Énergie, Mines et Ressources Canada
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COMMISSION GÉOLOGIQUE DU CANADA
GEOLOGICAL SURVEY OF CANADA

NOTES DESCRIPTIVES

Cette carte fait partie d'un jeu de quinze cartes géologiques à l'échelle de 1/50 000 qui couvrent la partie est de la zone de Cape Smith (fig. 1). Les cartes ont été compilées à partir des données de terrain levées par des équipes de la Commission géologique du Canada au cours des étés 1985 à 1987 (St-Onge et coll., 1986, 1987, 1988). La région cartographiée est accessible par vol régulier depuis Kuujuaq, au Québec (distance de 500 km) ou bien, par vol nolisé d'Iqaluit, dans les Territoires du Nord-Ouest (distance de 350 km). La roche en place affleure fréquemment et sur de grandes superficies dans la région. L'affleurement est continu dans les régions des bales Wakeham et Burgoyne et du lac Watts, lac Cross et rivière Déception et discontinu (mais suffisant) dans la région du lac Bombardier et du lac Vicenza. L'information géologique présentée sur la carte a été compilée à partir de données recueillies lors de traverses à pied espacées de moins de 2 km. Les relations tectonostratigraphiques et structurales indiquées sur les cartes découlent directement de l'information géologique cartographiée au cours des trois étés de travaux de terrain. Par ailleurs, la localisation des isogrades de métamorphisme a été déterminée suite à des travaux pétrographiques et de microsonde (Bégin et coll., 1988). Le jeu de quinze cartes fournit le complément de l'Énergie et des Ressources, Québec, for the western portion of the belt (Lamothe, 1986).

The ca. 1.9 Ga (R.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 5 to 18 km of structural relief from low grade rocks 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 southern part of the Cape Smith Belt (Fig. 2) documents the evolution of an Early Proterozoic epicontinental rift which ultimately led to formation of oceanic basalts (Hynes and Francis, 1982). The continent-derived sediments of the lower Povungnituk Group (**Pfm, Pfi, Pfse** and **Pfma**) 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 (Fig. 2) is supported by the similarity of upper Povungnituk Group mafic magmas (**Pfb**) 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 (Fig. 2). The geochemistry of Chukotat Group mafic volcanics ranges from komatiitic basalt (**Pcol**) to low-Mg tholeiite (**Pcpl**) 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 (Fig. 3) carry the Spartan Group pelagic sediments (**Pspe**) and the Watts Group sheeted dykes, gabbroic sills and pillowed basalts (**Pwb**), mafic cumulates (**Pwg, Pwpy**) and ultramafic cumulates (**Pwp**). These units are interpreted to constitute the imbricated and metamorphosed remnants of Early Proterozoic oceanic crust (Fig. 2), preserved in the thrust-fold belt as the Purtuniq ophiolite (Scott et al., 1988; St-Onge et al., 1988).

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, 1989). The cumulative effect of the D_1, D_2 and D_3 deformational events is to preserve the thin-skinned thrust-fold belt in an east-west-trending D_3 synclinorium, doubly-plunging as the result of D_3 northwest-trending cross-folds. 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) (Fig. 3). Transport of the thrust belt along the basal décollement during thermal relaxation following the early D_1 imbrication of the cover sequence 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 (Fig. 3) ramp through the previously assembled thrust stack to achieve late D_1 crustal thickening (Lucas and St-Onge, 1988; Lucas, 1989). Incorporation of laterally discontinuous basement slices (**Agn**) into the thrust belt is associated with out-of-sequence thrusting. Thick-skinned D_2 and D_3 folding of basement (**Agn**) and cover (**Pns** to **Pt**) produced a dome and basin fold interference pattern. The distribution of D_2 and D_3 axial traces shown on the set of geological compilation maps illustrates the importance of rheologic layering in producing buckle folds and determining their wavelength. Examples of this phenomenon include the D_2 folds developed where large layered gabbro-peridotite sills intrude the sediments of the Povungnituk Group

Hot-side-down metamorphic mineral isograds in the mapped area indicate a normal distribution of isotherms in the thickened Early Proterozoic crust following D_1 imbrication (St-Onge and Lucas, 1986). The lower greenschist to upper amphibolite facies isograds crosscut the early D_1 structures in the eastern and southern parts of the Cape Smith Belt (Bégin et al., 1988). In contrast, along the early D_1 retrograded out-of-sequence thrusts. Extensive overprinting retrograde mineral assemblages are developed in the hangingwall units of these late D_1 faults

DESCRIPTIVE NOTES

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

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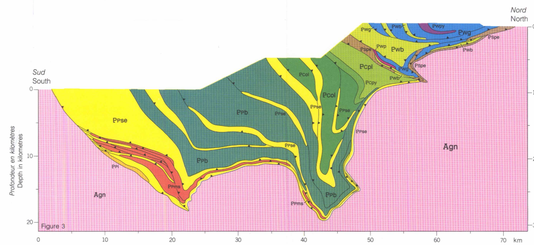

Figure 3

Coupe transversale composée (modifiée de Lucas, 1989) construite dans le sens de l'envoyage de la structure régionale et représentant la géologie en profondeur le long de la marge ouest de la région cartographiée (fig. 2). Il s'agit d'une coupe inclinée, construite à partir de plus de 50 projections dans le sens d'envoyage de la structure, empilées de façon à mettre en évidence le maximum de relief structural est-ouest. La pente nord-sud au sommet de la coupe transversale est le résultat d'une augmentation, du sud vers le nord, du relief structural présenté. La méthode de construction de la coupe transversale composée, les suppositions et les limites qu'elle entraîne, sont présentées dans Lucas (1989)

Composite, down plunge-constrained cross section (modified from Lucas, 1989) representing the geology at depth at the western margin of the map area (Fig. 2). The cross-section is an inclined section constructed from over 50 axial projections stacked in order to present the maximum east-west structural relief. The apparent north-to-south slope at the top of the cross-section is the result of a northward increase in structural relief. Details of the section construction technique, its assumptions and limitations are given in Lucas (1989)

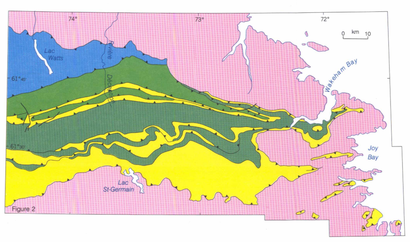

Figure 2

COLONNE TECTONOSTRATIGRAPHIQUE
TECTONO-STRATIGRAPHIC COLUMN

PROTÉROZOÏQUE INFÉRIEUR
EARLY PROTEROZOIC

- Croûte océanique (groupes de Watts et de Spartan) / *Ocean crust (Watts and Spartan groups)*
- Croûte transitionnelle (groupe de Chukotat) / *Transitional crust (Chukotat Group)*
- Laves de rift (groupe supérieur de Povungnituk) / *Rift-fill volcanics (upper Povungnituk Group)*
- Sédiments de rift (groupe inférieur de Povungnituk) / *Rift-fill sediments (lower Povungnituk Group)*

ARCHÉEN
ARCHEAN

- Gneiss du socle autochtone / *Autochthonous basement gneisses*

Contact géologique / Geological boundary
Faille de chevauchement D_1 / D_1 thrust fault
Faille avec décrochement oblique / Oblique-slip fault

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CARTE 1730A MAP
GÉOLOGIE-GEOLOGY

LAC FORCIER
QUÉBEC

Échelle 1/50 000 - Scale 1:50 000

Kilomètres 0 1 2 3 4 Kilomètres

Projection transverse universelle de Mercator
Universal Transverse Mercator Projection

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Pour la localisation des gîtes minéraux consulter le dossier DVP 897 publié par le ministère de l'Énergie et des Ressources du Québec (Centre de diffusion de la Géoinformation, 1620, boulevard de l'Entente, Québec (Québec))

See ministère de l'Énergie et des Ressources du Québec publication DVP 897 for location of mineral showings (available from Centre de diffusion de la Géoinformation, 1620, boulevard de l'Entente, Québec (Québec))

LIEU DE LA CARTE - INDEX MAP

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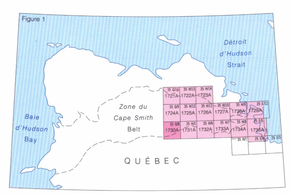

SYSTÈME NATIONAL DE RÉFÉRENCE CARTOGRAPHIQUE ET INDEX DES CARTES ATTRIBUANTES PUBLIÉES PAR LA COMMISSION GÉOLOGIQUE DU CANADA

NATIONAL TOPOGRAPHIC SYSTEM REFERENCE AND INDEX TO ADJOINING GEOLOGICAL SURVEY OF CANADA MAPS

LÉGENDE

La colonne tectono stratigraphique est commune pour les cartes 1721A à 1735A.
Le préfixe «méta» s'applique à l'ensemble des lithologies des unités **Agn** *à* **Pspe**

COLONNE TECTONOSTRATIGRAPHIQUE

PROTÉROZOÏQUE SUPÉRIEUR

- Pd — *Dyke de diabase*

PROTÉROZOÏQUE INFÉRIEUR

- Pt — *Tonalite*

GROUPE DE SPARTAN

- Pspe — *Phyllade à graphite; aleurolite; grès; gabbro*

GROUPE DE WATTS (**Pwp-Pwb**)

- Pwb — *Basalte; filons-couches et dykes de gabbro en feuillets*
- Pwpy — *Pyroxénite*
- Pwg — *Gabbro stratifié*
- Pwp — *Péridotite stratifiée*

GROUPE DE CHUKOTAT (**Pcol-Pcpl**)

- Pcpl — *Dominantly plagioclase-phyric basalt; gabbro*
- Pcpy — *Dominantly pyroxene-phyric basalt; gabbro*
- Pcol — *Dominantly olivine-phyric basalt; gabbro; peridotite; filons-couches stratifiés de péridotite et gabbro*

GROUPE DE POVUNGNITUK (**Pns-Pfb**)

- Pfb — *Basalte; volcanoclastite; rhyolite; petite quantité d'aleurolite et de grès; gabbro; péridotite; filons-couches stratifiés de péridotite et gabbro*
- Pfms — *Grès micacé*
- Pfv — *Basalte; volcanoclastite; petite quantité de grès, de dolomie et de calc-silicate; gabbro; péridotite,filons-couches stratifiés de péridotite et gabbro*
- Pfse — *Aleurolite; phyllade; grès micacé; grès; conglomérat; sédiments ferrugineux; dolomie; calc-silicate; petite quantité de basalte et de volcanoclastite; gabbro; péridotite; filons-couches stratifiés de péridotite et gabbro*
- Pfi — *Sédiments ferrugineux; petite quantité de grès et d'aleurolite*
- Pps — *Grès; sédiments ferrugineux; conglomérat*

discordance

ARCHÉEN

- Agn — *Gneiss tonalitique; gneiss granodioritique; gneiss granitique; petite quantité d'amphibolite*

Lithologies

Phyllade
Aleurolite
Grès micacé
Conglomérat
Dolomie
Calcsilicate
Grès
Basalte
Coulée coussinée
Volcanoclastite
Volcanoclastite dolomitique
Schiste métamorphique avec grunérite et grenat
Tonalite
Granite
Gabbro
Péridotite
Pyroxénite

Contact géologique (certain, probable)
Stratification, sommet déterminé (incliné)
Schistosité (inclinée)
D_1
D_2
D_3
Structure gneissique (inclinée)
Linéation d'allongement
D_1
Charnière de pli secondaire
D_2 (N-vergence à direction nord, S-vergence à direction sud, M-pli symétrique)
D_3 (E-vergence à direction est, W-vergence à direction ouest)
Faille de chevauchement (certaine, probable)
D_1
Faille avec décrochement oblique
Synclinal
D_1
Synforme (droite, déversée)
D_2
D_3
Antiforme (droite, déversée)
D_2
D_3
Isogrades
apparition de la hornblende
apparition de l'oligoclase-n
élimination de l'actinote
apparition du grenat ou du clinopyroxène

Géologie par M.R. St-Onge, S.B. Lucas, D.J. Scott et N.J. Bégin, 1985-1987

Compilation par M.R. St-Onge, S.B. Lucas, 1985-1988 et D.J. Scott 1987, 1988

L'information thématique de cette carte a été reproduite directement du manuscrit de l'auteur

Les contours des polygones ont été analysés et convertis en fichier récurrent. La séparation des couleurs a été préparée par la Commission géologique du Canada et tracée par la Division des systèmes de données sur les Terres du Canada de la Direction générale des terres d'Environnement Canada à l'aide d'un analyseur-traceur de type Optronics #340

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Déclinaison magnétique 1989, 33°13' Ouest diminuant de 7,6' par année

Altitudes en pieds au-dessus du niveau de la mer

LEGEND

This legend is common to maps 1721A to 1735A.
The prefix "meta" applies to all lithologies in units **Agn** *to* **Pspe**

TECTONO-STRATIGRAPHIC COLUMN

LATE PROTEROZOIC

- Pd — *Diabase dyke*

EARLY PROTEROZOIC

- Pt — *Tonalite*

SPARTAN GROUP

- Pspe — *Graphitic pelite; semipelite; sandstone, gabbro*

WATTS GROUP (**Pwp-Pwb**)

- Pwb — *Basalt; gabbro sills; sheeted gabbroic dykes*
- Pwpy — *Pyroxenite*
- Pwg — *Layered gabbro*
- Pwp — *Layered peridotite*

CHUKOTAT GROUP (**Pcol-Pcpl**)

- Pcpl — *Dominantly plagioclase-phyric basalt; gabbro*
- Pcpy — *Dominantly pyroxene-phyric basalt; gabbro*
- Pcol — *Dominantly olivine-phyric basalt; gabbro; peridotite; layered peridotite-gabbro sills*

POVUNGNITUK GROUP (**Pns-Pfb**)

- Pfb — *Basalt; volcaniclastic sediment; rhyolite; minor semipelite and sandstone; gabbro; peridotite; layered peridotite-gabbro sills*
- Pfms — *Micaceous sandstone*
- Pfv — *Basalt; volcaniclastic sediment; minor sandstone, dolomite and calc-silicate; gabbro; peridotite; layered peridotite-gabbro sills*
- Pfse — *Semipelite; pelite; micaceous sandstone; sandstone; conglomerate; ironstone; dolomite; calc-silicate; minor basalt and volcaniclastic sediments; gabbro; peridotite; layered peridotite-gabbro sills*
- Pfi — *Ironstone; minor sandstone and semipelite*
- Pps — *Sandstone; ironstone; conglomerate*

unconformity

ARCHEAN

- Agn — *Tonalite gneiss; granodiorite gneiss; granite gneiss; minor amphibolite*

Lithologies

Pelite
Semipelite
Micaceous sandstone
Conglomerate
Dolomite
Calc-silicate
Sandstone
Basalt
Pillowed flow
Volcaniclastic sediment
Dolomitic volcaniclastic sediment
Grunerite-garnet schist
Tonalite
Granite
Gabbro
Peridotite
Pyroxenite

Geological boundary (defined, approximate)
Bedding, tops known (inclined)
Schistosity (inclined)
D_1
D_2
D_3
Gneissosity (inclined)
Stretching lineation
D_1
Minor fold hinge
D_2 (N-Northward fold vergence, S-Southward fold vergence, M-Symmetric fold)
D_3 (E-Eastward fold vergence, W- Westward fold vergence)
Thrust fault (defined, approximate)
D_1
Oblique-slip fault
Syncline
D_1
Synform (upright, overturned)
D_2
D_3
Antiform (upright, overturned)
D_2
D_3
Isograds
hornblende-in
oligoclase-in
actinolite-out
garnet or clinopyroxene-in

Geology by M.R. St-Onge, S.B. Lucas, D.J. Scott and N.J. Bégin, 1985-1987

Compilation by M.R. St-Onge, S.B. Lucas, 1985-1988 and D.J. Scott 1987, 1988

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Base map at the same scale published by the Survey and Mapping Branch in 1961

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Magnetic declination 1989, 33°13' West decreasing 7.6' annually

Elevations in feet above mean sea level

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