

NATURAL RESOURCES CANADA - INVENTIVE BY NATURE

Completing the bedrock mapping of southern Baffin Island: stratigraphic, structural and geophysical context for the mafic-ultramafic Frobisher suite

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The Geo-mapping for Energy and Minerals (GEM) program:

- provide modern public geoscience
- support evidence-based exploration for new mineral and energy resources
- enable northern communities to make informed decisions about their land, economy and society

Southern Baffin Island project initiated in 2014:

- portions of southern Baffin Island represent some of the last major missing tectonic pieces in our understanding of Nunavut geology
- targeted bedrock tectonostratigraphic, geochronological, structural, petrological and geophysical studies would largely resolve this uncertainty







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Scientific Questions:

- Does the Lake Harbour Group
 metasedimentary assemblage and it's
 suite of mafic-ultramafic sills previously
 mapped on southern Baffin Island
 extend east onto Meta Incognita
 Peninsula and north onto Hall
 Peninsula and if so, what are the
 implications for the present architecture
 and past assembly of Baffin Island?
- Does the Archean Hall Peninsula Gneiss Complex (host to the Chidliak diamond district) extend south onto eastern Meta Incognita Peninsula or west on western Hall Peninsula?
- How does the geology of Hall Peninsula match that of the Cumberland Peninsula and does a Paleoproterozoic tectonic suture (Baffin suture) separate these two areas?





Summer 2014: **Completing the mapping** of Meta Incognita Peninsula

- four weeks of field work
- based out of Iqaluit
- team of 9 including cook and helicopter crew
- partnered between GSC, **CNGO, AANDC, PCSP and** the University of Ottawa



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CANADIAN GEOSCIENCE MAP 215E

OPEN FILE MAP 2015-02E

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100:000 scale maps: released 14 April 2015 (Nunavut Mining Symposium)

Free download http://geoscan.nrcan.gc.ca http://cngo.ca/







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









Document

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Plutonic rocks of Meta Incognita Peninsula

- tan weathering to a pink sugary texture
- Bt-Opx-HbI-IIm to Bt-Mag bearing
- massive to well foliated
- equant to megacrystic
- diorite enclave rich to absent



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- 1.87 Ga to 1.84 Ga crystallization ages
- local 1.89 Ga inheritance
- field and geochronology document no equivalent to the Archean Gneiss Complex on Hall Peninsula (present erosion levels)



Summer 2015: completing the mapping of Baffin Island south of latitude 70°N

- eight weeks of field work
- based out of Iqaluit and a temporary field camp
- team of 13 including cook and helicopter crew
- partnered between GSC, CNGO, PCSP, University of Oxford, Carleton University and Nunavut Arctic College
- with...



Consultation and engagement

- community engagement visits successfully completed in March 2015
- project permits and licences acquired prior to the start of field work in mid-June 2015

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Taukie Qappak Chairperson. Innamariit Piqusingit PO Box 603 Pangnitting, NU X0A 0R0

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Ms. Qappik Jf

a>4n. 4. 2015

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SCIENTIFIC RESEARCH LICENCE APPLICATION LAND, FRESHWATER & MARINE BASED RESEARCH

mends that applicants review the following documents prior to submitting an NRI strongly reco application: Scientific Research Licencing Guidelines and Negoliating Research Relationships in Inuit Communities: A Guide for Researchers. For more information about the Nunavut Research Institute (NRI) please visit our web site <u>www.nri.nu.ca</u>

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low impact, small footprint, temporary field research camp



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on-the-job, in-the-field training of Nunavut Arctic College students



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Summary of Activities 2015



glacial valley west of Chidliak Bay

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GEOLOGICAL SURVEY OF CANADA OPEN FILE 7953

2015 Report of Activities for Completing the Regional Bedrock Mapping of the southern half of Baffin Island: GEM 2 Baffin Project

N.M. Rayner, M.R. St-Onge, O.M. Weller and V. Tschirhart

2015

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NADIAN GEOSCIENCE MAP 260 OPEN FILE MAP 2016-17 MCKEAND RIVER (SOUTH)



Seconda Resources Resources CANADIAN GEOSCIENCE MAP 255E OPEN FILE MAP 2016-12E AMITTOK LAKE (NORTH)







Sylvia Grinnell Lake -**Clearwater Fiord outputs:**

- 18 aeromagnetic maps
- 10 bedrock geologial maps
- 7 field reports (SOA & GEM)



released 5 April 2016 http://geoscan.nrcan.gc.ca or http://cngo.ca/





Sylvia Grinnell Lake – **Clearwater Fiord outputs:**

- PDF of the bedrock geology map
- related map information document (descriptive notes)
- a full digital release package with GDB and MXD files
- lithological and sample point data



Sylvia Grinnell Lake – **Clearwater Fiord outputs:**

- Inuktitut version of published map
- Inuktitut version of map information document (descriptive notes)
- pilot project to continue gauging uptake

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http://geoscan.nrcan.gc.ca or http://cngo.ca/

Metasedimentary rocks of Hall Peninsula: Lake Harbour and Piling groups

Detrital zircon ages (SHRIMP)



- emplaced in the metasedimentary rocks of the Lake Harbour Group
- leucogabbro tops with locally well-developed subophitic texture
- cm- to metre-scale rhythmic layering in metagabbro defined by the amount of hornblende, clinopyroxene and plagioclase
- ultramafic rocks
 layered at the cm- to
 metre-scale defined
 by amount of
 pyroxene, talc, and
 derivatives of olivine
- gossans and local ferricrete in host strata
- disseminated sulphides including chalcopyrite



ferricrete below ultramafic sill

Phase diagram for monzogranite









- Preliminary 1.86 Ga crystallization age for megacrystic monzogranite
 - 1.89 Ga inheritance

Plutonic rocks

- range in composition from metagabbro to leucogranite
- variably Bt-Opx-Hbl-Grt-Mag-IIm bearing
- clear cross-cutting relationships
 - aeromagnetic signature related to mineralogy via phase diagram modelling







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15SAB-W066

Hall Peninsula **Gneiss Complex**

- Bt-Hbl-Mag tonalite to monzogranite
- massive to gneissic; locally enclave-rich
- dated between 3.21 -2.68 Ga
- host to Chidliak diamond field
- western margin thrust-imbricated
- constrained at depth with geophysical forward modelling





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- known occurrences and new ones documented on the published maps
- visit by the Government of Nunavut Department of Economic Development and Transportation (GN-EDT) carver/geologist evaluation team







Conclusions

Field work in 2015, covering 49,855 km², completed the partnered CNGO /GSC objective to update the bedrock coverage of Baffin Island south of latitude 70°N.
 Initiative was started in 1995 and supported by various programs including NRDP, GEM1, GEM2 and SINED.

 Documented a regional suite of layered mafic to ultramafic sills in the SGL – CF area that are intrusive into metasedimentary strata correlated with the middle Paleoproterozoic Lake Harbour Group. Many bodies contain disseminated sulphide, some associated with gossan or ferricrete.

 Constrained the 3-D geometry of the western margin of the Hall Peninsula Gneiss Complex, host to the Chidliak diamond field, both in map view and at depth. Margin characterized by spectacular thick-skinned thrust imbricates of Archean basement and Paleoproterozoic cover.

Followed by publication of *full digital release packages (GDB and MXD files)* for 10 maps, as well as Inuktitut versions, therefore delivering *meaningful* results, and communicating these results in a *meaningful* way to northern Canadians.





Thank you • Merci • Nakurmiik



Acknowledgements



Pierre Brouillette (GSC-Québec) **Guy Buller (GSC-Ottawa)** Kate Clark (GSC-Ottawa) Nathalie Côté (GSC-Québec) Sonya Dehler (GSC-Halifax) **Dave Everett (GSC-Ottawa)** Eleanor Everett (GSC-Ottawa) Angela Ford (GSC-Ottawa) **Celine Gilbert (CNGO)** Debbi Guilfoyle (Kelowna) **Rosemarie Khoun (GSC-**Ottawa) Annick Morin (GSC-Québec) Louis Robertson (GSC-

Ottawa)







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