DESCRIPTIVE NOTES

The Circle Lake map sheet, central Cumberland Peninsula, Baffin Island, exposes clastic metasedimentary rocks of the Paleoproterozoic Hoare Bay group, that are in tectonic contact with structurally underlying Archean tonalite. Both the basement and cover rocks are cut by relatively homogeneous, variably foliated Paleoproterozoic monzogranite, charnockite and granodiorite.

Archean plutonic rocks are exposed across the northern and southwestern parts of the map sheet. These light grey weathered, biotite-bearing tonalite-granodiorite±orthopyroxene rocks are strongly foliated (unit Amr) to gneissic (unit Atg), and commonly contain mafic plutonic layers and inclusions. At several localities, tonalite cuts gabbro (unit Agb) and diorite clearly establishing these mafic rocks as Archean whereas at other localities, relative age relationships between gabbroic rocks (unit PAgb) and tonalite are less certain. The tonalitic complex is typically cut by granitic veins that are cofincident to a strong tectonic foliation. In both the north and south, narrow panels of supracrustal rocks of unknown age and affinity are associated with tonalite. These rocks include: amphibolite (unit Amv), amphibolite-garnet gneiss (unit Asp), garnet-bearing granodiorite (unit PAmv), silicate facies iron-formation (SI) and psammite (unit PAps). Similar lithologies comprise part of the Archean basement complex in the south (Sanborn-Barrie et al., 2011).

The southeast part of this map sheet exposes relatively homogeneous semipelite and psammite. Semipelite (unit Psp_{sh}) is rusty-brown weathering with 15-25% biotite and up to 10% garnet. Psammite (unit Pps_{sh}) is light grey weathering with 5-10% biotite and rare (<2%) garnet, with calcareous layers or concretions locally. Quartzite occurs along both the tectonized northern and southwestern boundaries of the succession, in association with tectonized tonalite. Fine-grained mafic rocks at the base of the succession, in the southwestern corner of the map sheet, are cut by tonalite. The rocks have undergone recrystallization grain size and association with chert (unit Ct), semipelite and calc silicate (unit Psp_{ch}). This region is strongly tectonized and infolded and intruded with tonalite. Collectively, the clastic sequence has a relatively low magnetic expression (Figure 2). Although the lithological association and continuity with dated sample establishes this coherent clastic–dominated succession as the Paleoproterozoic Hoare Bay group (Jackson 1971), detrital zircons from two samples of quartzite from this map sheet indicated solely Archean provenance.

The western and central parts of the Circle Lake sheet expose relatively homogeneous, variably foliated monzogranite, charnockite and granodiorite (unit Pgd). Similar rocks underlie much of the Qikiqtarjuaq (Broughton I.) and Pangnirtung to Qikiqtarjuaq (Figure 1) and forms the spectacular peaks and towers of Auyuittuq National Park. Designation of this belt as the Qikiqtarjuaq plutonic suite is based on extensive exposures of compositionally similar rock types, which yield similar U-Pb ages between ca. 1860 and 1894 Ma from seven localities. This plutonic suite is ~35 my older than the 1845-1805 Ma Cumberland batholithic complex (Whalen et al., 2010) exposed to the west and formerly predicted to underlie this region. Both phases of the Qikiqtarjuaq plutonic suite are exposed in this map sheet. Coarse-grained, megacrystic granodiorite (unit Pgd) containing up to 10% orthopyroxene is the most abundant phase. Similar rocks, lacking orthopyroxene, underlie much of the northern central part of the sheet. These rocks are greasy green on fresh surfaces, reflecting high-temperature modification of feldspar crystal structure during post-emplacement high-grade metamorphism. A dioritic phase exposed 3 km south of Circle Lake yielded an U-Pb age of ca. 1,894 Ga (N. Rayner unpublished data, 2011). More widespread, pale grey-pink weathering, granodiorite to monzogranite (unit Pgd) dominates the western part of the map sheet. This phase, which cuts the charnockite and contains it as inclusions, contains 10-15% biotite, isolated aggregates of dark red almandine garnet, may contain ~5% quartz and/or K-feldspar phenocrysts. It yielded an age of 1889±3 Ma from a pinnacle south of Akvitaluq Lake (Rayner et al., 2010).

The tonalitic complex is characterized by gneissic layering which is variably oriented due to superimposed upright folds. Widespread evidence exists across the map area that the main strong shallow foliation/layering is a S_1>S_0 transposition foliation. For instance, this main foliation is generally parallel to the axial planes of inclined to recumbent F_2 folds that fold S_1. Accordingly, upright folds that modify S_1>S_0 transposition foliation across this map sheet are F_3. Plutonic rocks of the Qikiqtarjuaq plutonic suite generally display a moderately developed, west-striking, foliation that dips moderately north, although foliation can be variable. Where a preferred mineral extension was noted, it invariably plunged shallowly (<30°) to the west.

West-northwest-striking, near-vertical, post-tectonic gabbro dykes (unit Mg) are exposed at the head of Padle Fiord.

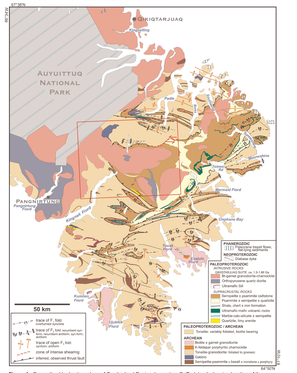


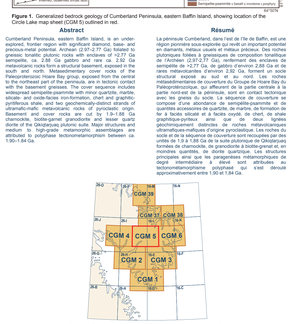
Figure 1. Generalized bedrock geology of Cumberland Peninsula, eastern Baffin Island, showing location of the Circle Lake map sheet (CGM 5) outlined in red.

Abstract

Cumberland Peninsula, eastern Baffin Island, is an underexplored frontier region with potential for diamond and precious-metal potential. Archean (2.81-2.77 Ga) foliated to gneissic tonalitic plutonic rocks with enclaves of >2.77 Ga amphibolite to >2.77 Ga paragneiss and >2.77 Ga to 2.72 Ga metasedimentary rocks form a structural basement, exposed in the south and north. Metasedimentary cover, rocks of the Paleoproterozoic Hoare Bay group, exposed from the central to the northeast part of the peninsula, are in tectonic contact with the basement rocks. The cover rocks consist mainly of widespread semipelite-psammite with minor quartzite, marble, silicate- and oxide-facies iron-formation, chert and graphitic-pyrrhlinous shale, and two geochemically-distinct strands of ultramafic-mafic metavolcanic rocks of pyroclastic origin. Psammite, locally with abundant garnet, and rare charnockitic, biotite-garnet granodiorite and lesser quartz diorite of the Qikiqtarjuaq plutonic suite. Major structures and medium- to high-grade metamorphic assemblages are attributed to polyphase tectonometamorphism between ca. 1.90-1.84 Ga.

Résumé

La péninsule Cumberland, dans l'est de l'île de Baffin, est une région pionnière encore sous-explorée qui offre un important potentiel en diamants, métaux usuels et métaux précieux. Des roches plutoniques foliées à gneissiques de composition tonalitique (2,81-2,77 Ga) avec des enclaves d'amphibolite >2,77 Ga et de semipélite de >2,77 Ga, de paragneiss >2,77 Ga et de roches sédimentaires datant de 2,72 Ga, forment un socle structural exposé au sud et au nord. Les roches métasédimentaires de couverture du Groupe de Hoare Bay du Paléoprotérozoique, exposées dans la partie centrale à la partie nord-est de la péninsule, sont en contact tectonique avec les gneiss du socle. La séquence de couverture se compose d'une abondance de semipélite-psammite et de quantités accessoires de quartzite, de marbre, de formation de fer à oxydes et à silicates, de chert et de shale graphitique-pyriteux ainsi que de deux lignées géochimiquement distinctes de roches métavolcaniques ultramafiques-mafiques d'origine pyroclastique. Psammite, souvent riche en grenat, et de la séquence de couverture sont recoupées par des unités de 1,9 à 1,88 Ga de la suite plutonique de Qikiqtarjuaq formées de charnockite, de granodiorite à biotite-grenat et, en moindres quantités, de diorite quartzique. Les structures importantes et les faciès métamorphiques de degré intermédiaire à élevé sont attribués à un tectonométamorphisme polyphasé qui s'est déroulé approximativement entre 1,90 et 1,84 Ga.



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

Cover illustration
View to west across the river valley draining into Padle Fiord of tight, upright F_3 folds of strongly gneissic grey-weathering tonalite and schistose rust-weathering metasedimentary rocks. Photo by Mike Young. 2012-059

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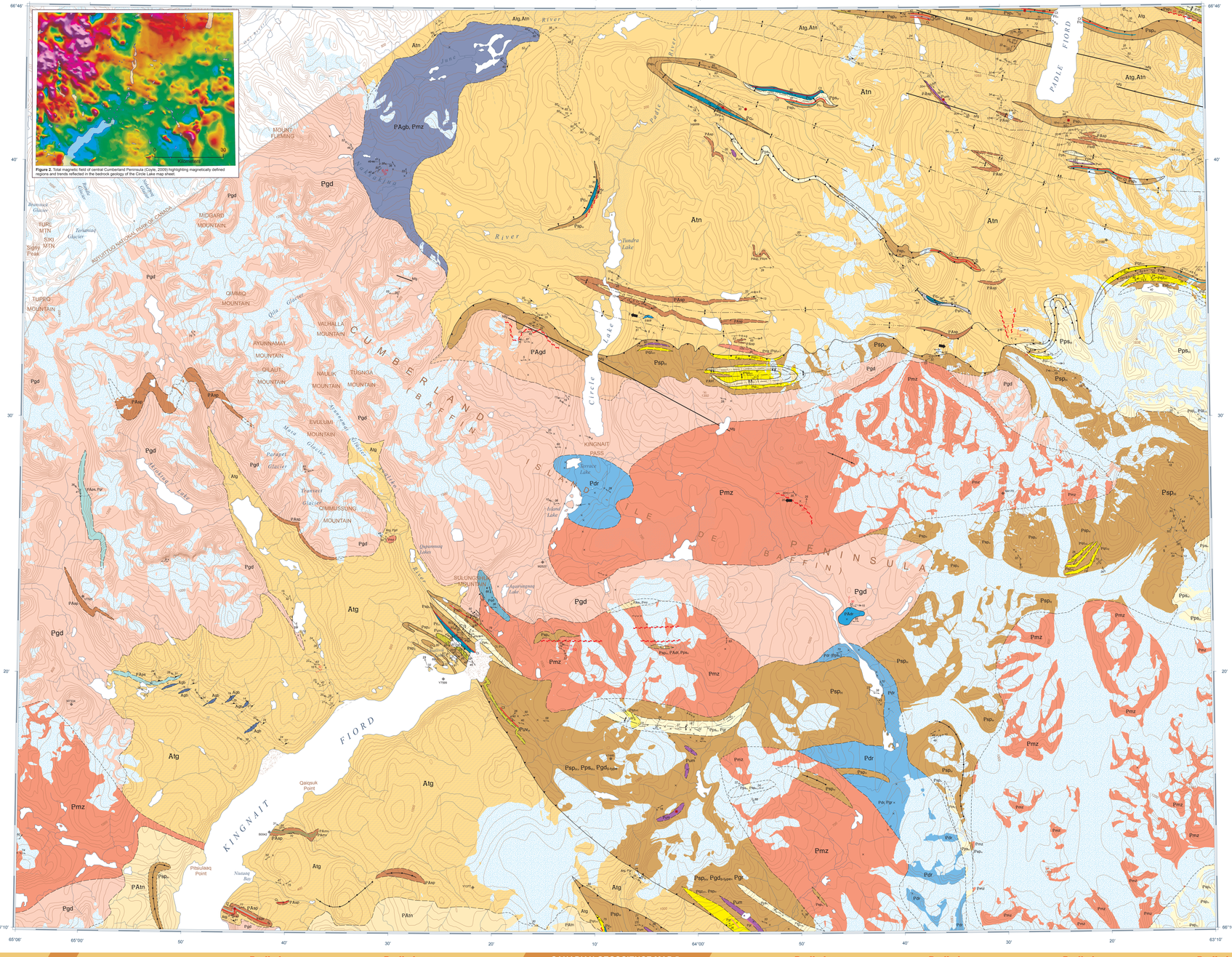
CANADIAN GEOSCIENCE MAP 5
GEOLOGY
CIRCLE LAKE
Baffin Island, Nunavut
1:100 000

Figure 2. Total magnetic field of central Cumberland Peninsula (Coyle, 2009) highlighting magnetically defined regions and trends reflected in the bedrock geology of the Circle Lake map sheet.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