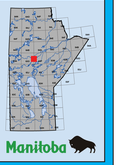
The Paint sequence: A new Paleoproterozoic supracrustal sequence in the Thompson Nickel Belt, Manitoba

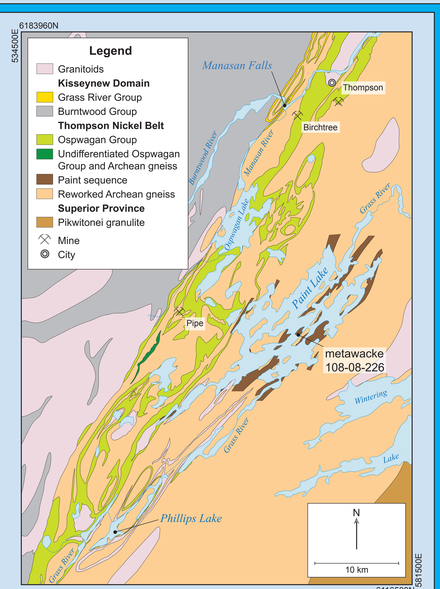
C.G. Couëslan



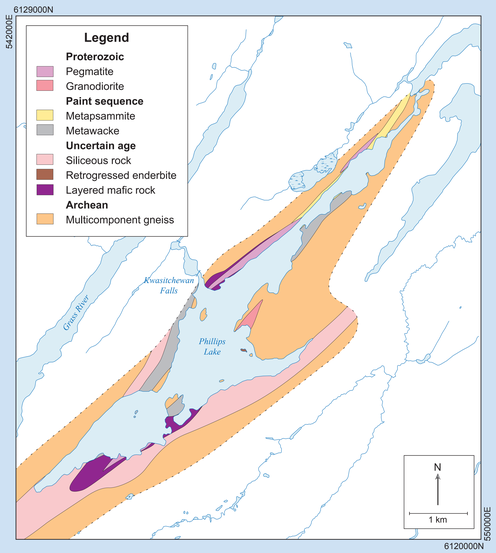
Summary

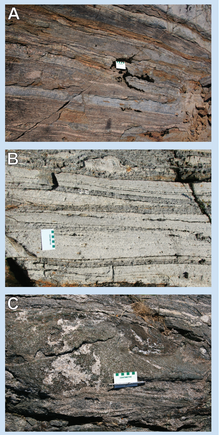
Recent mapping in the Paint Lake, Phillips Lake, and Manasan Falls areas have resulted in the recognition of at least one new metasedimentary succession in the Thompson Nickel Belt (TNB). Rocks of the Paint sequence consist largely of metawacke and metapsammite with subordinate meta-iron formation, metapelite and calcareous rocks. The Paint sequence occurs along the eastern boundary of the TNB with known exposures stretching from Phillips Lake in the south to north of Paint Lake. A possibly related supracrustal succession is present at Manasan Falls that includes a gradational sequence of mafic rocks and siliceous metasedimentary rocks. Neodymium-model ages for metawacke samples of the Paint sequence range from ca. 3.57 to 3.22 Ga, which is generally older than Ospwagan Group model ages of ca. 3.22–2.82 Ga; however, two samples of metawacke from Manasan Falls yielded Nd-model ages of ca. 3.08 and 3.12 Ga. Orthopyroxene-bearing leucosome in metawacke at Paint Lake has previously been interpreted to be the result of Archean metamorphism, but U–Pb ages of metamorphic monazite suggest that the leucosome formed after ca. 1806 Ma. Preliminary U–Pb ages from what are interpreted to be detrital zircons range from ca. 2850 to 2060 Ma suggesting that the Paint sequence was deposited in the Paleoproterozoic rather than the Neoarchean.

Sulphidic Ospwagan Group rocks hosting ultramafic intrusions are one of the major exploration targets for nickel in the TNB. Similarities between the Ospwagan Group and rocks of the Paint sequence include the presence of siliceous horizons and meta–iron formation, along with local horizons of metapelite and calcareous rocks. These similarities could allow for the misidentification of Paint sequence rocks for the more economically prospective Ospwagan Group rocks. Alternatively, the Paint sequence, if found to host mineralization, could represent a new exploration play for the TNB.



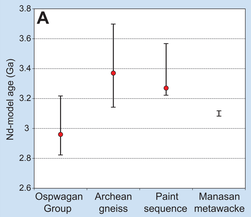
Phillips Lake





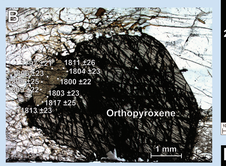
A) Paint sequence metawacke with typical light gossan stain and leucosome that is subparallel to layering. B) Metapsammite with interbeds of metawacke. C) Layered mafic rock, compositional layering is subparallel to the pen. The relationship of the layered mafic rock to the Paint sequence is not known.

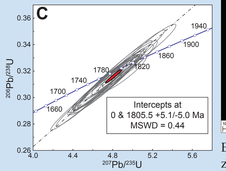
Paint sequence geochronology



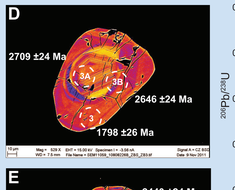
A) Range of Nd-model ages obtained from Ospwagan Group rocks (3.22–2.82 Ga, n=28)[1], Archean gneiss (3.70–3.14 Ga, n=18)[1], Paint sequence metawacke (3.57–3.22 Ga, n=5)[1,2], and Manasan Falls metawacke (3.12–3.08 Ga, n=2)[1,2]. Dots indicate the median age from each group. The range of Nd-model ages calculated for the Paint sequence appears to be comparable to model ages calculated for the Archean gneisses of the TNB rather than the Ospwagan Group. The Nd-model ages for metawacke from Manasan Falls is similar to model ages calculated for known Ospwagan Group rocks.

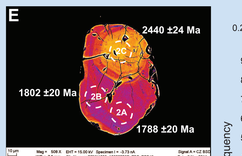
[1]Böhm, C.O., Zwanzig, H.V. and Creaser, R.A. 2007: Sm-Nd isotope technique as an exploration tool: delineating the northern extension of the Thompson Nickel Belt, Manitoba, Canada; Economic Geology, v. 102, p. 1217–1231.
[2]Couëslan, C.G. in press: The Grass River project: geological mapping at Phillips Lake, and new geochronological results from Paint Lake and Manasan Falls, Thompson Nickel Belt, central Manitoba (parts of NTS 63O1, 8, 9, 63P5, 12); in Report of Activities 2012, Manitoba Innovation, Energy and Mines, Manitoba Geological Survey.



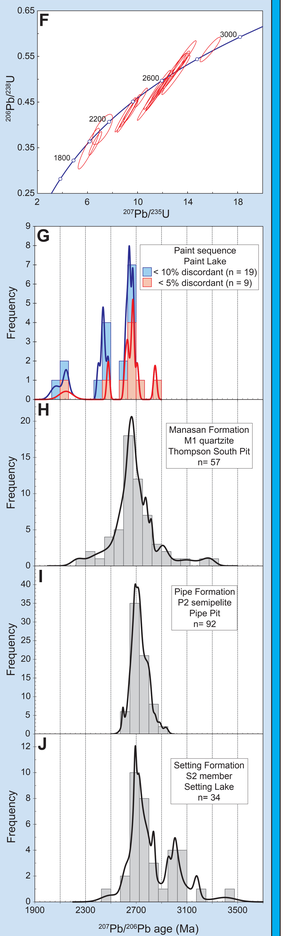


B) Image of monazite from sample 108-08-226A. The monazite grain occurs within a segregation of leucosome and is partially overgrown by orthopyroxene. Research on monazite stability suggests the monazite likely pre-dates the partial melting of the rock. U–Pb data obtained by LA–MC–ICP–MS. C) Concordia diagram of analyzed monazite in thin section of sample 108-08-226A. The upper discordia intercept suggests monazite growth at 1805.5 +5.1/-5.0 Ma.





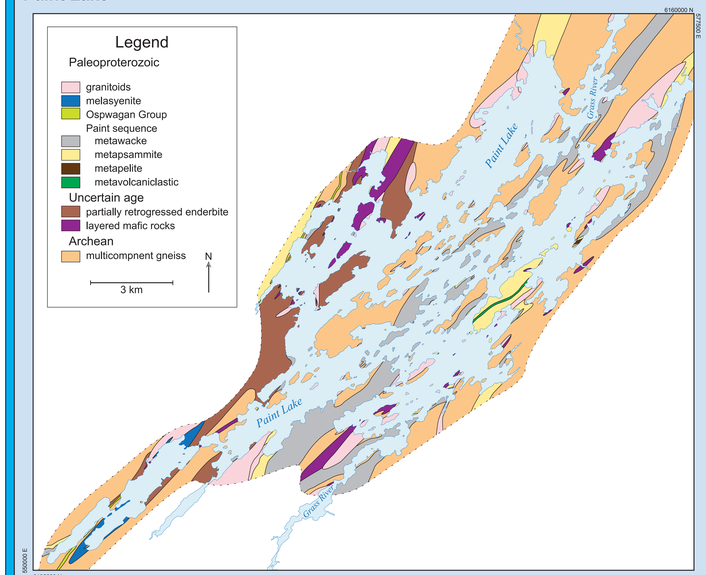
Backscattered electron images of zircon in metawacke from Paint Lake: D) zircon 3, sample 108-08-226B, analyses 3A is of detrital zircon (zoned core), analyses 3B is a mixed age and includes both detrital and metamorphic zircon, and analysis 3C is of metamorphic zircon (homogeneous rim); E) zircon 2, sample 108-08-226G, analysis 2C is of a detrital core, while analyses 2A and 2B are of a metamorphic overgrowth. U–Pb data obtained by LA–MC–ICP–MS, $^{207}Pb/^{206}Pb$ ages are cited at 2σ confindence level.

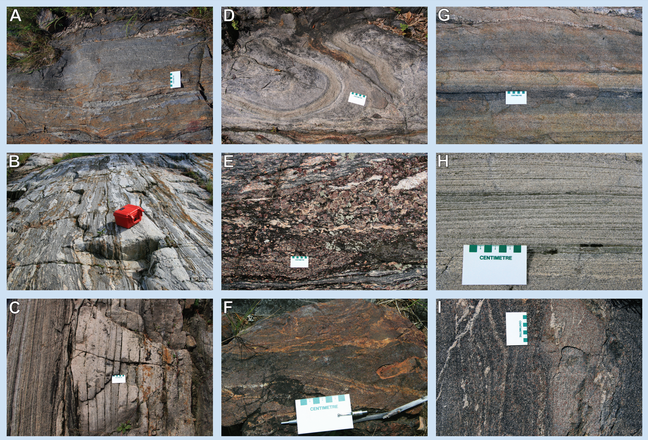


F) Concordia diagram of detrital zircon analysed from Paint sequence metawacke 108-08-226A–G that are < 10% discordant. G) Age histogram for detrital zircons from Paint sequence metawacke. Data plotted in blue represents detrital zircon analyses that are < 10% discordant, data plotted in red is < 5% discordant. Age histograms for detrital zircons from Ospwagan Group rocks plotted for comparison: (H) Manasan Formation M1 quartzite[3]; I) Pipe Formation P2 semipelite[4]; J) Setting Formation S2 member[3].

[3]Bernham, O.M., Halden, N., Layton-Matthews, D., Lesher, C.M., Liwanag, J., Heaman, L., Hulbert, L., Machado, N., Michalak, D., Pacey, M., Peck, D.C., Petrel, A., Theyer, P., Toope, K. and Zwanzig, H. 2009: CAMIRO Project 97IE-02, Thompson Nickel Belt: final report March 2002, revised and updated 2003; Manitoba Science, Technology, Energy and Mines, Manitoba Geological Survey, Open File OF2008-11, 434 p., 1 CD-ROM.
[4]Rayner, N., Zwanzig, H.V. and Percival J.A. 2006: Analytical data for sample 7798, Pipe Formation, Pipe II pit and sample 8422, Pipe Formation, Thompson mine, 2500-foot level; Manitoba Science, Technology, Energy and Mines, Manitoba Geological Survey, Data Repository Item DIG2006004, Microsoft® Excel® file.

Paint Lake



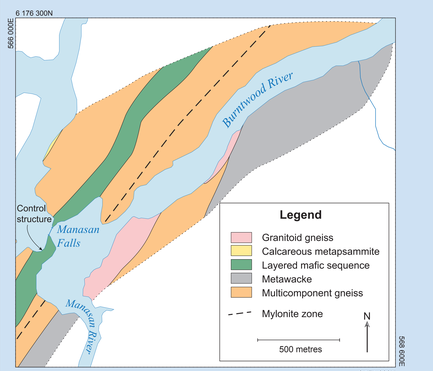


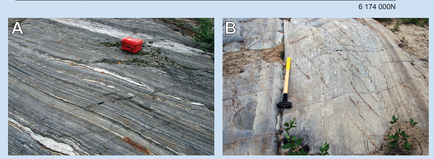
A) Paint sequence metawacke with light gossan stain. B) Intensely deformed and migmatized metawacke. C) Interbedded metawacke and metapsammite.

D) Paint sequence metapsammite with garnet-rich "concretions". Thin interbeds of metapelite are present at the bottom and upper center of the photo. E) Thick bed of very coarse-grained metapelite. F) Gossanous meta-iron formation from central Paint Lake.

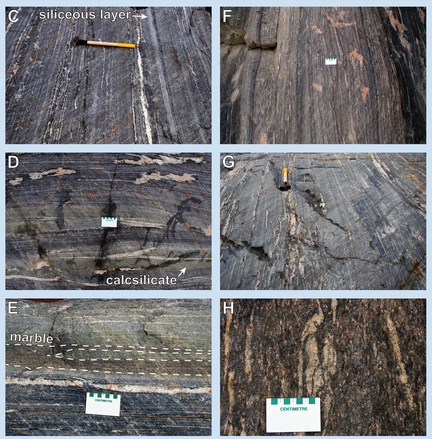
G) A possible banded metavolcaniclastic layer occurs enclosed in Paint sequence metapsammite, east-central Paint Lake. H) Laminated calcareous metapsammite. I) Garnet-bearing layered mafic rock from west-central Paint Lake. The relationship between the layered mafic rock and the Paint sequence is not known.

Manasan Falls





A) Metawacke and B) calcareous metapsammite from Manasan Falls which are texturally and mineralogically similar to those mapped at Paint Lake as part of the Paint sequence.



C) Layered mafic rock at Manasan Falls. The layered mafic rocks are part of the same sequence as the metasediments; however, it is unknown if they are equivalent to the mafic rocks at Paint and Phillips lakes. Siliceous layers occur locally and D) calcsilicate layers are common. E) Rare marble layers are associated with the calcsilicate bands.

F) Towards the southeast the layered mafic rocks become interbanded with semipelite and metawacke similar to A). G) Towards the northwest the layered mafic rocks grade into siliceous sediment over ~15 meters. H) The siliceous sediment then grades into metapelite over ~ 2 meters.