DESCRIPTIVE NOTES

The Kingnait Fiord map sheet, southwest Cumberland Peninsula, Baffin Island, is relatively poorly exposed compared to other parts of Cumberland Peninsula (Figure 1). Accordingly, recently-available aeromagnetic data (Figure 2; Coyle 2009) and Landsat 7 data (Figure 3) were relied upon more heavily for bedrock interpretation than for adjacent map sheets. This perspective, tilt-covered region offers its own challenges, as the Landsat data are affected by extensive snow and ice cover (Figure 3). The area typically contain layers, enclaves and/or inclusions of dioritic (unit PAdr) and/or gabbroic (unit PAgb) and are cut by mm- to cm-scale veins of monzogranite–(±)granodiorite (unit PAgr). Biotite tonalite gneiss (unit PAtn) underlies much of the area and is the oldest unit. Tonalite gneiss of the Kingnait Fiord gneiss complex as a Mesoarchean basement complex (unit Atn). In contrast, foliated hornblende-nearly contains inclusions of marble, presumed to be part of a Paleoproterozoic cover sequence, thereby establishing the presence of much younger, but similar looking plutonic rocks (e.g., unit Pm). Narrow screens and rafts of supracrustal rocks in the southeastern part of the map sheet are invariably rusty-weathering, pelitic to psammitic, and commonly migmatitic (unit PAsp). Most of the area is underlain by intrusive contact relationships with tonalitic host rocks known, or inferred, to be Archean they are designated Archean (unit Asp). Metasedimentary rocks suspected to represent a Paleoproterozoic cover sequence (unit PAsp) are found in the southeastern part of the map sheet and in the northwestern part of the map sheet. Although dominated by semipelite (unit Psp_{sp}), this sequence also generally includes one or several diagnostic units such as limy arenite (unit Psp_{ca}), marble (unit Pc_{ca}), both generally as 1–3 m thick units, or orthoquartzite (unit Psp_{qz}), which attains a thickness of several hundred metres on Kingnait Fiord (see cover photo). Metasedimentary rocks of undetermined age or affinity are found in the Hoare Bay area. Although poorly exposed, the presence of a NW–SE trending linear magnetic expression allows extrapolation from restricted exposures, out both tonalite and some Paleoproterozoic cover rocks but locally appear to be transitional with Psv_{ic}.

At two localities in the northeastern part of this map sheet, fine-grained mafic rocks interpreted to represent basaltic volcanic rocks (unit Psv_{ic}) are inhibited with marble, quartzite and semipelite. Archean rocks are subdivided into four units, three of which are dominantly gneissic.

Foliated, medium-grained, commonly K-feldspar quartz porphyritic monzogranite, granodiorite (unit Pgd), charnockite (unit Pmz) and quartz diorite (unit Pdr) are exposed throughout the southwestern part of the map area. Unit Pgd is generally more potassic than unit Pdr, but both have similar intensity (Figure 2). These rocks form a plutonic complex, informally designated the Qikiqtarjuaq plutonic suite, that extends over 200 km from Pangnirtung to Qikiqtarjuaq (Figure 1). A preliminary age of ca. 1 859 Ga (N. Rayner, pers comm. 2011) distinguishes it from the 1 864–1 845 Ga Cumberland batholith (Whalen et al., 2010).

Ductile structural fabrics throughout the map area are consistent with two penetrative deformation events whereby D_1 structures are folded about a broadly arcuate southwest to northeast-trending F_2 axes with a predominantly north-dipping axial planar foliation. The Qikiqtarjuaq plutonic suite possesses a variably-developed moderately west-dipping foliation. Field observations and the regional magnetic data reveal a set of west-northwest-striking dilatase dykes, spaced 2 5 km apart, transects the poorly-exposed southern part of this map sheet.

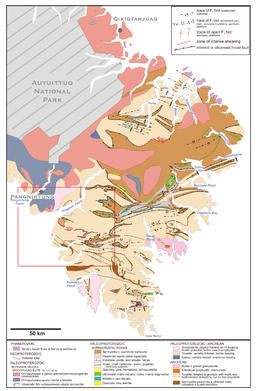
QIKIQTARJUAQ
AUYUITTUQ NATIONAL PARK
PANGNIRTUNG
base of F2 fold overturned
trace of F2 fold overturned; dots mark synform's culminal surface
trace of open F2 fold; synform labelled
zone of intense shearing
inferred or observed thrust fault
Cumberland Peninsula
Hoare Bay
Clearwater Fiord
Kingnait Fiord
Baffin Island
50 km
PHANEROZOIC
CENOZOIC
Ba Basalt, basanite, trachyte & fine-grained sedimentary rocks
MESOPROTEROZOIC
Pmz Monzogranite & granodiorite
PALEOPROTEROZOIC
Psp Semipelite, psammite, quartzite, calc-silicate rocks, iron formation, chert, graphitic pyrite/felsic shale, minor marble
Psv Basalt, basaltic andesite, felsic to intermediate volcanic rocks, rare pillow lavas
Pgd Foliated, medium-grained, commonly K-feldspar quartz porphyritic monzogranite, granodiorite (unit Pgd), charnockite (unit Pmz) and quartz diorite (unit Pdr) are exposed throughout the southwestern part of the map area. Unit Pgd is generally more potassic than unit Pdr, but both have similar intensity (Figure 2). These rocks form a plutonic complex, informally designated the Qikiqtarjuaq plutonic suite, that extends over 200 km from Pangnirtung to Qikiqtarjuaq (Figure 1). A preliminary age of ca. 1 859 Ga (N. Rayner, pers comm. 2011) distinguishes it from the 1 864–1 845 Ga Cumberland batholith (Whalen et al., 2010).
Pdr Quartz diorite – tonalite: Variably foliated, olive-brown weathering, equigranular, medium-grained, orthopyroxene±biotite-bearing quartz diorite – tonalite; well-exposed, prevalent unit on the peninsula between Pangnirtung and Kingnait fiords.
Pum Ultramafic sills: concordant sills of ultramafic composition are represented by three units (Pum, Pumg, Pumv) on the map sheet. Most are dominantly medium-grained, orthopyroxene-magnetite±ilmenite±biotite pyroxenite occurring as 50–100 m thick sills intrusive into supracrustal rocks and tonalitic gneiss, and cut by K-feldspar porphyritic charnockite of the Cumberland Batholith; pyroxenite displays diagnostic weathered surface due to 15–20% brown-weathering pits, 5–8 mm, thought to represent altered and preferentially weathered orthopyroxene; 2) black-weathering, fine-grained, equigranular, non-magnetic, ilmenite-bearing ultramafic sills, average 10 m thick, are dominantly hornblende ± biotite pyroxenite and hornblendite; and 3) well-layered mafic to ultramafic sills (Pumg) are exposed in the NE and SE parts of the map sheet; in dark brown-green-blue tones commonly with magnetic trends. Plutonic dykes are not defined well in this image due to the fact that they had extensive preferential vegetative cover and thus were masked from analysis. The spectral data was used in combination with high resolution aeromagnetic data, aerial and ground observations to maximize interpretation of map units.
Pmg Monzogranite & granodiorite
Pdr Quartz diorite – tonalite
Pum Ultramafic sills
Pumg
Pumv
PALEOPROTEROZOIC – ARCHEAN
Psp Semipelite, psammite, quartzite, calc-silicate rocks, iron formation, chert, graphitic pyrite/felsic shale, minor marble
Psv Basalt, basaltic andesite, felsic to intermediate volcanic rocks, rare pillow lavas
Pgd Foliated, medium-grained, commonly K-feldspar quartz porphyritic monzogranite, granodiorite (unit Pgd), charnockite (unit Pmz) and quartz diorite (unit Pdr) are exposed throughout the southwestern part of the map area. Unit Pgd is generally more potassic than unit Pdr, but both have similar intensity (Figure 2). These rocks form a plutonic complex, informally designated the Qikiqtarjuaq plutonic suite, that extends over 200 km from Pangnirtung to Qikiqtarjuaq (Figure 1). A preliminary age of ca. 1 859 Ga (N. Rayner, pers comm. 2011) distinguishes it from the 1 864–1 845 Ga Cumberland batholith (Whalen et al., 2010).
Atn Tonalite: light-grey to white weathering, variably foliated homogeneous biotite tonalite±clinopyroxene±hornblende granodiorite; locally containing xenoliths of marble (Pc_{ca}) and semipelite (Psp_{sp}).
ARCHEAN
Agt Granodiorite: light grey weathered, medium-grained orthopyroxene±biotite granodiorite to monzogranite; typically weakly foliated and equigranular; locally K-feldspar porphyritic; commonly cut by monzogranite±charnockitic veins (Amz); yields a preliminary age of ca. 2.7 Ga west of Exalum Fiord.
Amz Orthopyroxene monzogranite: K-feldspar porphyritic, orthopyroxene-monzogranite; moderately foliated; occurring as xenoliths in Agt; yields a preliminary age of ca. 2.75 Ga on Exalum Fiord.
Atn Tonalite: variably foliated, fine- to medium-grained biotite tonalitegranodiorite, typically cut by mm- to cm-wide veins of medium- to coarse-grained quartz diorite, monzogranite and trondjemite and typically containing xenoliths of diorite and quartz diorite; yields a preliminary igneous crystallization; yields preliminary ages of ca. 2.77 Ga at the head of Kuniein Fiord (CGM 1) and ca. 2.97 Ga northeast of unnamed fiord (CGM 2).
Atg Tonalite gneiss: compositionally layered orthogneiss dominated by tonalitic phase interlayered with dioritic, gabbroic and biotitic layers
Agb Gabbro: black, dark grey to brown weathering, fine- to medium-grained, variably foliated gabbro, typically with colour index of 60 to 85 and mafics dominantly as clinopyroxene (40-60%), biotite (up to 20%), with locally clinopyroxene (5-8%) and minor titanite; occurring as layers, enclaves and xenolithe in plutonic rocks either known, or presumed, to be of Archean age.
SUPRACRUSTAL ROCKS
Asc Semipelite: occurs as panels, layers and inclusions, average 20–50 m wide, within foliated to gneissic tonalite; typically brown-weathering, biotite-garnet±sillimanite±graphite semipelite, may be interlayered with garnet-rich (>60%) "garnetite" layers, 20–40 cm wide; amphibolite 1-4 m wide, and/or grey chert; 'qp' denotes graphite-rich unit.
PRE- to SYN-TECTONIC PLUTONIC ROCKS
Amv Mafic volcanic rocks: dark green weathering, pillowed flow with brown-weathering vesicles and sparse 1 cm plagioclase phenocrysts; overlain by limy arenite and cut by quartz porphyry dated at ca. 2.91 Ga; restricted exposure in CGM 1 northeast of the head of Akilliarfuaun Fiord, may also include amphibolite associated with Asp.
QIKIQTARJUAQ PLUTONIC SUITE
Pgd Granodiorite: weakly foliated, light grey to beige-weathering, medium-grained, equigranular biotite-magnetite-garnet±orthopyroxene granodiorite; 3% burgundy garnet typically as aggregates; may be quartz porphyritic, up to 1 cm; patchy granulite-facies assemblages and colouring.
Pmz Charnockite: weakly to strongly foliated, coarse-grained, biotite-orthopyroxene monzogranite/granodiorite (charnockite/enderbite); with distinctive greasy brown fresh surface indicative of attainment of granulite facies, commonly containing elliptical, 1 cm long quartz eyes; orthopyroxene partially retrogressed to biotite and serpentine (basitite); locally containing 10–15% K-feldspar phenocrysts, up to 10 cm (e.g. NW of Pangnirtung Fiord); cuts opx-porphyritic ultramafic sills at M79 & M98 and is commonly cut by monzogranite pegmatite veins.
Pdr Quartz diorite – tonalite: Variably foliated, olive-brown weathering, equigranular, medium-grained, orthopyroxene±biotite-bearing quartz diorite – tonalite; well-exposed, prevalent unit on the peninsula between Pangnirtung and Kingnait fiords.
Pum Ultramafic sills: concordant sills of ultramafic composition are represented by three units (Pum, Pumg, Pumv) on the map sheet. Most are dominantly medium-grained, orthopyroxene-magnetite±ilmenite±biotite pyroxenite occurring as 50–100 m thick sills intrusive into supracrustal rocks and tonalitic gneiss, and cut by K-feldspar porphyritic charnockite of the Cumberland Batholith; pyroxenite displays diagnostic weathered surface due to 15–20% brown-weathering pits, 5–8 mm, thought to represent altered and preferentially weathered orthopyroxene; 2) black-weathering, fine-grained, equigranular, non-magnetic, ilmenite-bearing ultramafic sills, average 10 m thick, are dominantly hornblende ± biotite pyroxenite and hornblendite; and 3) well-layered mafic to ultramafic sills (Pumg) are exposed in the NE and SE parts of the map sheet; in dark brown-green-blue tones commonly covered region SE of Kingnait Fiord; 2) minor +2 m wide, bright green-weathering clinopyroxenite with pale green to white pegmatitic plagioclase-rich interiors are denoted by a purple line labeled Pum. Potential carving stone locally designated with cs.
Pumg
Pumv
SUPRACRUSTAL ROCKS
HOARE BAY GROUP
Psp Semipelite/psammite/psammite/quartzite/chert of undetermined age, may have 10% pale green diopside.
Psp Semipelite: occurs as panels, layers and inclusions, average 20–50 m wide, within foliated to gneissic tonalite; typically brown-weathering, biotite-garnet±sillimanite±graphite semipelite.
Psp Iron-formation: oxide- (O) and/or silicate-facies (S): typically 1m (+/-) and lenticular interbeds of silicate-facies iron-formation in the western map area and thicker (up to 5–10 m), predominantly oxide-facies, in the eastern and northeastern map area.
Psh Shale/siltstone: grey to black weathering shale/siltstone/pelite; black shale is typically 1–2 m thick, commonly graphitic and pyritic, and commonly recessive or marked by white chalky sulphur coating on weathered surface; locally bedding and cleavage coated by pyrite; grey shale is 1–100 m wide, fissile to flaggy, is locally associated with dolomitic marble and calc silicate and locally appears to transition up section into black shale. Shale horizons < 1 m wide are denoted by a grey line labeled Psh_{fs}.
Ct Chert: massive to laminated chert, typically 1–3 m wide, locally up to 5 m wide; generally deep purple- to rusty-weathering (gossanous) but locally pale grey- and white-weathering and thinly to thickly laminated (i.a. near Exeter Sound); observed to occur structurally above and below metavolcanic rocks (Psv_{ic}).
Pgpt Pink orthoquartzite: vitreous, hematized, pink-weathering, fine- to medium-sand size orthoquartzite, 1–2 m thick, spatially associated with Psv_{ic}, may have associated minor intercalated, chalky grey-weathering psammite and/or chert.
Psv Ultramafic-Mafic volcanic rocks: komatiitic, basaltic-komatiitic to basaltic volcanic rocks, variably textured including fragmental, pillowed and massive flows; typically bright green-weathering, characteristic of high-Mg composition; locally dark green-black, Fe-thickrete as pillowed flows with light buff-weathering elliptical xenolith cores; locally as massive, aphanitic slightly diapsidosian-phyric flows immediately east of Mermaid Fiord; minor interbedded, cream-weathering psammite to quartzite occurs as 1 m wide beds (i.e. Ikkok Island); this unit is thickest in the east and northeast, and thinnest or absent in the western map area.
Psv Mafic – Calc silicate: pale brown- to light-grey weathering marble, typically composed of calcite, olivine-clinohumite assemblages, average 1–3 m thick, lesser associated pale-green to white calc-silicate generally as thin (<30 cm) interbeds and nodules/concretions/boudins, contains up to 25% diopside, up to 20% amphibole/tremolite/aggregate; locally with psammite and semipelite interbeds; metabasalic silicate <2 m wide denoted by turquoise line labelled Psv_{ic}.
Psp Limy arenite: immature quartz-rich clastic rocks characterized by 5–10% pale green diopside/hornblende, an indication of metamorphosed limy component; also commonly containing <3% muscovite and graphitic; occurs as cm- to m-thick layers, associated with quartzite.
Psp Orthoquartzite: pale grey, blue-grey to white-weathering, equigranular, fine- to medium-sand size orthoquartzite; typically massive and thickly bedded, with no recognizable primary structures; across the map area, this unit averages 5–20 m and thickens to 400 m at the "type" Kingnait exposure on the southeast shore of Kingnait Fiord; may contain up to 2% pale pink garnet and <5% biotite; locally interbedded with psammite and semipelite.
PALEOPROTEROZOIC / ARCHEAN (undetermined age)
PREs- to SYN-TECTONIC PLUTONIC ROCKS
PAgd Granodiorite: light grey weathered, medium-grained biotite±orthopyroxene±garnet granodiorite to monzogranite; variably foliated to mylonitic, locally K-feldspar porphyritic or porphyroblastic; commonly cut by monzogranite±charnockitic veins.
PAtn Tonalite: light grey to white weathering, weakly to moderately foliated homogeneous biotite tonalite.
PAgb Gabbro: black, dark grey to brown weathering, fine- to medium-grained, variably foliated non-magnetic gabbro typically with colour index between 60 and 85 occurring as 1–5 m wide layers, up to 20 m wide; mafics consist dominantly of hornblende (40–60%), biotite (up to 20%), locally clinopyroxene (5–10%), and 1–2% visible titanite; locally medium grey-green weathering gabbro contains both clinopyroxene and hornblende and is cut by 1–5 cm wide veins of biotite leucogabbro to gabbroic anorthosite (i.e. mafic complex east of Qailluk Fiord); continuous mafic layers <2 m wide are denoted by a blue line labeled PAgb.
PAdr Diorite - Quartz diorite: medium green-grey (dioritic) to light grey (quartz diorite), fine- to medium-grained, biotite ± hornblende ± clinopyroxene diorite to quartz diorite or biotite as dominant mafic mineral and minor clinopyroxene; quartz diorite has colour index of 30–40 and typically hornblende > biotite with 5–20% quartz, non-megacrystic.
SUPRACRUSTAL ROCKS
PAps Psammite: light grey to rusty weathering psammite/quartzite/chert of undetermined age, may have 10% pale green diopside.
PAsp Semipelite: occurs as panels, layers and inclusions, average 20–50 m wide, within foliated to gneissic tonalite; typically brown-weathering, biotite-garnet±sillimanite±graphite semipelite.
PAmv Mafic volcanic - Amphibolite: black to dark green weathering, fine- to very fine-grained amphibolite with 50–70% hornblende and locally up to 5% garnet; occurs as layers up to 10 m thick; suspected to be extrusive in origin, but lacking diagnostic primary features.

Figure 2. Vertical gradient of the magnetic field for southwestern Cumberland Peninsula (Coyle 2009) highlighting magnetically defined regions and trends reflected in the bedrock geology of the Kingnait Fiord sheet.

Figure 3. Landsat 7 spectral data for southwestern Cumberland Peninsula enhanced using Minimum Noise Fraction Transformation to highlight spectral variations in the bedrock geology of the Kingnait Fiord sheet. This image is affected by extensive snow and glacial ice cover as shown in the blacked grey and yellow tones. Despite this, the underlying bedrock geology is still clearly expressed, with the brown-weathering rocks underlying most of the NE and SE parts of the map sheet, in dark blue-green-blue tones commonly with magnetic trends. Plutonic dykes are not defined well in this image due to the fact that they had extensive preferential vegetative cover and thus were masked from analysis. The spectral data was used in combination with high resolution aeromagnetic data, aerial and ground observations to maximize interpretation of map units.

National Topographic System reference and index to adjoining published Geological Survey of Canada maps

Cover illustration:
View to east of southeast shore of Kingnait Fiord where orthoquartzite of the Paleoproterozoic Hoare Bay Formation (unit Psp) overlies tonalite (unit Atn) and forms a resistant peak in (tilt-covered) contact with tonalite (background left). Cumberland Peninsula, Nunavut. Photograph by M. Sanborn-Barrie. 2011-034

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2nd EDITION

CANADIAN GEOSCIENCE MAP 2
GEOLOGY
KINGNAIT FIORD
Nunavut
1:100 000

Abstract

Cumberland Peninsula, eastern Baffin Island, is an under-explored, frontier region with significant diamond, base- and precious-metal potential. Plutonic rocks of tonalitic to quartz dioritic composition across southern Cumberland Peninsula form the structural basement to supracrustal rocks of the Hoare Bay group in the north. Tonalitic rocks are variably foliated to gneissic with preliminary Archean ages of ca. 2.9–2.77 Ga. Supracrustal rocks in the north and in the southeast and south are inferred to be of Archean age. Extensive metasedimentary cover rocks of the Hoare Bay group in the north include silicate- and oxide-facies iron-formation, chert, graphitic pyrite/felsic shale, minor marble, basalt, basaltic andesite, and subordinate semipelite turbidite. At several localities, mafic to ultramafic volcanic rocks preserve primary textures supporting both flow and pyroclastic origin. Additional mafic panels of uncertain origin are widespread.

Résumé

La péninsule Cumberland, située dans l'est de l'île de Baffin, est une région prometteuse peu explorée offrant un important potentiel en diamants ainsi qu'en métaux communs et précieux. Les roches plutoniques, de composition allant de tonalitique à de dioritique quartzique, qui sont situé sur le socle structural du sud de la péninsule des roches supracrustales qui dominent dans sa partie nord. La texture des roches tonalitiques varie de foliée à gneissique avec des âges préliminaires archéens. Les roches datesant de l'Archéen, vers 2,77 Ga. Des roches supracrustales, sous forme de segments isolés dans le sud, datesant également de l'Archéen. Dans le nord, une couverture étendue de roches métasédimentaires du groupe de la baie Hoare comprend une formation de fer à faciès silicaté et oxydé, du chert, du shale graphitique pyritique, un peu de quartzite, et du marbre, avec une présence répandue de turbidites de psammite-semipélite. A plusieurs endroits, des roches volcaniques mafiques à ultramafiques préservent des textures primaires indiquant des origines de coulée et des origines pyroclastiques. D'autres fragments maffiques d'origine incertaine sont largement répandus.

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Geology by M. Sanborn-Barrie, M. Young, B. Hamilton, C. Nagy, R. Klein, M. Pontbriand, R. Takayama-Bréhe, J. Whalen, L. Sheldon, M.R. St-Onge, K. Rutledge and J. Day, Geological Survey of Canada; D. James, Canada-Nunavut Geoscience Office, 2009

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CANADIAN GEOSCIENCE MAP 2
GEOLOGY
KINGNAIT FIORD
Nunavut
1:100 000
2 0 2