Énergie, Mines et Ressources Canada
Energy, Mines and Resources Canada

Commission géologique du Canada
Geological Survey of Canada

NOTES DESCRIPTIVES

[illegible]

... Cape Smith (Bégin et al,., 1988). En contraste, le long de la marge nord (l'arrière-pays) de la zone de Cape Smith, les zones minérales sont recoupées par des chevauchements retrogrades D_1 désordonnés. Ces failles tardives transportent des nappes chevauchantes charactérisées par des assemblages de minéraux métamorphiques retrogrades bien développés.

DESCRIPTIVE NOTES

This map is one of a series of sixteen 1:50,000 scale geological maps (Fig. 1) for the eastern Early Proterozoic Cape Smith Belt (Fig. 2). The maps were compiled from the results of field work completed by the Geological Survey of Canada during the summers of 1985 to 1987 (St-Onge et al., 1986, 1987, 1988). The Open File map area (Fig.2) is accessible by scheduled flight from Kujjuaq, Québec (distance of 500 km) or by chartered aircraft from Iqaluit, Northwest Territories (distance of 350 km). Bedrock exposure in the mapped area is generally excellent, varying from continuous in the Wakeham Bay - Burgoyne Bay and Lac Watts -Lac Cross - Rivière Déception region to sufficient in the vicinity of Lac Bombardier and Lac Vicenza. The geological data presented in this Open File was gathered during ground-level traverses at a spacing of 2 km or less. Tectono-stratigraphic and structural relationships recorded on the maps of this Open File are based directly on the geology mapped during the three summers of field work. In contrast, the position of metamorphic mineral isograds was determined by follow-up petrographic and microprobe work (Bégin et al., 1988). The Open File maps provide first-order constraints for future mineral exploration projects in the area (St-Onge et al., 1988) and complement those published by MER (Québec) for the western portion of the belt (Lamothe, 1986).

The ca. 1.9 Ga (R. Parrish, pers. comm., 1986) Cape Smith Belt is a thin-skinned, south-vergent thrust-fold belt (Hynes and Francis, 1982; Lamothe et al., 1984; Hoffman, 1985) which is exposed in a west-plunging oblique section (15 km of structural relief) from low structural levels in the Wakeham Bay area (St-Onge et al., 1986) to high structural levels in the Lac Watts - Lac Cross area (St-Onge et al., 1987). The tectono-stratigraphic record of the Cape Smith Belt documents the evolution of an Early Proterozoic epicontinental rift which ultimately led to formation of oceanic crust (Hynes and Francis, 1982). The continent-derived sediments of the lower Povungnituk Group (units 2, 3a, 3b and 4) record the opening and infilling of a rift margin basin, which at least in part overlies continental crust. The epicontinental rift setting for the accumulation of the Povungnituk Group is supported by the similarity of upper Povungnituk Group mafic magmas (unit 5) to modern, within-plate continental tholeiites with respect to overall major element ratios, ranges in TiO_2 content and trace-element ratios (Hynes and Francis, 1982; Francis et al., 1983). The Chukotat Group is interpreted to record a phase in the magmatic evolution of the Cape Smith Belt which involved formation of transitional oceanic crust. The geochemistry of Chukotat Group mafic volcanics ranges from komatiitic basalt (unit 6) to low-Ti tholeiite (unit 8) with MORB affinities (Francis and Hynes, 1979; Hynes and Francis, 1982; Francis et al., 1983). The tholeiitic lavas are low in incompatible elements and have trace element characteristics very similar to those shown by modern ocean-floor basalts. Thrust sheets in the most internal (northern) part of the Cape Smith Belt carry the Spartan Group pelagic sediments (unit 13) and the Watts Group sheeted dykes, gabbroic sills and pillowed basalts (unit 12), mafic cumulates (unit 10) and ultramafic cumulates (unit 9). These units are interpreted to constitute the imbricated and metamorphosed remnants of Early Proterozoic oceanic crust, preserved in the thrust-fold belt as the Purtuniq ophiolite (Scott et al., 1988; St-Onge et al., 1988). The ophiolitic suite completes the tectono-stratigraphic record of the northern margin of the Superior craton, which evolved ca. 1.9 Ga ago from an epicontinental rift system to a true oceanic domain.

The continental-rift, transitional-crust and ophiolitic suites of the Cape Smith Belt are deformed by three temporally and geometrically distinct sets of structures (Lucas and St-Onge, 1987; St-Onge and Lucas, 1988a). The cumulative effect of the D_1, D_2 and D_3 deformation events is to preserve the thin-skinned thrust-fold belt in an east-west-trending D_2 synclinorium, doubly-plunging as the result of D_3 northwest-trending cross-folds (Fig. 2). The earliest set of D_1 structures recorded are regular sequence (piggyback-style) south-verging thrust faults which root on a basal décollement localized at or near the Archean basement - Proterozoic cover interface (St-Onge and Lucas, 1986). Transport of the thrust belt along the basal décollement during thermal relaxation following the early D_1 imbrication of the cover resulted in the growth of a ductile basal shear zone (Lucas and St-Onge, 1986). Syn- to post-thermal peak out-of-sequence thrust faults ramp through the previously assembled thrust stack to achieve late D_1 crustal thickening (Lucas and St-Onge, 1988). Incorporation of laterally discontinuous basement slices (unit 1) into the thrust belt is associated with out-of-sequence thrusting. Thick-skinned D_2 and D_3 folding of basement (unit 1) and cover (units 2 to 14) produced a dome and basin fold interference pattern. The distribution of D_2 and D_3 axial traces shown on the geological compilation maps of this Open File emphasizes the importance of rheologic layering in producing buckle folds and determining their wavelength. Examples of this phenomena include the D_3 folds developed where large layered gabbro-peridotite sills intrude the sediments of unit 3b.

Hot-side-down metamorphic mineral isograds in the mapped area document a normal distribution of isotherms in the thickened Early Proterozoic crust following D_1 imbrication (St-Onge and Lucas, 1988b). The lower greenschist to upper amphibolite facies isograds cross-cut the early D_1 structures in the eastern and southern parts of the Cape Smith Belt (Bégin et al., 1988). In contrast, along the northern (hinterland) margin of the belt, mineral zones are truncated by the late D_1 (retrograde) out-of-sequence thrusts. Extensive overprinting retrograde mineral assemblages are developed in the hangingwall units of these late D_1 faults.

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LEGEND / COLONNE TECTONOSTRATIGRAPHIQUE

Notes

1. This legend is common to all of the map sheets of this Open File. However, not all map units will appear on each map sheet / la colonne tectonostratigraphique est commune pour toutes les cartes de ce dossier publique. Par contre, toutes les unités n'apparaissent pas sur chaque carte.

2. The prefix "meta" applies to all lithologies in units 1 to 13 / le préfix "meta" s'applique à l'ensemble des lithologies des unités 1 à 13.

LATE PROTEROZOIC / PROTÉROZOIQUE SUPÉRIEUR

15 Diabase / dyke de diabase

EARLY PROTEROZOIC / PROTÉROZOIQUE INFÉRIEUR

14 Tonalite / tonalite

Spartan Group / Groupe de Spartan

13 Graphitic pelite; semipelite; sandstone, gabbro / phyllade à graphite; siltstone; grès; gabbro

Watts Group / Groupe de Watts

12 Basalt; gabbro sills; sheeted gabbroic dykes / basalte; filons-couches et dykes en feuillets de gabbro

11 Pyroxenite / pyroxénite

10 Layered gabbro / gabbro stratifié

9 Layered peridotite / péridotite stratifiée

Chukotat Group / Groupe de Chukotat

8 Dominantly plagioclase-phyric basalt; gabbro / principalement basalte à phénocristaux de plagioclase; gabbro

7 Dominantly pyroxene-phyric basalt; gabbro / principalement basalte à phénocristaux de pyroxène; gabbro

6 Dominantly olivine-phyric basalt; gabbro; peridotite; layered peridotite-gabbro sills / principalement basalte à phénocristaux d'olivine; gabbro; péridotite; filons-couches stratifiés péridotite-gabbro

Povungnituk Group / Groupe de Povungnituk

5 Basalt; volcanoclastic sediment; rhyolite; minor semipelite and sandstone; gabbro; peridotite; layered peridotite-gabbro sills / basalte; volcanoclastite; rhyolite; quantité mineure de siltstone et grès; gabbro; péridotite; filons-couches stratifiés péridotite-gabbro

4 Micaceous sandstone / grès micacé

3c Basalt; volcanoclastic sediment; minor sandstone, dolomite and calcsilicate; gabbro; peridotite; layered peridotite-gabbro sills / basalte; volcanoclastite; quantité mineure de grès, dolomie et calcsilicate; gabbro; péridotite; filon-couches stratifiés péridotite-gabbro

3b Semipelite; pelite; micaceous sandstone; sandstone; conglomerate; ironstone; dolomite; calcsilicate; minor basalt and volcanoclastic sediments; gabbro; peridotite; layered peridotite-gabbro sills / siltstone; phyllade; grès micacé; grès; conglomérat; sédiments ferrugineux; dolomie; calcsilicate; quantité mineure de basalte et volcanoclastite; gabbro; péridotite; filons-couches stratifiés péridotite-gabbro

3a Ironstone; minor sandstone and semipelite / sédiments ferrugineux; quantité mineure de grès et siltstone

2 Sandstone; ironstone; conglomerate / grès; sédiments ferrugineux; conglomérat

ARCHEAN / ARCHÉEN

1 Tonalite gneiss; granodiorite gneiss; granite gneiss; minor amphibolite / gneiss tonalitique; gneiss granodioritique; gneiss granitique; quantité mineure d'amphibolite

SYMBOLS / SYMBOLES

Lithologies / lithologies

- Pelite / phyllade
- Semipelite / siltstone
- Micaceous sandstone / grès micacé
- Conglomerate /conglomérat
- Dolomite / dolomie
- Calcsilicate / calcsilicate
- Sandstone / grès
- Dolomitic sandstone / grès dolomitique
- Basalt / basalte
- d Layered gabbro / gabbro stratifié
- s Sheeted gabbroic dykes / dykes de gabbro en feuillets
- br Volcanic breccia / brèche volcanique
- Pillowed flow / coulée coussinée
- pl. Plagioclase-phyric basalt / basalte à phénocristaux de plagioclase
- px. Pyroxene-phyric basalt / basalte à phénocristaux de pyroxène
- ol. Olivine-phyric basalt / basalte à phénocristaux d'olivine
- Rhyolite / rhyolite
- p Plagiogranite / plagiogranite
- Volcanoclastic sediment / volcanoclastite
- Dolomitic volcanoclastic sediment / volcanoclastite dolomitique
- Magnetite-bearing ironstone / sédiments ferrugineux avec magnétite
- Grunerite-garnet schist / schiste métamorphique avec grunérite et grenat
- Grunerite-dolomite schist / schiste métamorphique avec grunérite et dolomite
- Tonalite / tonalite
- Granite / granite
- Granodiorite / granodiorite
- Amphibolite xenoliths / xénolites d'amphibolite
- Disrupted gneiss / gneiss chaotique
- Straight gneiss / gneiss régulier
- Fe Rusty, iron-stained / ferrugineux
- Gabbro / gabbro
- Peridotite / péridotite
- Pyroxenite / pyroxénite
- Layered peridotite / péridotite stratifiée
- Pyroxenite in layered gabbro / pyroxénite dans le gabbro stratifié

Boundaries / contacts

- Geological boundary (defined, approximate) /contact géologique (certain, probable)
- D_1 thrust fault / faille de chevauchement D_1
- Oblique-slip fault / faille avec décrochement oblique

Structure /structure

- Bedding, tops known (inclined) / stratification, sommet déterminé (incliné)
- Gneissosity (Archean) / gneissosité (archéenne)
- D_1 schistosity (inclined) / schistosité D_1 (inclinée)
- D_1 stretching lineation / linéation d'allongement D_1
- D_1 syncline / synclinal D_1
- D_1 anticline / anticlinal D_1
- D_2 schistosity (inclined) / schistosité D_2 (inclinée)
- D_2 minor-fold hinge (N - northward fold vergence, S - southward fold vergence, M - symmetric fold) / charnière de pli secondaire D_2 (N - vergence à direction nord, S - vergence à direction sud, M - pli symétrique)
- D_2 synform / synforme D_2
- D_2 antiform / antiforme D_2
- D_3 schistosity (inclined) / schistosité D_3 (inclinée)
- D_3 minor-fold hinge (E - eastward fold vergence, W - westward fold vergence) / charnière de pli secondaire D_3 (E - vergence à direction est, W - vergence à direction ouest)
- D_3 synform / synforme D_3
- D_3 antiform / antiforme D_3

Isograds / isogrades

- hornblende-in / apparition de la hornblende
- oligoclase-in / apparition de l'oligoclase
- actinolite-out / élimination de l'actinote
- garnet or clinopyroxene-in / apparition du grenat ou du clinopyroxene

Geology by / géologie par:
M.R. St-Onge 1985-1987
S.B. Lucas 1985-1987
D.J. Scott 1985-1987
N.J. Bégin 1985-1987

Compilation by / compilation par:
M.R. St-Onge 1985-1988
S.B. Lucas 1985-1988
D.J. Scott 1987-1988

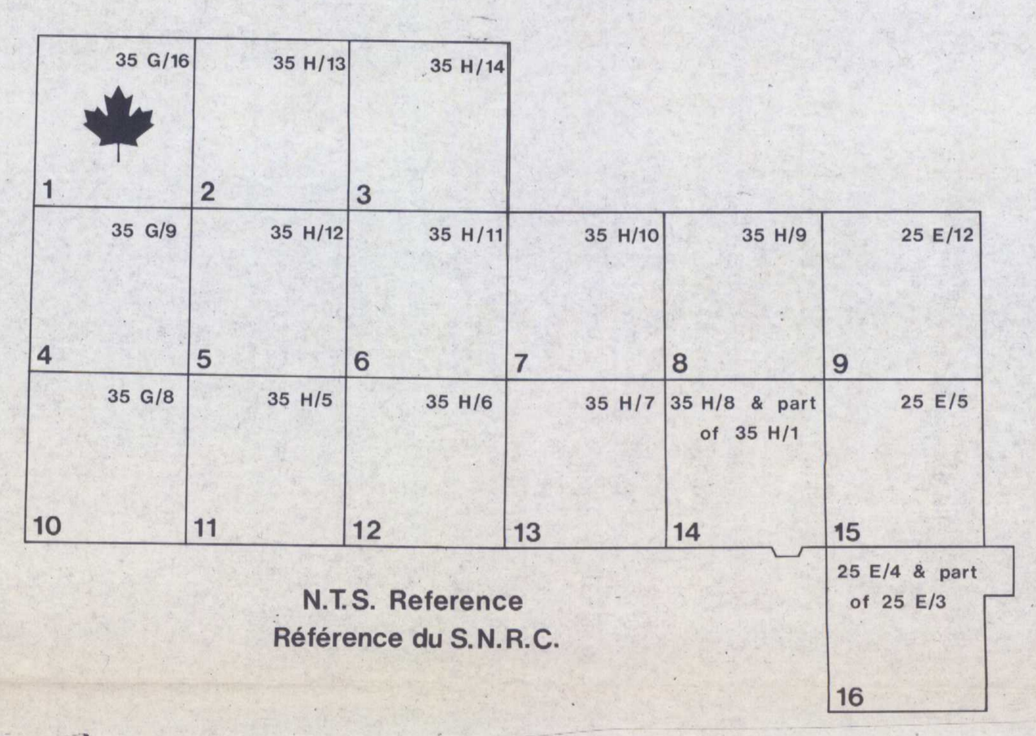


Figure 1. National Topographic System reference and index to Geological Survey of Canada maps / référence cartes du Système National de Référence Cartographique et index des cartes de la Commission Géologique du Canada.

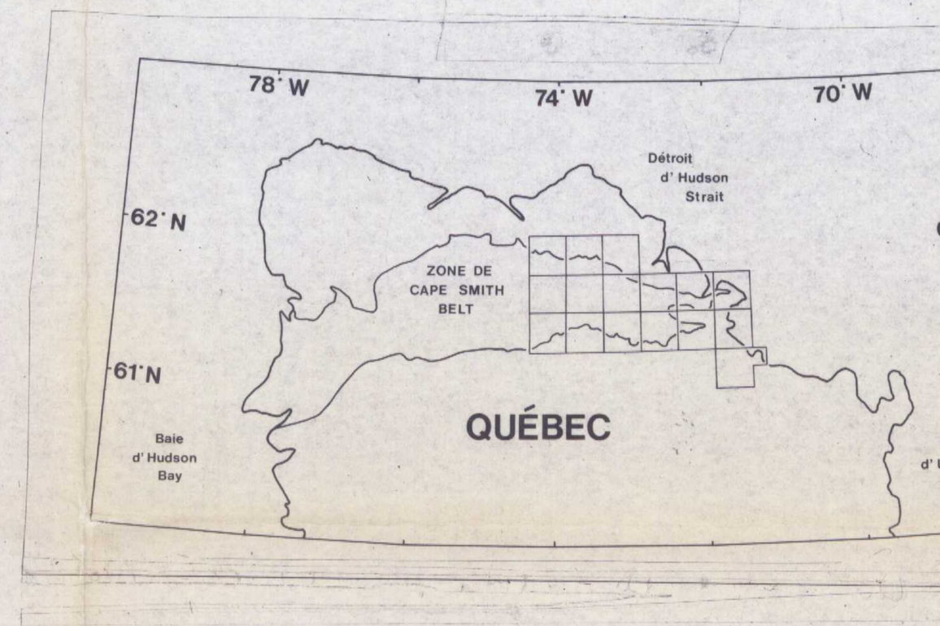
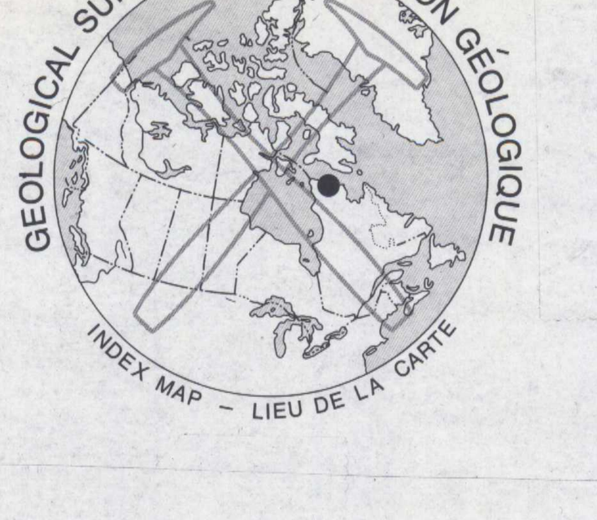


Figure 2. Location of Geological Survey of Canada maps in the eastern portion of the Cape Smith Belt, northern Quebec / localisation des cartes de la Commisssion Géologique du Canada dans la partie est de la zone de Cape Smith, Québec.



FEUILLE 1 DE 16 / SHEET 1 OF 16

GÉOLOGIE / GEOLOGY

SECTEUR ORIENTAL DE LA ZONE DE CHEVAUCHEMENT ET DE PLISSEMENT DU CAPE SMITH; PARTIE DES CARTES DE WAKEHAM BAY, CRATÈRE DU NOUVEAU-QUÉBEC ET NUVILIK LAKES, QUÉBEC SEPTENTRIONAL

EASTERN PORTION OF THE CAPE SMITH THRUST-FOLD BELT; PARTS OF THE WAKEHAM BAY, CRATÈRE DU NOUVEAU-QUÉBEC AND NUVILIK LAKES MAP AREAS, NORTHERN QUÉBEC

Échelle 1/50 000 - Scale 1:50 000

Kilomètres 1 0 1 2 3 4 Kilometres

Projection transverse universelle de Mercator / Universal Transverse Mercator Projection

Notation bibliographique conseillée:

St-Onge, M.R., Lucas, S.B., Scott, D.J. and Begin, N.J.
1988: Géologie, secteur oriental de la zone de chevauchement et plissement du Cape Smith; partie des cartes de Wakeham Bay, Cratère du Nouveau-Québec et Nuvilik Lakes, Québec septentrional; Commission géologique du Canada, Dossier public 1730, échelle 1/50 000, 16 cartes.

Recommended Citation:

St-Onge, M.R. Lucas, S.B., Scott, D.J. and Begin, N.J.
1988: Geology, eastern portion of the Cape Smith Thrust-Fold Belt, parts of the Wakeham Bay, Cratere du Nouveau-Quebec and Nuvilik Lake map areas, northern Quebec; Geological Survey of Canada, Open File 1730, 1:50,000 scale, 16 maps.

OPEN FILE
DOSSIER PUBLIC
1730
GEOLOGICAL SURVEY OF CANADA
COMMISSION GÉOLOGIQUE DU CANADA
OTTAWA
1988

Canada