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CANADIAN GEOSCIENCE MAP 104

GEOLOGY

TAKIYUAQATTAK

Victoria Island, Northwest Territories

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Cover Illustration

Looking east at flood basalt-capped cuesta with Kuujjua River and upper Kilian Formation and diabase sill in foreground, Victoria Island, Northwest Territories, 2011-07-13. Photograph by R. Rainbird. 2013-204

ABSTRACT

NTS 87-H/4 is underlain by the middle to upper Kilian, Kuujjua and Natkusiak formations of the Neoproterozoic Shaler Supergroup. Together with at least 5 diabase sills (type 2), spaced at regular intervals within the host sedimentary rocks, the strata comprise the gently south-dipping northern limb of the Holman Island Syncline. The northern half of the map area is dominated by a thick sill, which forms a prominent southeast dip slope down to the Kuujjua River. Sedimentary strata are best exposed along a prominent cuesta that faces north-northwest along the south side of the Kuujjua River. The upper two members of the Kilian Formation are sporadically exposed along the base of the cuesta. Crossbedded quartzarenite of the disconformably overlying Kuujjua Formation is prominent along the cuesta's face along with conformably capping basalt flows of the Natkusiak Formation. Both are also well exposed along the flanks of two, north-flowing tributaries of the Kuujjua River. Several steep, northwest-striking, west-side down normal faults are spaced evenly across the map area.

RÉSUMÉ

Le Feuillet NTS 87-H/4 expose des roches Néo-protérozoïques des Formations du Kilian Moyen à Supérieur, Kuujjua et Natkusiak. Les roches sédimentaires appartiennent au Supergroupe de Shaler, et sont injectées par 5 filons-couches diabasiques de l'évènement Franklin. Les strates constituent le flanc nord du Synclinal Holman Island, et pendent doucement vers le sud. La partie nord du feuillet est dominée par un filon-couche épais, qui forme un banc qui va jusqu'à la rivière Kuujjua. Les roches sédimentaires sont bien exposées le long d'une falaise qui s'élève au sud de cette rivière et aussi le long de ses tributaires du côté sud. Les deux membres supérieurs du Kilian sont exposés sporadiquement au pied de la falaise. Les arénites quartzifères à lits entrecroisés de la Formation de Kuujjua sont en discordance sur les strates du Kilian. Le sommet de la montagne est formé par les laves et volcaniclastites de la Formation de Natkusiak. Il y a plusieurs failles normales orientées nord-ouest, avec pendange vers l'ouest.

ABOUT THE MAP

General Information

Authors: R.H. Rainbird, J.H. Bédard, and N. Williamson

Geology by R.H. Rainbird and J.H. Bédard, 2011

Geomatics by É. Girard

Cartography by N. Côté

Initiative of the Geological Survey of Canada, conducted under the auspices of the Victoria Island PGE/Base Metals project, as part of Natural Resources Canada's Geo-mapping for Energy and Minerals (GEM) program.

Map projection Universal Transverse Mercator, zone 11.
North American Datum 1983

Base map at the scale of 1:50 000 from Natural Resources Canada, with modifications.
Elevations in metres above mean sea level

Shaded relief image derived from the digital elevation model supplied by GeoBase.
Illumination: azimuth 225º, altitude 45º, vertical factor 1x

Proximity to the North Magnetic Pole causes the magnetic compass to be erratic in this area.Magnetic declination 2013, 20º32' E, decreasing 53' annually.

The Geological Survey of Canada welcomes corrections or additional information from users.

Data may include additional observations not portrayed on this map.
See documentation accompanying the data.

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Preliminary publications in this series have not been scientifically edited.

Map Viewing Files

The published map is distributed as a Portable Document File (PDF), and may contain a subset of the overall geological data for legibility reasons at the publication scale.

ABOUT THE GEOLOGY

Descriptive Notes

The map area (NTS 87-H/4) lies within the Minto Inlier, a ~300 km long by 100–150 km wide belt of gently folded sedimentary and igneous rocks of early Neoproterozoic (late Tonian-early Cryogenian) age. The Neoproterozoic sedimentary strata belong to the Shaler Supergroup, an approximately 4 km-thick succession of shallow marine carbonate rocks and evaporite rocks with interbedded terrigenous rocks that were mainly deposited in a shallow intracontinental epeiric sea, referred to as the Amundsen Basin (Rainbird et al., 1994; Rainbird et al., 1996a; Thorsteinsson and Tozer, 1962; Young, 1981). The basin is considered to have formed within the supercontinent Rodinia and exposures of similar rocks, in what are now the Mackenzie Mountains of the northern Cordillera, suggest that it extended for more than 1000 km to the southwest (Long et al., 2008; Rainbird et al., 1996a). The sedimentary succession is intercalated with mafic sills of the ca. 720 Ma Franklin igneous event (Heaman et al., 1992). The sills are of variable thickness up to 100 m, but most are 20–60 m thick. In many cases, individual sills extend for 20 km or more along-strike with little significant change in thickness. Sills constitute anywhere from 10 to 50 per cent of the stratigraphic section. Sills of similar type and age also occur in the Coppermine Homocline, Brock Inlier and Duke of York Inlier to the south (Rainbird et al., 1996b; Shellnutt et al., 2004) and coeval, geochemically similar intrusions and volcanic rocks associated with the Franklin event extend from Greenland to the western Yukon (Denyszyn et al., 2009; Heaman et al., 1992; Macdonald et al., 2010). The Shaler Supergroup in Minto Inlier is capped by a succession of flood basalt flows and interflow sedimentary rocks (Natkusiak Fm), more than 1 km thick, which are the extrusive equivalent of the sills (Baragar, 1976; Jefferson et al., 1985). Rare north-northwest-striking dykes are interpreted to have intruded along syn-magmatic normal faults, to feed sills and possibly the flood basalts (Bédard et al., 2012). Three magma populations are identified in the lavas, which have correlatives in the different sill subtypes. The oldest sills and corresponding basal lavas are enriched in incompatible trace elements and may have olivine-enriched bases. Younger diabasic sills correspond to the major sheet-flow units of the lava succession. Basal strata of the Shaler Supergroup (Rae Group) are exposed only at the northeastern end of Minto Inlier, near Hadley Bay, where they unconformably overlie Paleoproterozoic sedimentary rocks, which, in turn, unconformably overlie Archean granitic rocks (Campbell, 1981; Rainbird et al., 1994). The irregular edge of Minto Inlier is defined by an erosional unconformity that separates the Neoproterozoic rocks from Lower Cambrian sandstone and siltstone that pass upward into a thick succession of mainly dolomitic carbonate rocks, ranging in age from Cambrian to Devonian (Thorsteinsson and Tozer, 1962). Structurally, the Minto Inlier is relatively simple, composed of the open, northeast-trending Holman Island syncline and a smaller Walker Bay anticline to the northwest. Beds typically dip no more than 10° and there is generally no penetrative cleavage or other apparent outcrop-scale fabric. The origin of the folding is unknown but it occurred after deposition of the early Neoproterozoic rocks and before uplift, erosion and deposition of overlying lower Cambrian siliclastic rocks, which are not folded. All rocks are dissected by east-northeast to east-trending faults that form a horst and graben system with up to 200 of metres of stratigraphic separation on individual faults. The zone of faulting is about 100 km wide and stretches from the head of Minto Inlet in the west to Wynniatt Bay in the east and is spectacularly imaged as prominent lineaments on recently published aeromagnetic maps (e.g. Kiss and Oneschuk 2010).

NTS 87-H/04 is underlain by stratigraphic units from the middle to upper Kilian Formation, Kuujjua Formation and Natkusiak Formation of the Shaler Supergroup. Together with diabase sills, the strata comprise the gently south-dipping northern limb of the Holman Island Syncline, whose axis lies along the southern edge of the map sheet. Exposures of the Kilian Formation (clastic-carbonate and tan carbonate members) are limited in the northern half of the map sheet area due to the recessive nature of the strata and the dominance of thick diabase sills that form a prominent southeast dip slope down to the Kuujjua River. The upper Kilian Formation, Kuujjua Formation and basal Natkusiak Formation, are best exposed along a prominent cuesta that faces north-norteast along the south side of the Kuujjua River. The Kilian generally is quite recessive but a good exposure of the tan carbonate member (nPK3) and upper evaporite member (nPK4) is located near UTM, 568071E, 7894971N. In most places within the map area, the basal contact of the Kuujjua with the upper evaporite member is poorly exposed, but at one locality (UTM, 556153E, 7890758N), it is a well developed erosional unconformity overlain by a thin, discontinuous, chert-cobble conglomerate. The conglomerate, in turn, is overlain by a green, parallel-stratified volcanic-lithic wacke, which passes upward into a dark green siltstone, that is interbedded with a cleaner (quartzose) sandstone, more typical of overlying crossbedded quartzarenite of the Kuujjua Formation. The underlying Kilian Formation strata at this location are strongly altered (chloritized with FeS staining) and drab (normally red), suggesting that deposition of the overlying strata was accompanied by introduction of reducing hydrothermal fluids. This important outcrop shows that volcanism, normally associated with the overlying Natkusiak Formation, was already active at the beginning of Kuujjua time. One of the thickest and best preserved sections of the Kuujjua Formation is exposed near the eastern end of the cuesta at UTM, 571404E, 7893899N (see section 86-22 of Rainbird, 1992 and section 4 of Jefferson, 1985). Other good exposures of the Kuujjua Formation are located at UTM, 565423E, 7893681N (section 86-18) and UTM, 564149E, 7884097N (section 86-14). The Kuujjua and Natkusiak formations are also well exposed along the flanks of two, north-flowing tributaries of the Kuujjua River. The contact between the two formations generally is planar and conformable but there are numerous places where soft-sediment deformation features are preserved in the underlying sandstone indicating that the sand was unlithified at the time of the main eruption (see Rainbird, 1993). As well, irregular fragments of basalt have been observed within the sandstone. The most complete exposures of the Natkusiak Formation are located at approximately UTM, 557694E, 7889062N and UTM, 564681E, 7885879N and are described in detail by Williamson at al. (2013). Members nPN1 and nPN3 are composed of basaltic flows and associated interflow deposits that are regionally distributed, but the intervening volcaniclastic nPN2 member is discontinuous and of variable thickness. It thins markedly from the central part of the map area toward the northwest and is absent in the western half of the map area. At least 5 diabase sills occur within the map area and generally are spaced at regular intervals within the host sedimentary rocks. The sills are of the type 2 (diabasic) described in the legend. Several steep, northwest-striking, mostly west-side down, normal faults are spaced evenly across the map area and are evident as prominent linear topographic lows. At approximately UTM, 542418E, 7894570N, the lineament coincides with a thin diabase dyke, suggesting that emplacement was coincident with faulting, a relationship that has been documented elsewhere in the region (Bédard et al., 2012). East-west block faulting, common in map areas to the north, is largely absent from NTS 87-H4.

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Coordinate System

Projection: Universal Transverse Mercator
Units: metres
Zone: 11
Horizontal Datum: NAD83
Vertical Datum: mean sea level

Bounding Coordinates

Western longitude: 116°00’00” W
Eastern longitude: 115°00’00” W
Northern latitude: 71°15’00” N
Southern latitude: 71°00’00” N

Data Model Information

This Canadian Geoscience Map does not conform to the Bedrock Mapping Geodatabase Data Model v.3.1.

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   ii upon written notice of termination by the Licensee at any time, and such termination shall take effect thirty (30) days after the receipt by Canada of such notice; or

   iii upon mutual agreement of the parties.

2. Upon the termination for whatever reason of this Agreement, the Licensee's obligations under section 4.0 shall survive; and the Licensee's rights under section 2.0 shall immediately cease.

3. Upon the termination for whatever reason of this Agreement, the Licensee shall delete or destroy all Data acquired under this Agreement immediately or within a reasonable timeframe where the Data is required to complete orders of Derivative Products made before the termination date of this Agreement.

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   This Agreement shall be construed and enforced in accordance with, and the rights of the parties shall be governed by, the laws of Ontario and Canada as applicable. The parties hereto attorn to the jurisdiction of the Superior Court of the Province of Ontario.

2. **Entire Agreement**

This Agreement constitutes the entire agreement between the parties with respect to its subject matter. This Agreement may only be amended in writing, signed by both parties, which expressly states the intention to amend this Agreement.

3. **Dispute Resolution**
   If a dispute arises concerning this Agreement, the parties shall attempt to resolve the matter by negotiation.

ACCORD DE LICENCE

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III. **ATTENDU QUE** le Canada déclare avoir la pleine autorité pour accorder les droits demandés par le Détenteur de licence, sous réserve des modalités énoncées ci-après;

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5. L'obligation du Détenteur de licence d'indemniser le Canada selon cet Accord ne peut affecter ni empêcher le Canada d'exercer tout autre droit selon la loi.

5.0 DURÉE

1. Cet Accord entre en vigueur à partir de la date et de l'heure d'acceptation des modalités de l'Accord (Heure de l'Est) et restera en vigueur pour une période d'un (1) an, en vertu de la sous-section 5.2 et de la section 6.0 qui suivent.

2. À la fin du premier terme, cet Accord sera automatiquement renouvelé pour des termes successifs d'un (1) an, en vertu de la section 6.0 qui suit.

6.0 RÉSILIATION

1. 6.1 Nonobstant la section 5.0, cet Accord peut être résilié :

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   ii. par un préavis écrit de résiliation émis par le Détenteur de licence, en tout temps, et cette résiliation prendra effet trente (30) jours suivant la réception d'un tel préavis par le Canada; ou

   iii. par consentement mutuel des parties.

2. Lors de la résiliation de cet Accord, pour quelque raison que ce soit, les obligations qui incombent au Détenteur de licence en vertu de la section 4.0 continueront de s'appliquer et les droits du Détenteur de licence en vertu de la section 2.0 cesseront immédiatement.

3. Lors de la résiliation de cet Accord, pour quelque raison que ce soit, le Détenteur de licence devra immédiatement effacer ou détruire toutes les Données obtenues en vertu de cet Accord, ou à l'intérieur d'un délai raisonnable lorsque les Données sont nécessaires pour terminer la livraison de Produits dérivés commandés avant la résiliation de cet Accord.

7.0 GÉNÉRAL

1. **Lois d'application**
   Le présent Accord est régi et interprété en vertu des lois en vigueur dans la province de l'Ontario. Les parties acceptent de tomber sous la juridiction de la Cour supérieure de la Province de l'Ontario.

2. **Totalité de l'Accord**
   Le présent Accord constitue l'intégralité de l'entente conclue entre les parties relativement à l'objet du présent Accord. Toute modification à cet Accord ne peut être que par écrit, doit porter la signature de chaque partie et exprimer clairement l'intention de modifier cet Accord.

3. **Solution des litiges**
   Si un litige survient à propos de cet Accord, les parties tenteront de le résoudre par des négociations de bonne foi.