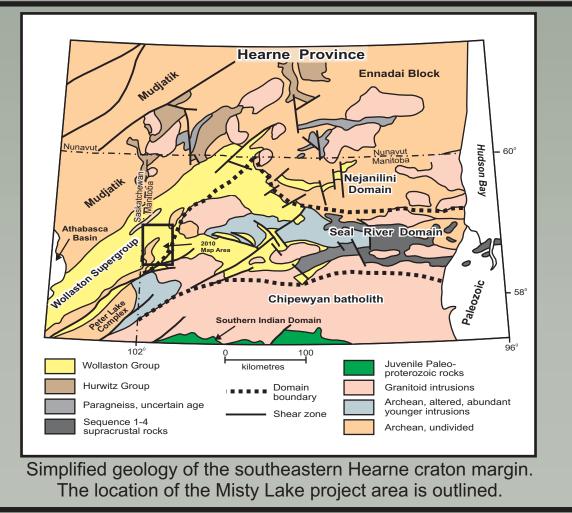


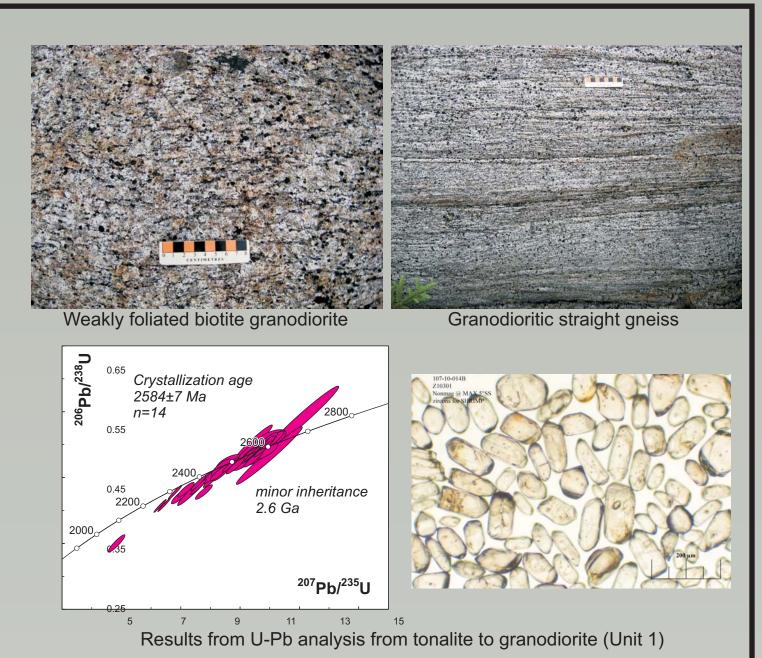
Introduction

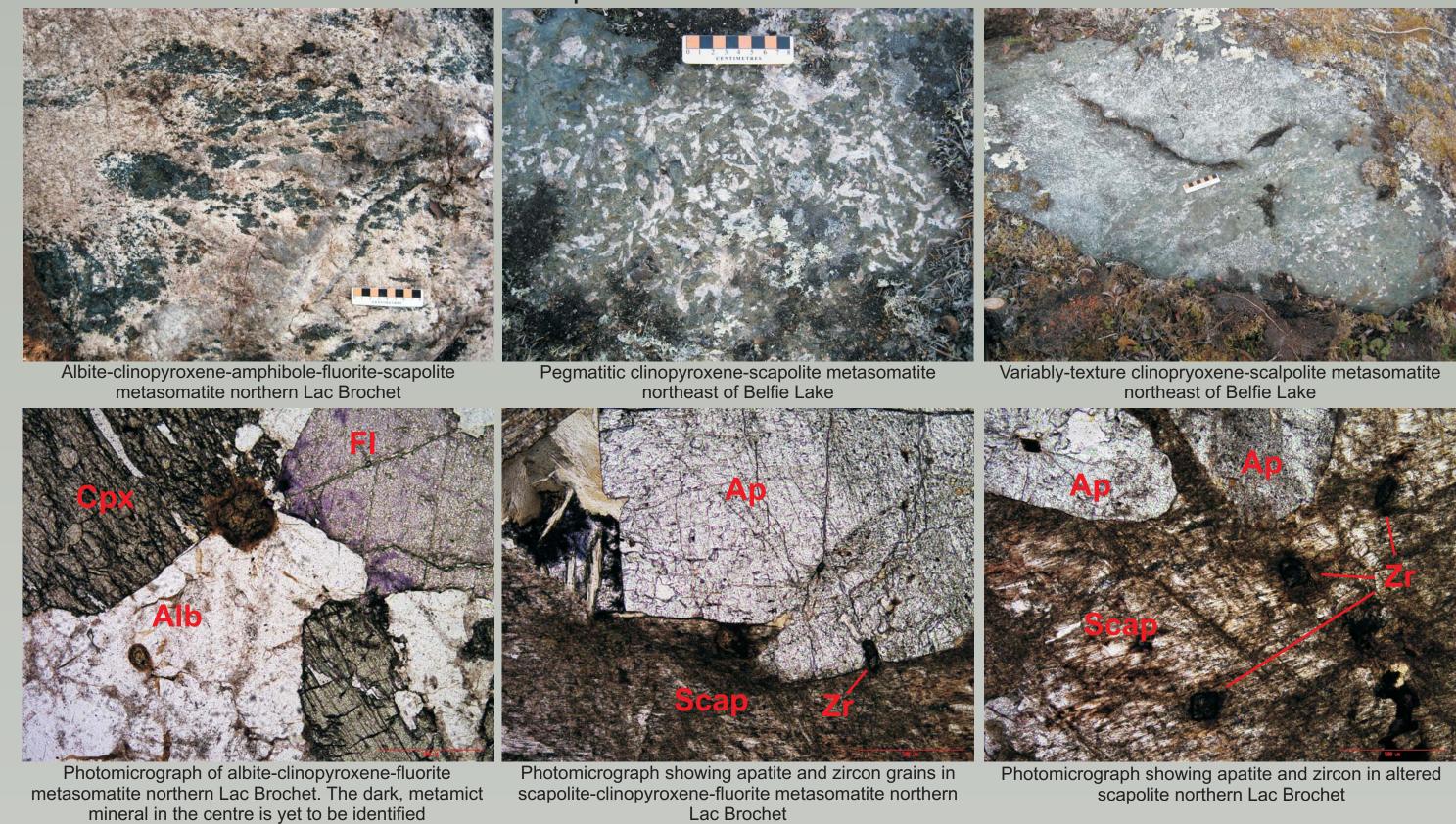
Six weeks of bedrock geological mapping was conducted in the Misty Lake area of northwestern Manitoba as part of the Manitoba Geological Survey's Far North Geomapping Initiative. The Misty Lake area is dominated by metasedimentary rocks of the Wollaston Supergroup. The Wollaston Supergroup is interpreted as an evolving rift passive margin - foreland basin deposited on the southeastern margin of the Hearne craton ca. 2.1-1.9 Ga.



Basement rocks

Inliers of Archean rocks of the southeastern Hearne margin are infolded with metasedimentary rocks of the Wollaston Supergroup throughout the Wollaston Domain. In the Misty Lake area, variably foliated to locally gneissic leucotonalite to granodiorite (Unit 1) forms the core of a large structural dome in central Misty Lake that extends southwest towards Waspison Lake. A sample collected for geochronology indicates a crystallization age of 2584 ± 7 Ma. This data is consistent with similar data collected in Saskatchewan for Archean rocks of the Hearne margin.



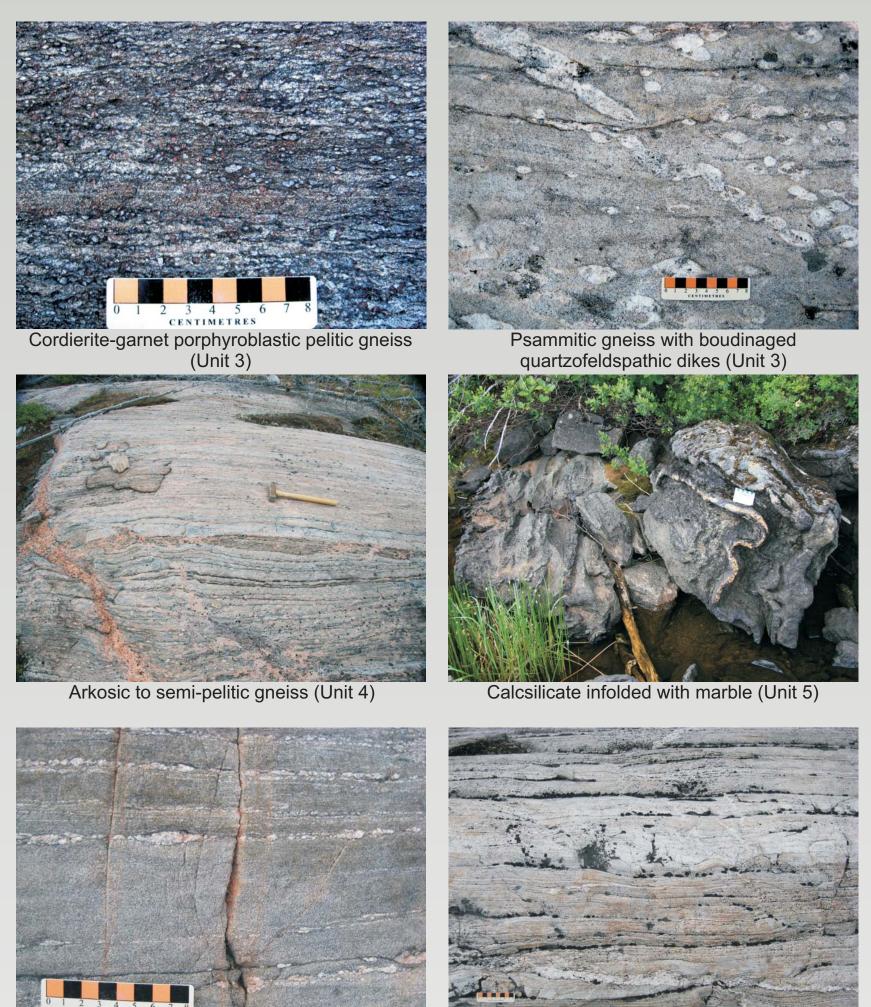


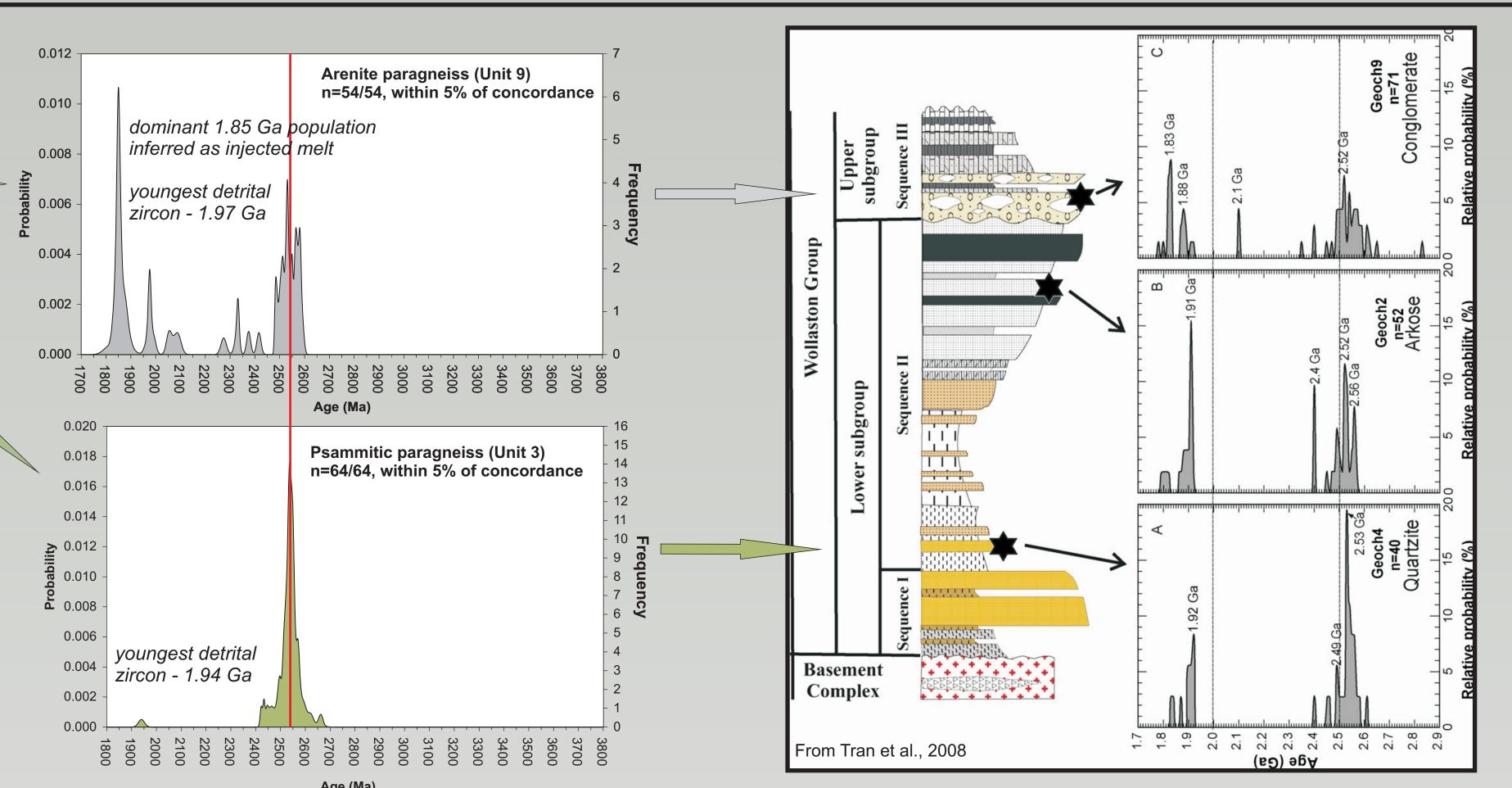
Wollaston Supergroup

Metasedimentary rocks of the Wollaston Supergroup exposed in the Misty Lake area include:

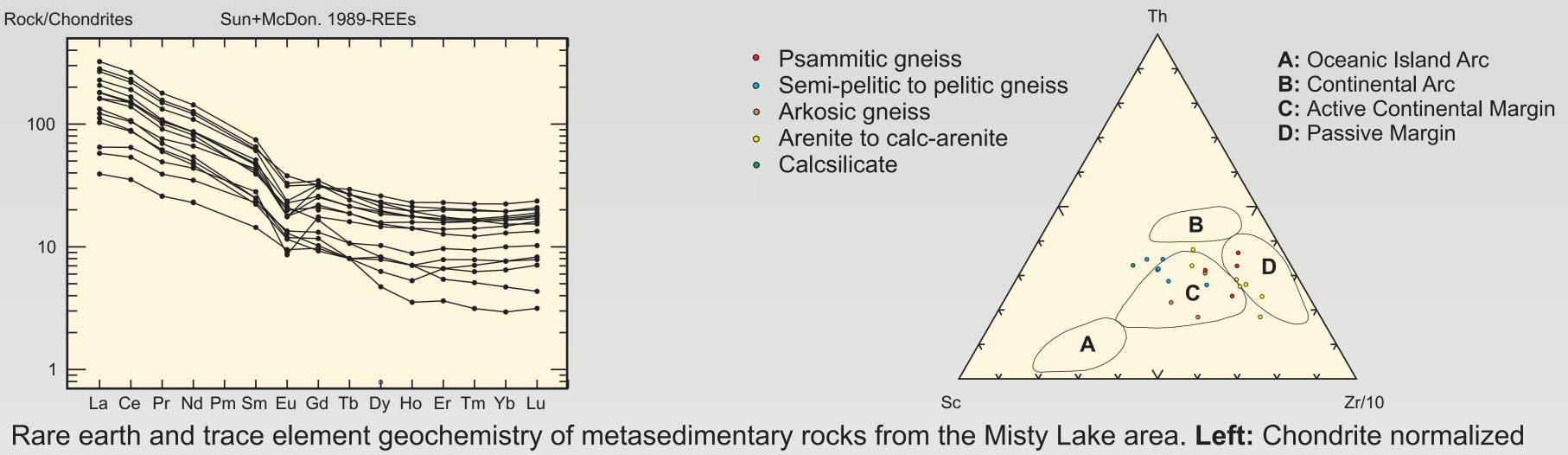
- arenite to calcareous arenite, minor calcsilicate (Unit 9)
- psammitic biotite gneiss (Unit 6)
- calcsilicate and marble (Unit 5)
- arkosic to semipelitic cd porphphyroblastic gneiss (Unit 4) - psammitic to pelitic, gt-cd-sil porphyroblastic gneiss
- (Unit 3)

The metasedimentary rocks in the Misty Lake area are petrographically similar to and are likely correlative with Sequence II (and possibly Sequence III) rocks of Tran et al., 2008 (Daly Lake and Geikie River Groups respectively of Yeo and Delaney, 2007).





Comparison of geochronological analyses from the Wollaston Supergroup in the Misty Lake area (left) and in Saskatchewan (right). Psammitic rocks in Misty Lake correlate well with results from Sequence II of Tran et al., 2008 (Daly Lake Group of Yeo and Delaney, 2007). A sample of arenite collected from Misty Lake is most similar to Sequence III of Tran et al., 2008 (Geikie River Group of Yeo and Delaney, 2007).



REE spider diagram. Right: Sc-Th-Zr trace element discrimination diagram (after Bhatia and Crook, 1986)

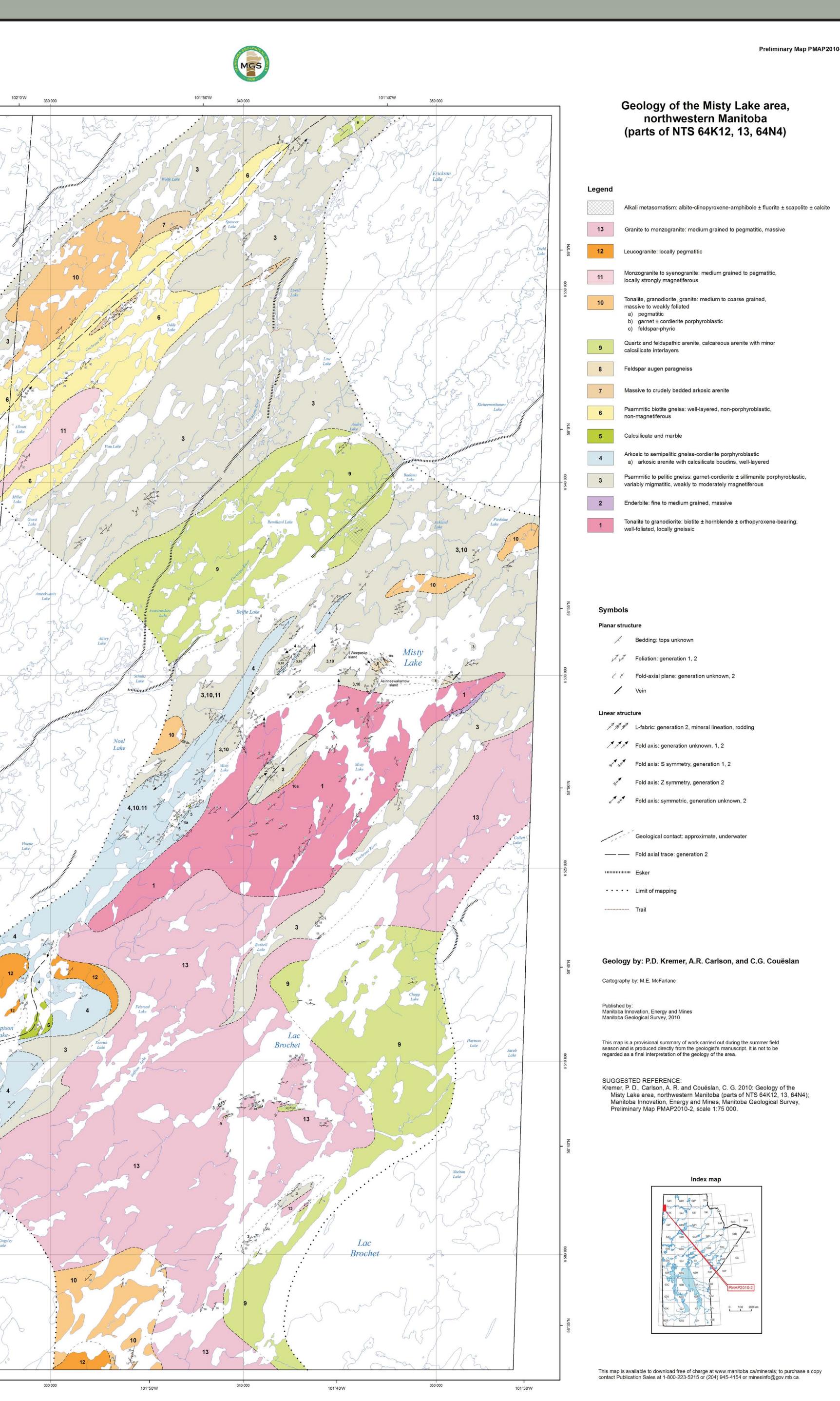
Far North Geomapping Initiative: Preliminary Results From Geological Mapping in the Misty Lake Area, Northwestern Manitoba

Metasomatites

Zones of moderate to intense alkali metasomatism were identified throughout the map area. the zones are characterized by partial to complete replacement of host rock types (metasedimentary and granitic rocks) by a medium- to coarse-grained assemblage of albite-clinopyroxene-amphibole ± fluorite ± scapolite ± calcite. Accessory minerals are locally abundant in metasomatic phases, including titanite, zircon, and occasional clusters of a black, equant to prismatic mineral surrounded by radial fractures that has a pitchy to resinous lustre and appears to be metamict. Chemically, metasomatites are marked by U and Th levels four to five times background values, and minor HREE enrichment relative unmetasomatized equivalents

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Generation	Structural Elements
D ₁	 rarely preserved and transposed F₁ folds
	• compositional layering (composite S ₀ -S ₁ foliation)
D ₂	• NE-trending, shallowly to moderately NE and SW plunging,
	tight to isoclinal, upright folds (F ₂)
	 weakly to moderately developed S₂ foliation
	• peak metamorphism: porphyroblast growth and anatexis
D ₃	• NW-trending, gentle to open folds (F ₃)
	• rare kink bands
$F_{1} \text{ isoclinal folds in metasedimentary} \\ \textbf{s. Bedding is transposed into composite } \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{0}-\textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{1} \text{ fabric on limb (top of photo)} \\ \textbf{s}_{1} fabr$	$F_{x} \text{ fold in metasedimentary rocks with granitic lits, which are thickened in the hinge zone and attenuated on the limbs.}$

Left: Psammitic to semi-pelitic gneiss (Unit 3). The observed metamorphic assemblages is highlighted in blue and suggests peak metamorphic conditions of ~ 750–850 °C and 4.5–6.5 kbar. **Centre:** Potassium feldspar porphyroblastic arkosic biotite gneiss (Unit 8). The observed metamorphic assemblage is highlighted in red and suggests peak metamorphic conditions of ~ 750–800 °C and 3.5–6.0 kbar.

Right: Overlapping the two calculated equilibrium assemblages provides a best estimate of ~ 750–800 °C and 5–6 kbar for peak metamorphic conditions in the Misty Lake area. All equilibrium assemblage diagrams were calculated in the system MnO-Na2O-CaO-K2O-FeO-MgO-Al2O3-SiO2-H2O-TiO2 using the Theriak-Domino software package (de Capitani & Petrakakis, 2010) and the thermodynamic dataset of Holland & Powell (1998) with activity models as outlined in Tinkham & Ghent (2005) and Pattison & Tinkham (2009). Abbreviations: Ab = albite, Bt = biotite, Crd = cordierite, Cz = clinozoisite, Grt = garnet, IIm = ilmenite, Kfs = potassium feldspar, Ms = muscovite, PI = plagioclase, Qz = quartz, Rt = rutile, Sil = sillimanite, Spl = spinel, Ttn = titanite.

Economic Considerations

- Pelitic gneissic rocks in the Misty Lake area are tentatively correlated to metasedimentary rocks of the Daly Lake Group in Saskatchewan, where they locally contain fracture- and pegmatite-hosted uranium mineralization (Yeo and Delaney, 2007).

- Anomalous REE and uranium mineralization (<7.2% U3O8) have been documented in boulders and boulder trains scattered throughout northwestern Manitoba (Assessment File 74359, Manitoba Innovation, Energy and Mines, Winnipeg).

- In the Misty Lake area, LREE enrichment up to 10% (including 4.39% Ce, 2.91% La, and 1.53% Nd) has been reported (CanAlaska Uranium Ltd., 2009).

- Alkali metasomatism has been documented in association with a variety of mineral deposit types, including intrusion-hosted or metasomatic U, REE and rare-element deposits (U, skarn, carbonatiterelated REE-Nb-F, LCT-type pegmatites and peralkaline granitoid-related Zr-Nb-Y-REE-F). These features at Misty Lake are suggestive of significant potential for high-grade U and REE deposits.

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