equivalents (Unit 1)

Unit 1 was originally described by Stevenson (1967) as a continuous unit underlying most of NTS area 13F/2 and the western part of NTS area 13F/1. However, the present, more detailed mapping has revealed a much more irregular distribution pattern for this unit; variably sized enclaves are enclosed and intruded by granitoid plutonic rocks in what, in effect, is a map-scale intrusion breccia. The size of enclaves within this regional breccia varies from centimetres to kilometres. The unit is distributed as two major belts in the western half of the area; the numerous other enclaves are too small to be shown on Figure 3. In poorly exposed ground, such as that occupying much of the south-central part of the area, it is difficult, if not impossible, to determine whether isolated outcrops of metagabbro represent small enclaves or parts of larger, more continuous belts. As a result, the boundaries of the unit as shown in Figure 3 are somewhat speculative and probably only crudely approximate its true distribution. The southern metagabbro belt, in particular, contains numerous outcrops of granitoid, and may well comprise a cluster of small gabbroic enclaves as opposed to a single belt.

Attempts were made to more accurately interpret the contacts of the unit using aeromagnetic maps (Geological Survey of Canada, 1970) summarized in simplified form in Figure 4. However, there is little correlation between the aeromagnetic highs that would normally be expected to mark mafic rocks and the known distribution of some of the larger enclaves. Figure 4 shows that the principal aeromagnetic highs are centred over the southern part of NTS area 13F/2, an area underlain by both monzonitic and gabbroic rocks, and the major part of NTS area 13F/1, an area underlain predominantly by monzonitic rocks. Measurements of magnetic susceptibility in outcrop confirm that the highest susceptibilities generally, though not invariably, reside in gabbroic rocks. Therefore, the most likely explanation for the lack of a correlative aeromagnetic expression over the larger gabbroic enclaves is that these are relatively thin, shallow bodies. Similary, it is suspected that the monzonitic rocks that underlie aeromagnetic highs may form only a thin cover over mafic masses at depth. All of these features are compatible with the interpretation of the metagabbros as the stoped and brecciated remnants of what was either a single pluton or series of smaller intrusions.

The metagabbros display a range of textures from coarse to fine grained and locally exhibit compositional layering in well exposed outcrops. The unit is pervasively altered to hornblende-bearing assemblages, an effect that is due in part to granitoid intrusion, and in part to regional metamorphism. The metagabbroic rocks in general become more strongly metamorphosed toward the northeast where, in the same area that gneissic textures appear in granitoid rocks, they give way to hornblende–plagioclase amphibolite and amphibolite schist.

Granitoid Plutonic Rocks (Units 2–7)

Granitoid rocks underlie most of the map area, and are provisionally correlated with the contiguous rocks of the Mealy Mountains plutonic suite of Emslie (1976) to the east. Granitoid rocks within the map area are dominantly of monzonitic to granitic composition, and with the exception of Units 2 and 7, are characterized by numerous, variably sized inclusions of metagabbro and amphibolite, and by a plethora of minor granitic intrusions.

Unit 2 is composed of buff to cream, medium grained monzonite exhibiting a recrystallized to weakly foliated texture; however, rounded, relict-plagioclase phenocrysts having partial K-feldspar rims are preserved. Mafic mineralogy comprises clinopyroxene in association with hornblende. The unit is locally characterized by a shallow, south- to southeast-dipping fabric defined by pyroxene and amphibole. In contrast to most other granitoid units in the area, this unit is noticeably devoid of mafic inclusions.

Unit 3 comprises buff to cream monzonite similar to Unit 2. However, it lacks plagioclase phenocrysts, contains abundant mafic inclusions and is injected by numerous minor granitic intrusions. The unit is pervasively recrystallized and marked by the development of subvertical metamorphic fabrics.

Unit 4 is a mixed assemblage of monzonite and granite that could not be separated at this scale of mapping. Monzonite is generally pink to purplish gray weathering, medium grained and typically K-feldspar porphyritic. Granite is characteristically pink and medium grained. Outcrops along the banks of the Churchill River contain minor amounts of sillimanite that occur as rosettes on fracture surfaces and as segregations within foliation planes. The mineral is believed to be a residual phase from the almost complete assimilation of metasedimentary-gneiss xenoliths. Sillimanite-bearing metasedimentary gneiss is known to occur as local enclaves within granitic gneiss north of the Churchill River (Wardle and Ash, 1986).

A subunit (4a) of K-feldspar-porphyritic, purplish-gray monzonite and brown-weathering monzodiorite has been delineated in the southeastern part of the area. Its contact with the remainder of Unit 4 appears transitional. The structural state of the unit varies from weakly to moderately foliated in the southern half of the map area, to strongly deformed and locally gneissic in the northern half (Figure 3).

Unit 5 underlies a small area on the northern boundary of the map area and consists of pink- to buff-weathering, weakly to moderately foliated, quartz syenite to alkali-feldspar granite. This unit is similar to alkali-feldspar granites of the Dome Mountain intrusive suite (Wardle and Ash, 1986) exposed north of the Churchill River.

Unit 6 consists of a suite of heterogeneous, pink granites containing local gray, pyroxene-bearing phases. The granites are only mildly deformed and characterized by a marked inhomogeneity of grain size, locally giving rise to a banded appearance in outcrop. The unit is identical to the granitic component of Unit 4, and likely has a transitional contact with that unit.

Unit 7, exposed as a small sliver in the northeastern part of the map area, consists of buff, medium to coarse grained, alkali-feldspar granite containing pyroxene as the predominant mafic phase. The unit resembles the adjacent monzonite of Unit 2 in that it is devoid of mafic inclusions. A moderately strong, steeply dipping quartz fabric is generally characteristic of the unit.

Granitoid Gneiss (Unit 8)

Unit 8 is predominantly exposed north of the Churchill River where it consists of interlayered pink granitic gneiss and black garnetiferous amphibolite and amphibolite gneiss. The granitic gneiss is similar to the gneissic granite component of Unit 4 exposed along the south bank of the Churchill River; it is likely transitional with Unit 4 and derived from a similar granite protolith. In this respect, the amphibolite intercalated with the granitic gneiss was probably derived from metagabbroic inclusions in the granite protolith. The unit is contiguous to the north with granitic gneiss of the Lower Brook metamorphic suite (Wardle and Ash, 1986), and has been included with that suite on Figure 2.

Double Mer Formation

Conglomerate and sandstone of the Late Precambrian–Early Paleozoic Double Mer Formation were recognized by Stevenson (1967) in exposures on the Churchill River, four kilometres west of the map area. These rocks are inferred to extend northeastward under the drift cover of the Churchill River valley and are interpreted by Gower *et al.* (1986) to occupy a half-graben splay off the Lake Melville graben system (Figures 1 and 2).

Mafic Dikes

Plutonic rocks in the south-central portion of the area are intruded by a variety of mafic dikes unrecognized in previous work. The dikes, in general, are not well exposed

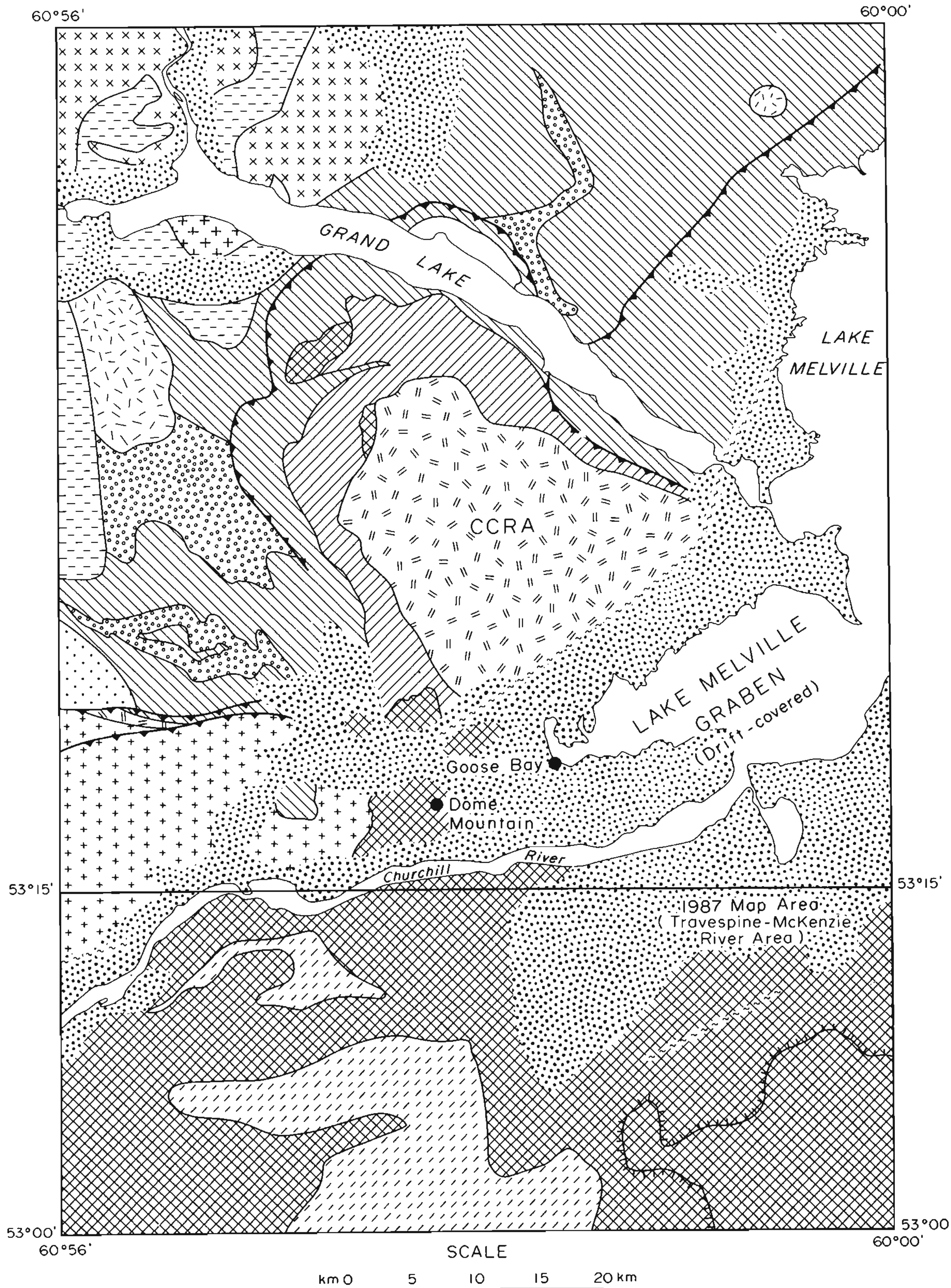


Figure 2. *Regional geology of the Goose Bay–Grand Lake area showing distribution of the monzonitic–granitic rocks of the Traverspine–McKenzie rivers area and Dome Mountain suite, relative to the Cape Caribou River allochthon and other major thrust structures.*

LEGEND *(Figure 2)*

PLEISTOCENE

Glacial, glaciofluvial and estuarine deposits

PROTEROZOIC

Late monzonite–syenite and gabbro intrusions

Granite–quartz monzonite plutons (part of Trans-Labrador batholith)

Megacrystic granite

Metadiorite

Lower Brook metamorphic suite (foliated granite and granitic gneiss)

Monzonite, quartz monzonite to granite intrusions, including rocks of Dome Mountain and Mealy Mountains intrusive suites

(limit of metagabbroic enclaves within these rocks)

North West River anorthositic suite:
Anorthosite
Metagabbroic rocks

Metagabbroic rocks of Traverspine–McKenzie rivers area

Foliated to gneissic quartz diorite (Susan River quartz diorite)

Metasedimentary gneiss (1650 Ma?)

Banded, migmatitic, quartz diorite–tonalite–granodiorite gneiss (1650 Ma?)

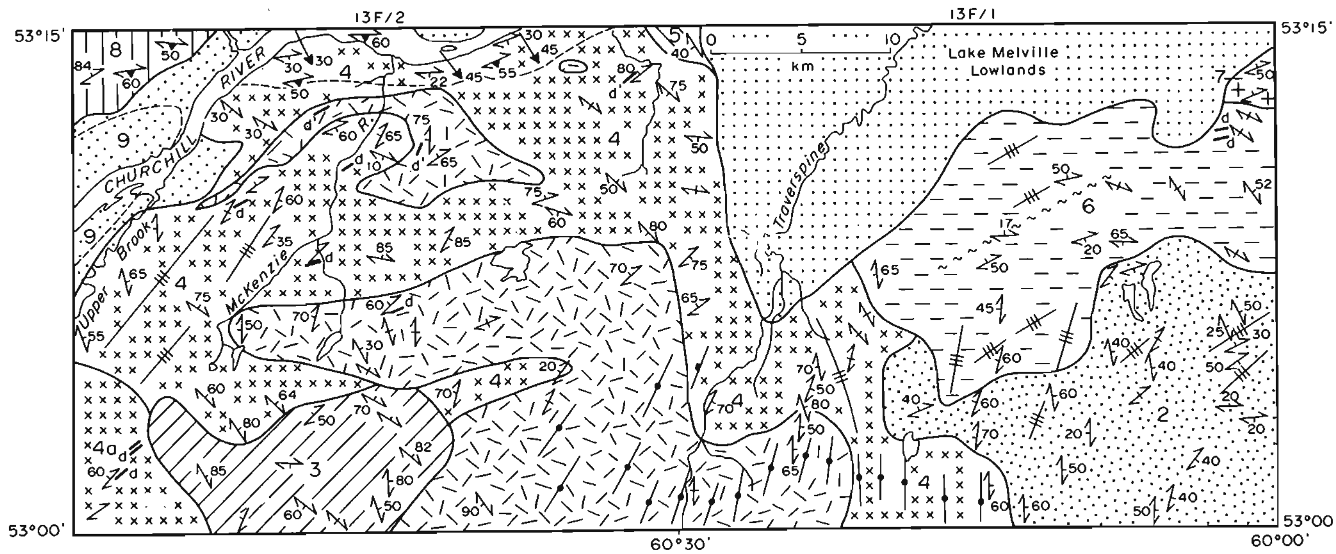
and contacts are often obscured. Where measurable, trends are northeasterly (Figure 3) and parallel to a set of prominent airphoto lineaments. The dikes are provisionally divided into a suite that is deformed or recrystalized (d′), and a suite of fresh, undeformed rocks (d). The deformed suite includes a variety of rock types ranging from strongly recrystallized metagabbro and amphibolite, to weakly recrystallized metadiabase. Some are intruded by white leucogranite dikes. The more strongly deformed dikes generally appear to have been deformed in common with their host rocks, whereas the fresh dikes locally crosscut and have chilled margins against the metamorphic fabrics in the host rocks. However, the structural relationship of most dikes to their plutonic host is obscured due to poor exposure. The age of the various dikes is unknown; all that can be stated at present is that the more strongly deformed examples are probably pre-Grenvillian, whereas the majority of the fresh dikes are probably post-Grenvillian.

Structure and Metamorphism

Tectonic fabrics in the map area have an irregular but overall northeasterly to northerly trend, the irregularity persumably being due to later folding (see below). Intensity of foliation development increases from southern and central parts of the area, where rocks are only weakly to moderately deformed, to the northeastern part where they are of gneissic aspect. Thin ductile shear zones are locally developed parallel to regional fabric trends. Kinematic indicators such as asymmetric augen and *C–S* fabric relationships indicate a northwesterly sense of tectonic transport on these southeast-dipping shear zones. Lineation is only present in the more strongly deformed rocks of the northeastern part of the area and generally plunges to the south or southeast at moderate to steep angles. Metamorphic assemblages developed in association with both L and S fabrics consist predominantly of hornblende, biotite and locally lower grade minerals, including actinolite, chlorite and epidote.

The initial effects of partial melting in the gneissic rocks occur as small, lenticular patches of leucosome, which become progressively larger to the north and pass gradationally into banded, migmatitic, *lit-par-lit* gneisses. Principal metamorphic minerals in these rocks are hornblende and biotite in granitoid gneiss, and hornblende and garnet in amphibolite. S fabrics in rocks exposed on the south bank of the Churchill River in the northeastern part of the area are deformed into gently southeast-plunging open folds. Other open folds, regionally developed, probably account for the variation in trend of S and L fabrics in the remainder of the area.

Late, brittle faults, parallel to several prominent, northeast-trending aeromagnetic and airphoto lineaments are believed to have developed in association with the Late Precambrian Lake Melville graben, the southeastern part of



LEGEND

PLEISTOCENE

Glacial, glaciofluvial and estuarine deposits

LATE PROTEROZOIC-PALEOZOIC

d — *Diabase – gabbro dikes*

9 — *Area suspected to be underlain by Double Mer Formation sandstone and conglomerate*

EARLY – MIDDLE PROTEROZOIC

d' — *Metadiabase – gabbro dikes*

8 — *Pink, foliated granite to granite gneiss, and amphibolite to amphibolite gneiss; both typically garnetiferous*

7 — *Buff, alkali-feldspar granite.*

6 — *Heterogeneous, pink granite containing metagabbro – amphibolite enclaves; minor gray pyroxene granite, granite and quartz monzonite*

5 — *Buff to pink, alkali-feldspar granite, granite and quartz syenite; includes enclaves of metagabbro – amphibolite*

4 — *Mixed unit comprising pink to gray, typically K-feldspar-porphyritic monzonite; pink granite – quartz monzonite, lesser alkali-feldspar granite; abundant metagabbro – amphibolite enclaves*

4a — *Purple-gray monzonite and brown monzodiorite, both typically K-feldspar porphyritic and containing enclaves of metagabbro – amphibolite*

3 — *Buff to cream, pyroxene monzonite containing metagabbro – amphibolite enclaves*

2 — *Buff to cream, pyroxene monzonite, typically containing relict, ovoid plagioclase phenocrysts; minor alkali-feldspar granite*

1 — *Unit consisting predominantly of metagabbro, ranging in composition from melagabbro to leucogabbro, and their amphibolite equivalents; includes lesser amounts of intrusive pink granite, quartz monzonite and monzonite*

Striated till – drumlinoid ridges

Southern limit of partial-melt textures in granitoid rocks

Figure 3: *Geology of the Traverspine – McKenzie rivers area.*

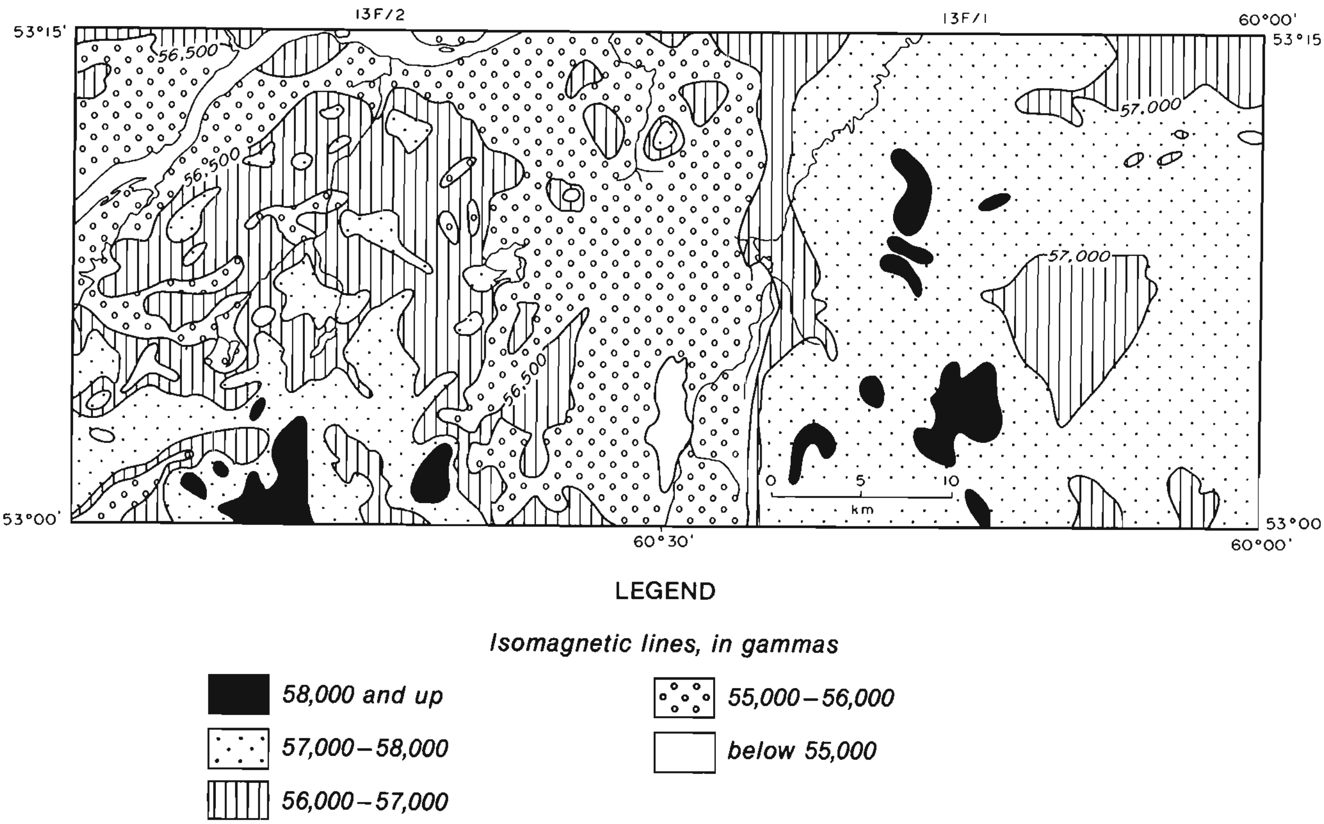


Figure 4: *Simplified total-field aeromagnetic map of the Traverspine–McKenzie rivers area (after Geological Survey of Canada, 1971). Highs are indicated by outward ticks, lows by inward ticks.*

which is believed to underlie the drift-covered Lake Melville lowlands in the northeastern part of the map area in NTS area 13F/1 (Gower *et al.*, 1986). Significantly, these faults trend parallel to the fresh mafic dikes (d), and may have been generated more or less contemporaneously within the same overall environment of crustal rifting. Rocks along the Traverspine River (Figure 3) also show evidence of widespread fracturing and low-grade alteration, suggesting the existence of a broadly northeast-trending fracture system that may mark the extension of a fault forming the eastern termination of the graben.

DISCUSSION

The distribution of the granitoid and gabbroid rocks in the map area is suggestive of a large-scale, regionally developed, intrusion breccia in which an originally continuous or partially continuous gabbroic body was pervasively intruded by granitoid plutons and dispersed into a variety of variably sized enclaves. These granitoid–gabbro relationships are identical in most respects to those described by Wardle and Ash (1986) for granitoid and associated metagabbroic rocks of the Dome Mountain suite in the Goose Bay area to the north. The Dome Mountain suite is intrusive into marginal meta-gabbroic rocks of the major North West River anorthositic suite, and it has been suggested by Wardle and Ash (1986) that the mafic enclaves in the Dome Mountain suite represent the remnants of a southerly extension of that anorthositic suite. A pronounced positive aeromagnetic anomaly extends from these rocks, under the drift cover of the Churchill River valley (Geological Survey of Canada, 1971; Wardle *et al.*, 1986), to the granitoid rocks of the Traverspine–McKenzie rivers map area, suggesting that the granitoid suites of the two areas are continuous (Figure 2). The granitoid suite described here is also contiguous to the east with monzonitic rocks of the Mealy Mountains anorthosite–granitoid suite described by Emslie (1976). However, the granitoid–gabbro relationships that typify most of the Traverspine–McKenzie rivers area are not developed in the most easterly plutons (Units 2 and 7), nor have they been described by Emslie (1976) in the area to the east, a feature which suggests that they are restricted to an area of some 2200 km^2 in the vicinity of Goose Bay (Figure 2). An understanding of the origin of the granitoid–gabbro relationships is presently hampered by lack of precise age dates for the two rock types and consequent knowledge of the time interval separating their intrusion. The overall monzonitic composition of the granitoid rocks is typical of granitoid suites generally thought of as having been formed contemporaneously with anorthosite–gabbro intrusion (Emslie, 1978). Whilst this may be simple coincidence, it suggests a genetic link between the Mealy Mountains–North West River anorthositic intrusions and the granitoid rocks of the Traverspine–McKenzie rivers area and the Dome Mountain suite. However, regional intrusion breccia of the type described here is not typical of anorthosite–granite massifs, and an understanding of its origin and significance will require further research. The only direct constraint on the age of either granitoid or gabbroid rocks has been provided from the eastern Mealy Mountains area by Emslie *et al.* (1983), who have determined U–Pb and Rb–Sr ages of 1640 ± Ma and 1678 ± 77 Ma respectively. However, apart from the overall similarity of composition, there is no compelling reason to assume that the rocks described here from the eastern end of the suite are necessarily of the same age.

Deformation in the Traverspine–McKenzie rivers area is most likely to have occurred during the Grenvillian orogeny (ca. 1000 Ma), a supposition discussed in more detail below. An unusual feature of the area in this regard is the marked increase in intensity of both metamorphism and deformation toward the northeastern part of the area. There is no lithological or rheological control evident for this phenomenon, and it appears that it most likely results from a primary metamorphic gradient. Deformation culminates north of the map area in a major, east-trending ductile shear zone, possibly a westerly extension of the shear zone bounding the Cape Caribou River allochthon (Figure 2), and which, on the basis of kinematic indicators, acted as a north-directed overthrust (Wardle and Ash, 1986). Granulite-facies rocks are locally exposed on the hanging wall of this structure (Wardle and Ash, 1986) suggesting that rocks of relatively deep crustal level have been brought up at the base of the overthrust block. The possibility exists, therefore, that the increase in metamorphic–deformational intensity is due to the exposure of progressively deeper crustal levels to the northeast.

The assumption that most of the rocks in the map area were deformed in the Grenvillian orogeny is based on comparisons with areas to the north and east, where isotopic dating has revealed ca. 1000 Ma ages of metamorphism (T. Krogh, personal communication, 1986; Scharer *et al.*, *in preparation*). However, a potential problem is posed by the dikes (d) that crosscut deformational fabrics in their plutonic host rocks. The most obvious correlation for these dikes is with the Mealy dike swarm of the Mealy Mountains area (1380 Ma; Park and Emslie, 1983). However, this would require the host-rock fabrics to be pre-Grenvillian, and subsequent Grenvillian deformation to have been minimal–a rather unlikely scenario. Pending isotopic dating of the dikes, the more likely assumption is made that most of the fresh dikes are post-Grenvillian and related to development of the Lake Melville graben. This argument gains limited support from the existence of dated Lower Proterozoic dikes having colinear northeast trends in coastal areas of eastern Labrador (Gower *et al.*, 1986). The postulated existence of a major, post-Grenvillian dike swarm (as described above) also raises the question of how many of the so called Mealy dikes are really of ca. 1380 Ma, as opposed to being Late Precambrian or Early Paleozoic.

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REFERENCES

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

1978: Elsonian magmatism in Labrador: characteristics and tectonic setting. Canadian Journal of Earth Sciences, Volume 15, pages 438-453.

Emslie, R.F., Loveridge, W.D., Stevens, R.D. and Sullivan, R.W.
1983: Igneous and tectonothermal evolution, Mealy Mountains, Labrador. Joint Annual Meeting, Geological Association of Canada, Mineralogical Association of Canada, Canadian Geophysical Union, Victoria 1983, Program and Abstracts, Volume 8, page 20.

Gillet, L.B.
1956: Anorthosites and syenites of the Mealy Mountain area Labrador. Unpublished MSc thesis, McGill University, Montreal, 95 pages.

Fulton, R.G. and Hodgson, D.A.
1969: Surficial geology of the Goose Bay 1:250,000 sheet (13F). Geological Survey of Canada, Open File 29, 16 maps.

Geological Survey of Canada
1970: Aeromagnetic maps, 1″=1 mile, Traverspine River (13F/1) and McKenzie River (13F/2). Geological Survey of Canada, aeromagnetic maps 6023G (13F/1) and 6022G (13F/2).

1971: Aeromagnetic map, 1″=4 miles, Goose Bay [13F]. Geological Survey of Canada, aeromagnetic map 7391G.

Gower, C.F., Erdmer, P. and Wardle, R. J.
1986: The Double Mer Formation and the Lake Melville rift system, eastern Labrador. Canadian Journal of Earth Sciences, Volume 23, pages 359-368.

Kindle, E.M.
1924: Geography and geology of Lake Melville district, Labrador Peninsula. Geological Survey of Canada, Memoir 141, 104 pages.

Low, A.P.
1896: Report on explorations in the Labrador Peninsula along the East Main, Koksoak, Hamilton, Manicuagan and portions of other rivers, in 1892-93-94-95. Geological Survey of Canada, Annual Report L, 1895, Volume VIII, 387 pages.

Park, J.K. and Emslie, R.F.
1983: Paleomagnetic history of the Mealy dykes of Labrador, Canada. Canadian Journal of Earth Sciences, Volume 20, pages 1818-1833.

Scott, H.S. and Conn, H.K.
1949: Geology of the Goose Bay area, Labrador. Geological Division, Photographic Survey Corporation. Unpublished report, 71 pages. [13F/1]

Stevenson, I.M.
1967: Goose Bay map-area, Labrador. Geological Survey of Canada, Paper 67-33, 12 pages.

Wardle, R.J. and Ash, C.
1985: Geology of the Goose River—Goose Bay area (13F/7 and F/8). Newfoundland Department of Mines and Energy, Mineral Development Division, Open File map 85-65.

1986: Geology of the Goose Bay—Goose River area. *In* Current Research. Newfoundland Department of Mines and Energy, Mineral Development Division, Report 86-1, pages 113-123.

Wardle, R.J. and Crisby, L.V.J.
1986: Geology of the Goose Bay Area. Newfoundland Department of Mines and Energy, Mineral Development Division, Open File map 86-60.

Wardle, R.J., Ryan A.B., Ash, C. and Miller, H.G.
1986: The Cape Caribou River Allochthon, Grenville Province, Labrador: structure and tectonic implications. Joint Annual Meeting, Geological Association of Canada, Mineralogical Association of Canada, Canadian Geophysical Union, Ottawa 1986, Abstracts with Program, Volume 11, page 142.

Note: Mineral Development Division file numbers are included in square brackets.