

Natural Resources Ressources naturelles

## INTRODUCTION



t of this poster reports preliminary results of the GEM-2 Thelon tectonic which undertook field work and laboratory studies in 2014.

## **1. GEOCHRONOLOGY**



25 U-Pb zircon crystallization ages were obtained across the region (Davis et al., 2013, 2014), complementing data near and along the coast of Queer Maud Gulf (Figs. 2, 3: Schultz et al., 2007: Tsermette, 2012). These data. combined with Nd isotopic data and aeromagnetic data (Fig. 2: regional and a high resolution across the transect) define 5 distinct crustal age domains ( 3) Voluminous 2.6 Ga granitic rocks of the western Rae craton have not been soarchean domain. This suggests its accretion to the Rae after 2.6 Ga, but before ca, 2.5 Ga, the age of a granitoid suite (Qmg) which intrudes both domains. This conclusion supports the convergent tectonic setting at ca. 2.54 Ga interpreted from monazite dating of deformation fabrics on Boothia and Melville peninsulas (Fig. 1; Berman et al., 2008, 2015).



Nd model ages & crustal age domains (with magnetic subdivisions

# **CHANTREY TRANSECT**



the adjacent metamorphic map (Fig. 5; Berman et al., 2013). crustal reworking during the Thelon orogeny

**ECONOMIC POTENTIAL** 2.0-1.9 3.2-3.0 Cu Aqua Regia Cu (ppm) • 0.30 - 2.37
Ni Aqua Regia Ni (ppm) Sanctuary Olivine grains (/10 kg) ● 1-10 ▲ none

### **Base metal potential**

Till heavy mineral analyses show a strong correlation between olivine and Mesoarchean block samples (Fig. 6). The lack of other mantle xenolith indicators and Fe/(Fe+Mg) between 0.5-0.8 indicate a mafic magmatic source. Proximity to the Perry River Cu-Ni showings and N-directed glacial transport determined from surficial study, indicate that potential mafic-ultramafic host rocks are much more abundant than previously recognized. A preliminary age of ca. 2.35 Ga for a gabbro from the Perry River prospect (Fig. 6) raises the possibility that a widespread mafic underplate occurred during the waning stages of the Arrowsmith orogeny (see above).

Till chemistry (Fig. 7) shows that base metals are elevated in most samples from the Mesoarchean domain, and a gossan developed in metapsammitic rocks returned 660 ppm Ni. Base and precious metals also show a number of locations east of the Chantrey fault and in the Thelon tectonic zone with elevated potential.

## References

Berman, R.G., Ryan, J.J., Davis, W.J., and Nadeau, L., 2008. GSC Current Reseach 2008-2. Berman, R.G., Davis, W.J., Corrigan, D., and Nadeau, L., 2015. GSC Current Reseach 2015-4. Berman, R.G., Sandeman, H.A.I., and Camacho, A., 2010. J. Metamorphic Geology 28, 439-457. Berman, R.G., Pehrsson, S., Davis, W.J., Ryan, J., Qiu, H., and Ashton, K.E., 2013. Precambrian Research 232, 44-59.

Chacko, T., De, S.K., Creaser, R.A., and Muehlenbachs, K., 2000. Canadian J. Earth Sciences 37, 1597–1609

Davis, W., Berman, R.G., and MacKinnon, A., 2013. GSC Open File 7409. Davis, W.J., Berman, R.G., Nadeau, L., and Percival, J.A., 2014. GSC Open File 7652. Frith, R.A. and van Breemen, O., 1990. GSC Paper 89-2, 49-54.

## New insights into the geological evolution and economic potential of the Thelon tectonic zone and western Rae craton, Nunavut

R.G. Berman, L. Nadeau, W.J. Davis, M.W. McCurdy, J.A. Craven, I. McMartin, J.B. Whalen, M. Sanborn-Barrie, S. Carr, S.J. Pehrsson, J.A. Percival, É. Girard

Monazite and zircon geochronology (Fig. 4) indicate 4 main metamorphic episodes at: 1) ca. 2.5 Ga, spatially associated with ca. 2.5 Ga granitic plutonism (QMg; Schultz et al., 2007); 2) ca. 2.35 Ga, extending across the width of the Mesoarchean domain; this dominant phase of the Arrowsmith orogeny may reflect collision of the Slave craton prior to the Thelon orogeny (Schultz et al., 2007) or with another unknown block. The current extent of the Arrowsmith orogeny is shown in

3) ca. 1.91 Ga. across the Thelon tectonic zone and adjacent Mesoarchean crust, with thermal effects extending east to the Sherman basin; this period appears to reflect the dominant time of

4) ca. 1.84 Ga, in the Rae craton east of the Chantrey fault, thought to reflect ca. 1.87 Ga collision of Meta Incognita microcontinent with the southeast flank of the Rae (Berman et al., 2010)











2.15 Ga detrital zircon populations are known from the Queen Maud block and southwestern Rae (Fig. 1), linking the basin to sources associated with the western Rae margin. The tectonic setting of the volcanic rocks is the subject of ongoing work. Their age is coincident with the timing of <1.97 Ga foredeep sedimentation in the adjacent Kilihigok basin (Tirrul & Grotzinger, 1990), potentially indicating development of a syn to late-collision, extensional basin within the Thelon orogen.

McCurdy, M.W., Berman, R.G., Kerr, D.E., and Vaive, J.E., 2013. GSC Open File 7471. Hoffman, P.F., 1988. Annual Reviews Earth and Planetary Sciences 16, 543–603. McMartin, I., Normandeau, P., Berman, R.G., and Percival, J., 2013. GSC Open File 7418. Schultz, M.E.J., Chacko, T., Heaman, L.M., Sandeman, H.A., Simonetti, A., and Creaser, R.A., 2007. Geology 35, 707–710.

# THELON TECTONIC ZONE

2014 suggests the major anomaly in 76H is associated with ultramafic volcanic rocks now dated at 1.95 Ga (Fig. 9). This region also shows anomalies in heavy minerals from stream sediment and till samples (McCurdy et al. 2013; McMartin et al. 2013). It occurs in a structurally complex zone associated with a shallow high conductivity (sulphide-rich?) region beneath the surface (see Fig. 12).

old c Her Majesty the Queen in Right of Canada, as represented by the Minister of Natural Resources Canada, 2015

Thériault, R.J., Henderson, J.B., and Roscoe, S.M., 1994. Geol. Surv. Canada Current doi:10.4095/296719 Tirrul, R. and Grotzinger, J.P., 1990, Tectonics 9, 1015-1036.

Tsermette, D., 2012. M. Sc. Thesis, Univ. of Alberta, Edmonton, Alberta, 161 pp.

Research 1994-F. 37-42.

This publication is available for free download through GEOSCAN (http://geoscan.nrcan.gc.ca/).



anomaly is sourced in a region with metamorphosed iron formation at high grade, suggesting a similar source rock to some of the economic lode gold deposits in the Churchill and Slave cratons.

Recommended citation Berman, R.G., Nadeau, L., Davis, W.J., McCurdy, M.W., Craven, J.A., McMartin, I., Whalen, J.B.,

OPEN FILE DOSSIER PUBLIC Publications in this se have not been edited; they are released as 7901 GEOLOGICAL SURVEY OF CANADA COMMISSION GÉOLOGIQUE DU CANADA elles sont publiées telles 2015 que soumises par l'auteur.

Sanborn-Barrie, M., Carr, S., Pehrsson, S.J., Percival, J.A., and Girard, E., 2015. New insights into the geological evolution and economic potential of the Thelon tectonic zone and western Rae craton, Nunavut; Geological Survey of Canada, Open File 7901, 1 poster. doi:10.4095/296719