



Geology, Geochemistry and Geochronology of the Southern Indian Lake Area, Northern Manitoba

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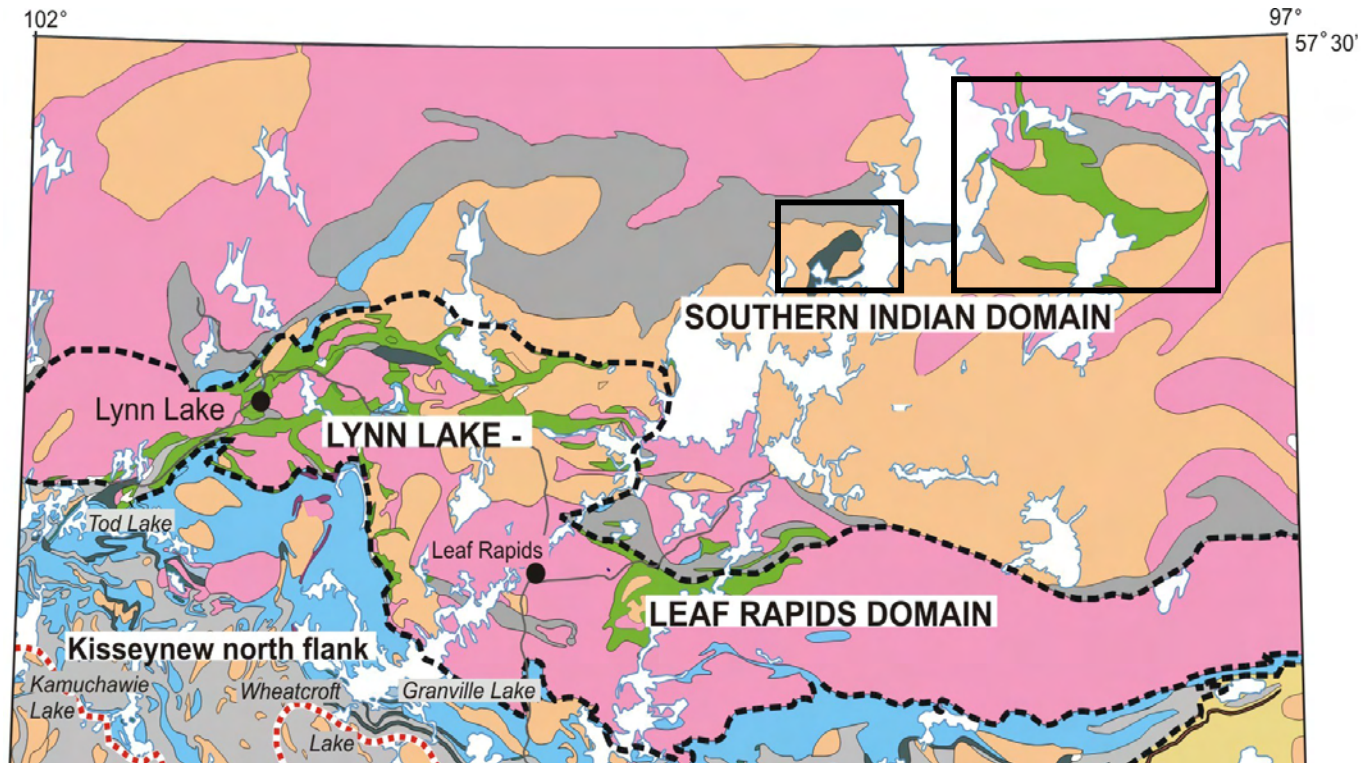
Outline

- Project goals
- TGI-3 collaborations
- Results
- Exploration opportunities
- Implications/Conclusions



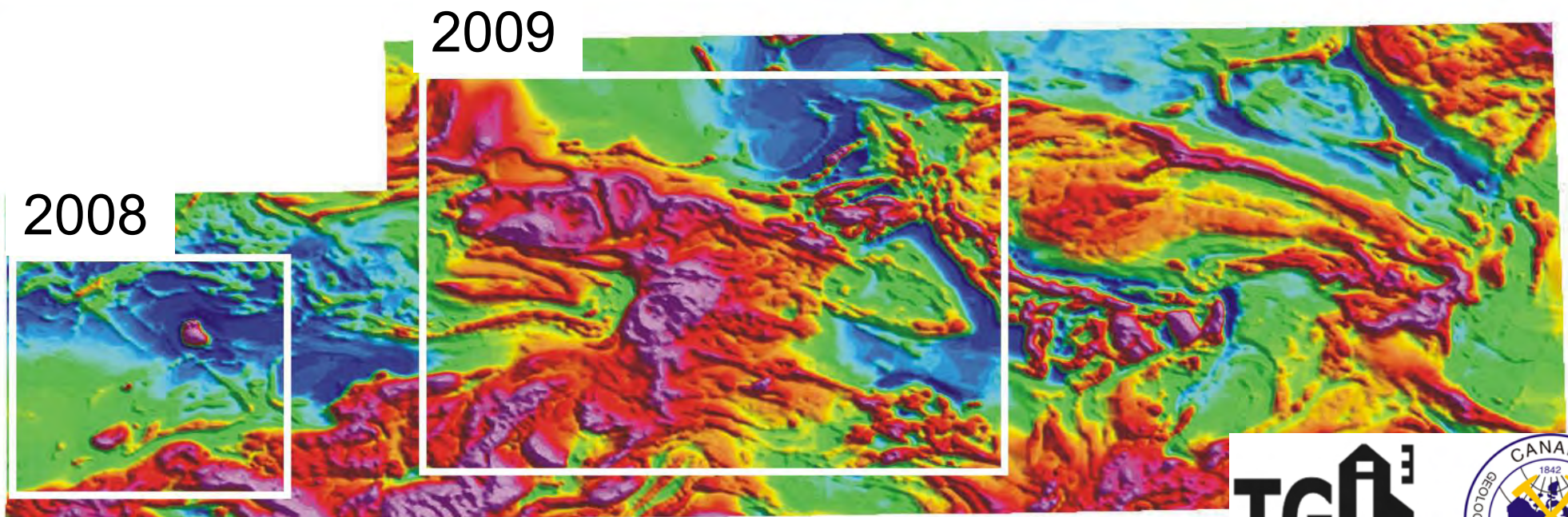
Project goals

- Northwestern internides of the Trans-Hudson Orogen
- Southern Indian Domain
 - Dominated by variably migmatitic paragneiss and plutonic rocks
- Bounded to the north by the Chipewyan Batholith
- Two belts dominated by volcanic/sedimentary rocks
 - Pukatawakan Bay
 - Partridge Breast Lake



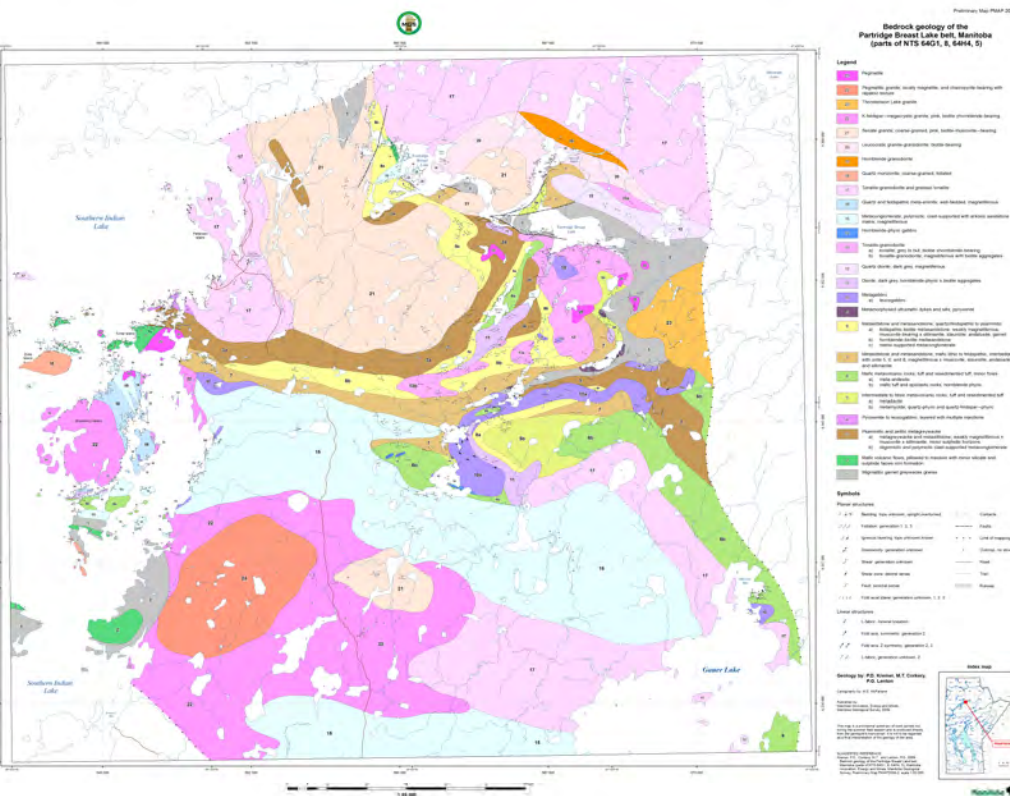
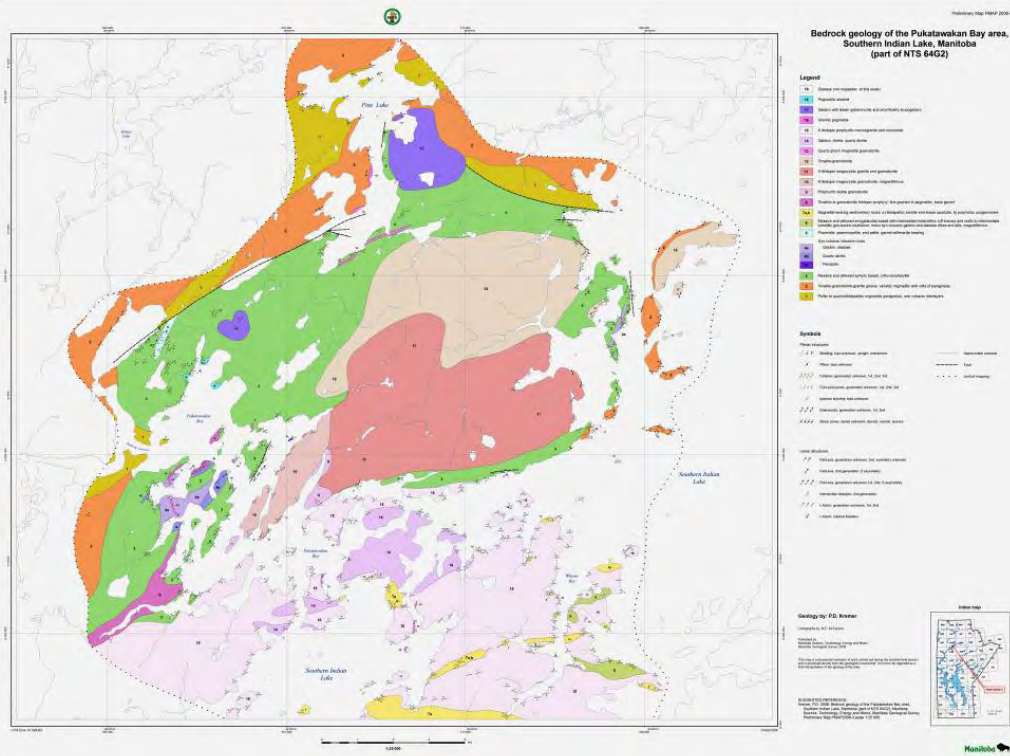
TGI-3 Collaborations

- MGS
 - Shoreline and helicopter-supported mapping 2008 and 2009
 - Kremer (2008); Kremer, Corkery and Lenton (2009)
- GSC
 - Aeromagnetic survey (Coyle and Kiss, 2008) co-released with the MGS
 - Geochronological analysis (N. Rayner)
 - 6 samples in 2008; 5 samples in 2009



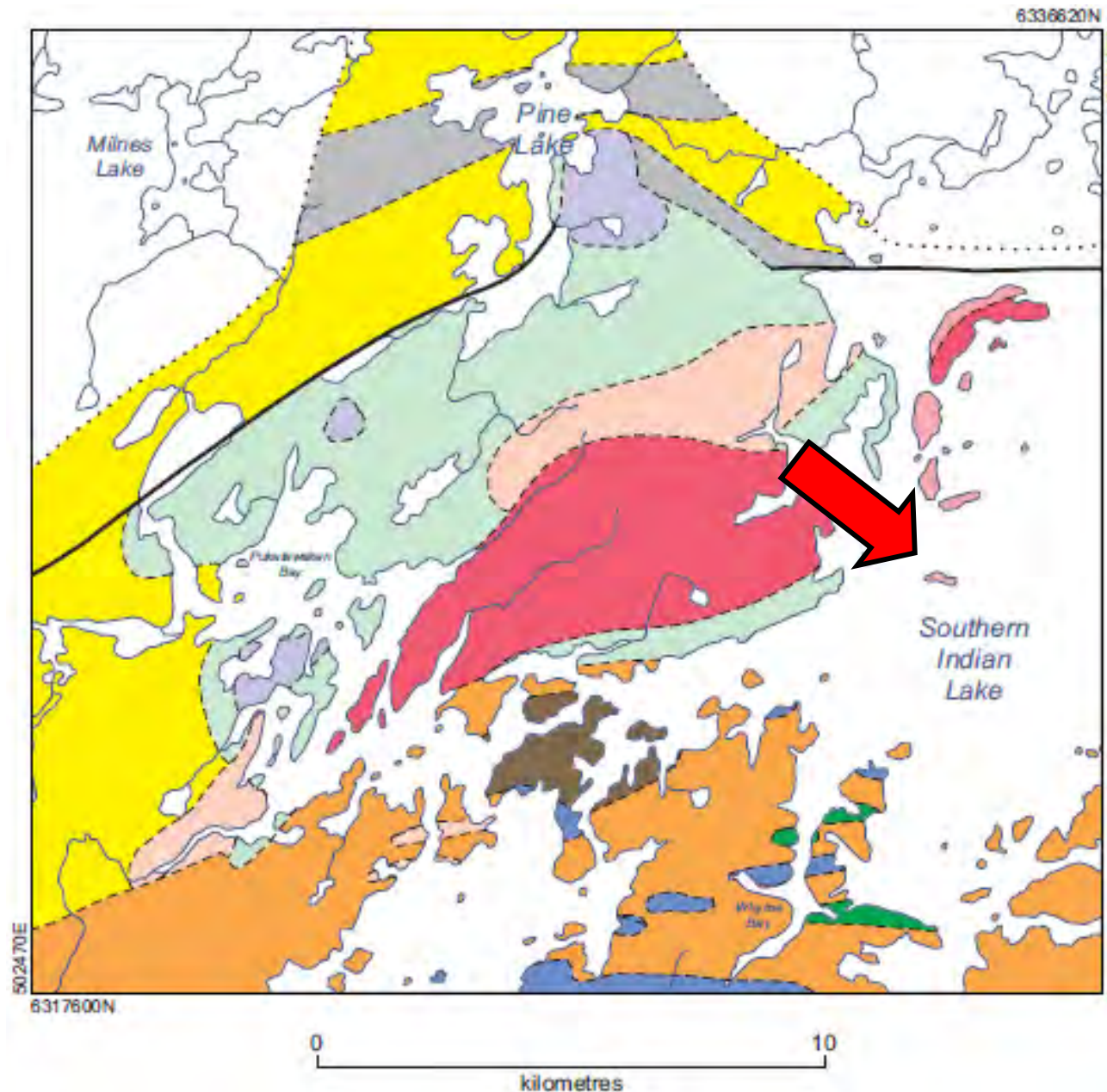
Results

- Recognition of Archean gneiss
- 2 distinct volcano-sedimentary sequences
 - Ocean floor assemblage
 - Volcanic arc assemblage
- Young fluvial alluvial clastic sedimentary sequence

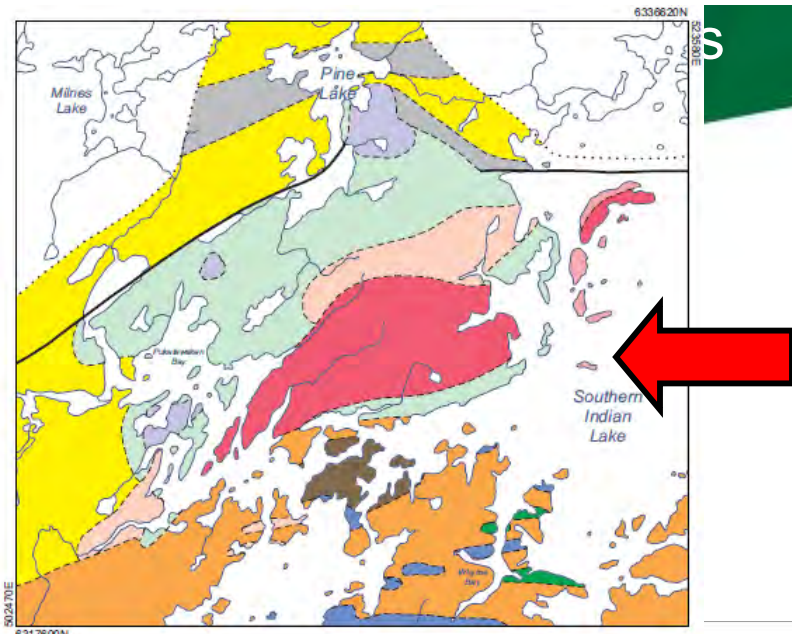


Archean Gneiss

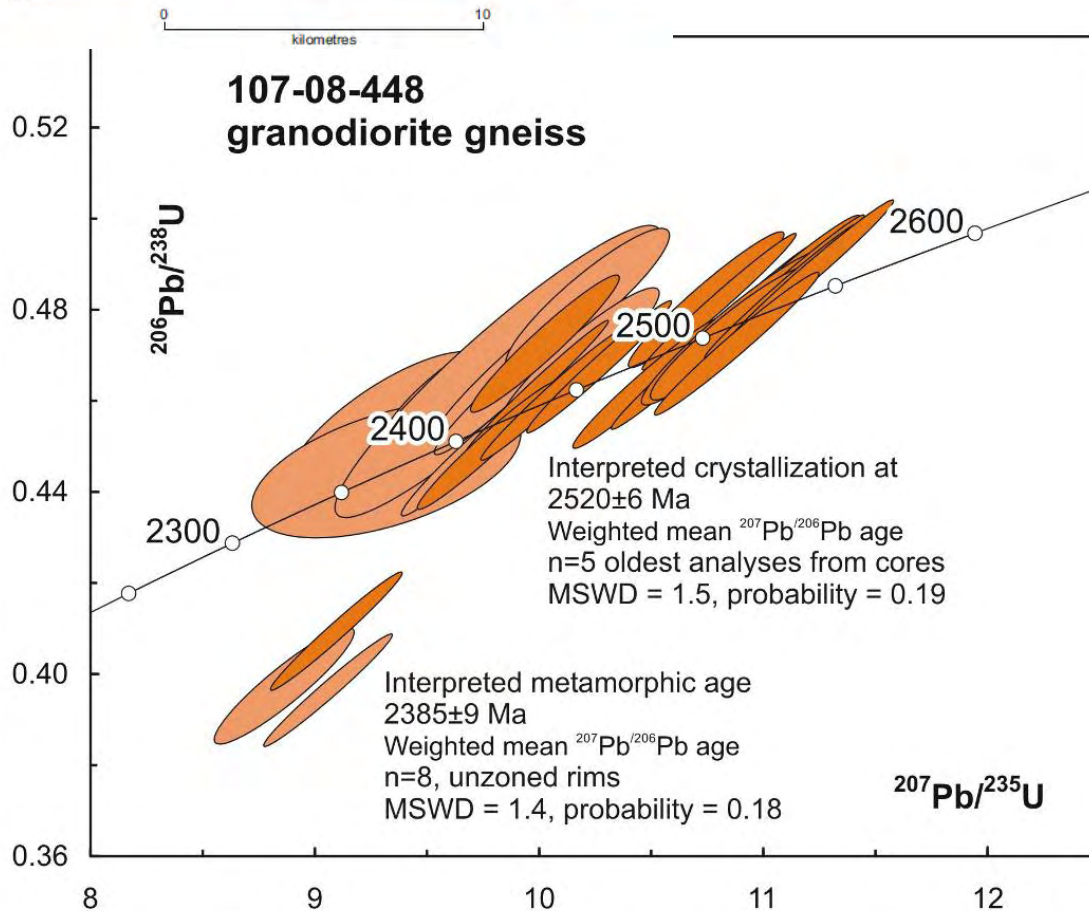
- Homogeneous to complex, tonalitic to granodioritic orthogneiss
- ϵ_{Nd} value -7.1
- 2.52 Ga crystallization age
 - Consistent with known ages of the Sask craton
- Inherited and detrital populations elsewhere



Archean Gneiss

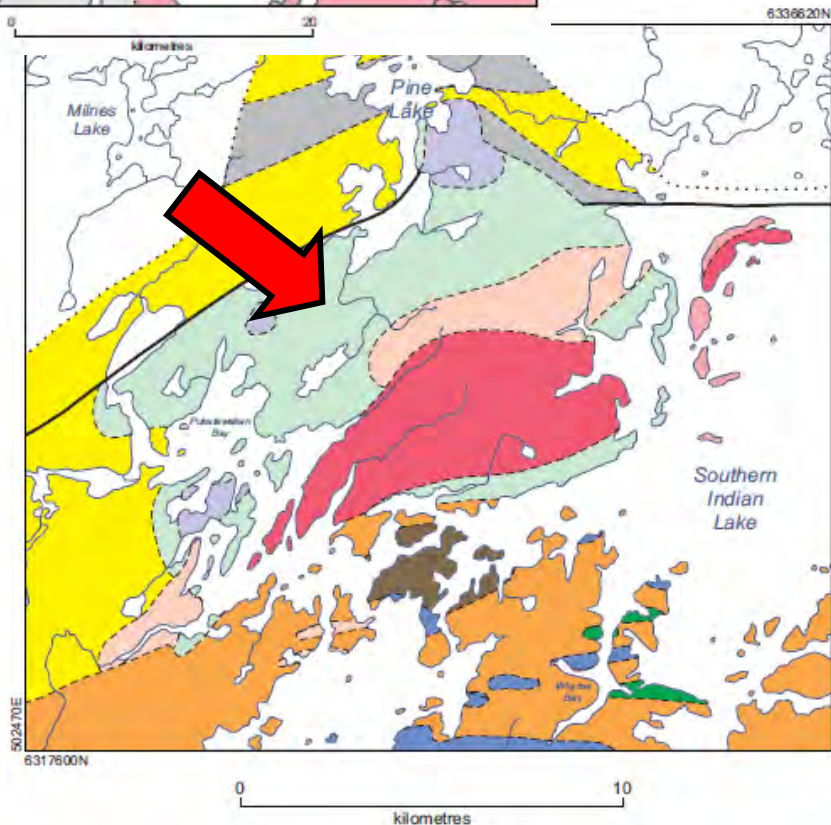
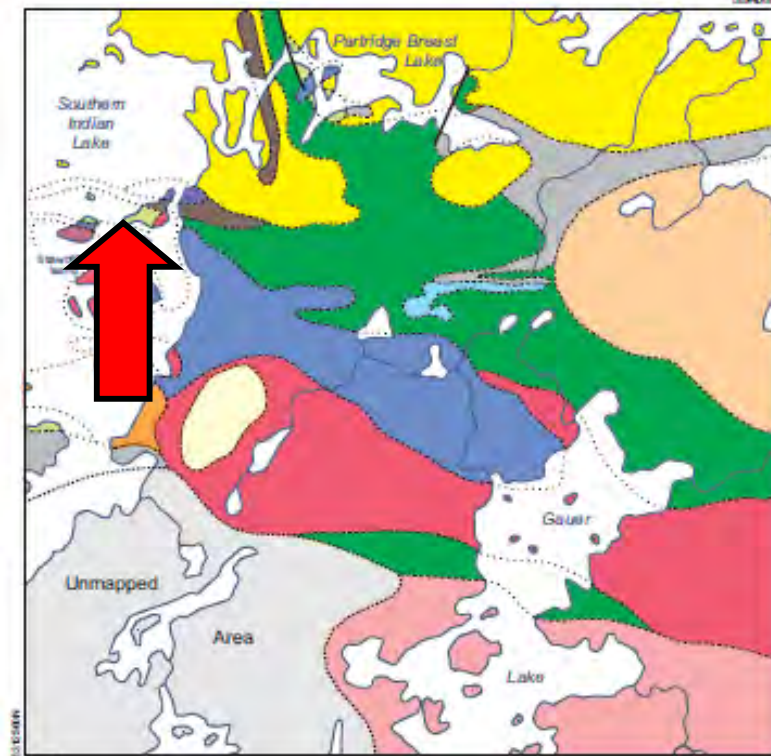


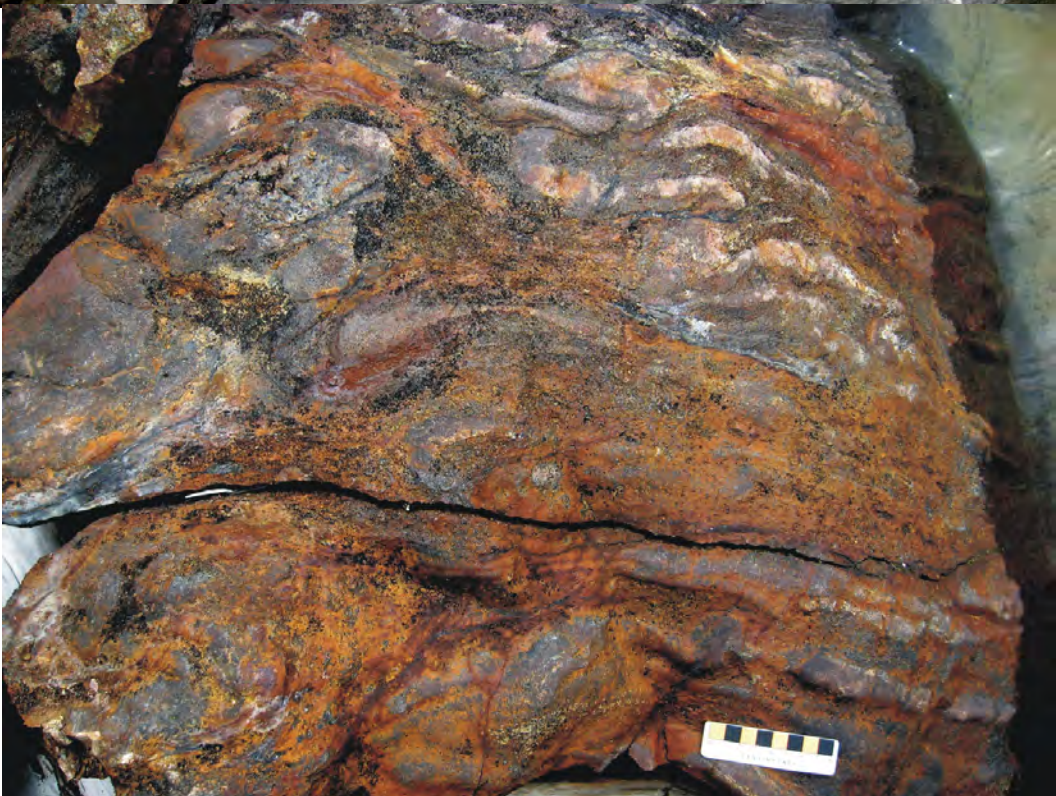
107-08-448 granodiorite gneiss

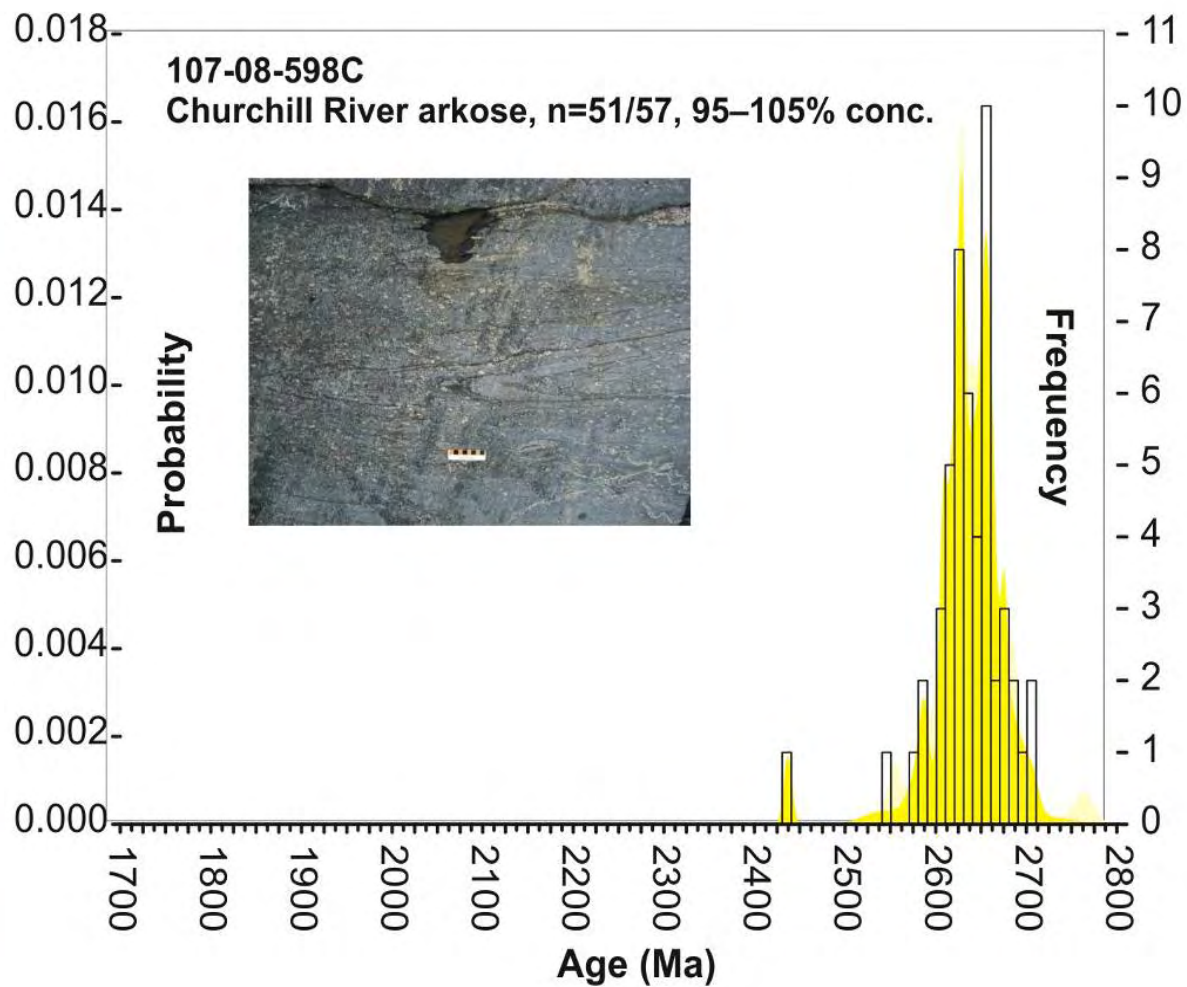
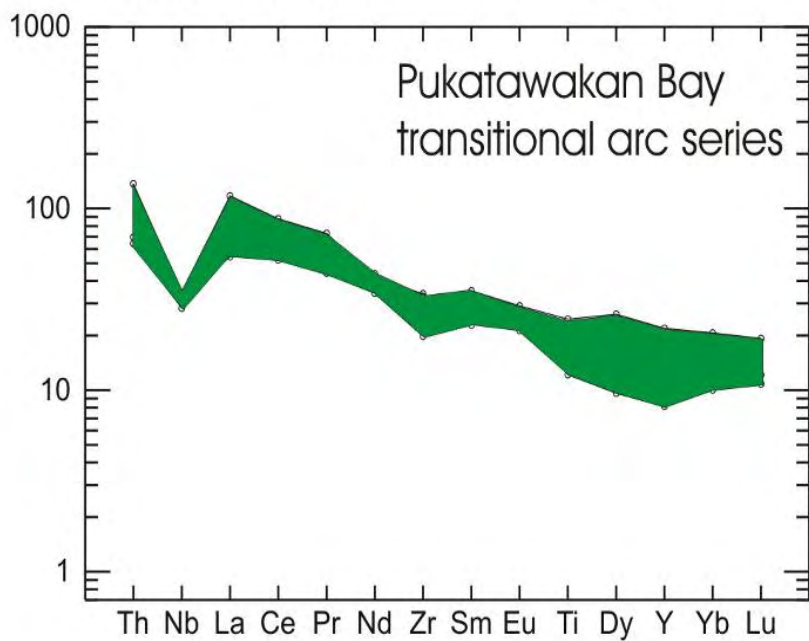
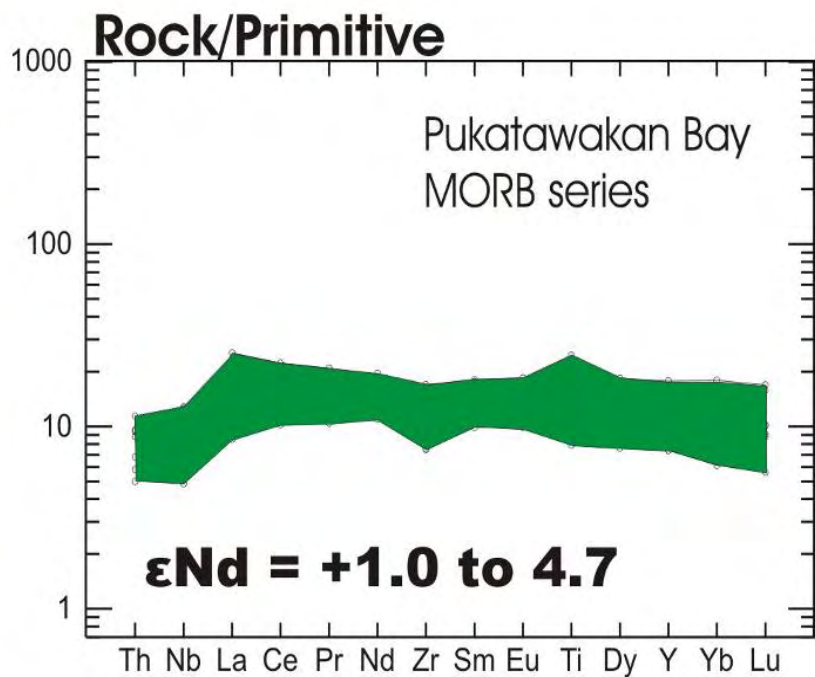


Ocean floor assemblage

- Sequence of subaqueous mafic volcanic flows
 - Tholeiitic MORB- to transitional arc (ocean floor/back-arc)
 - Juvenile tracer isotopic signatures
- Interflow sedimentary rocks
 - Sillimanite-bearing metagreywacke, silicate-sulphide facies iron formation, sulphidic and graphitic horizons





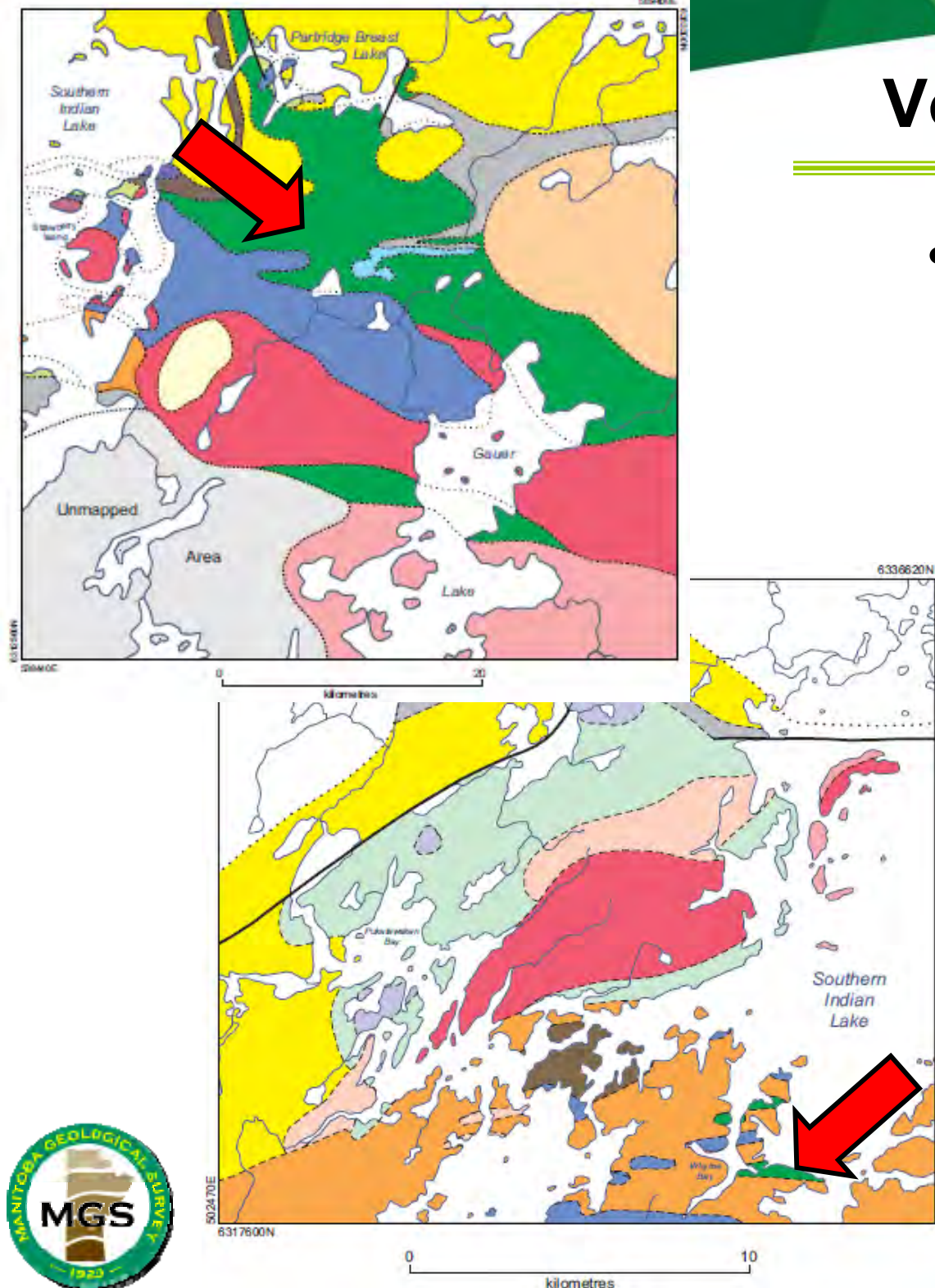


Volcanic arc assemblage

- Mafic to felsic volcanic and volcanoclastic rocks
 - Tholeiitic to calc-alkaline
 - Evolved tracer isotope signatures
 - T_{DM} model age 2.58 Ga

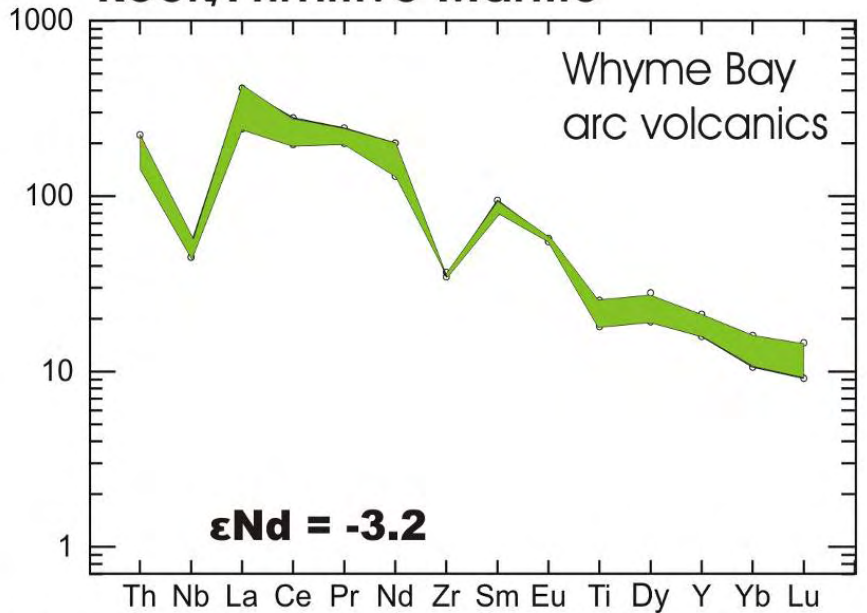
Interbedded sedimentary rocks

- 1.86-1.90 Ga (arc derived) and 2.30-2.50 Ga (Sask-aged) detrital zircon modes

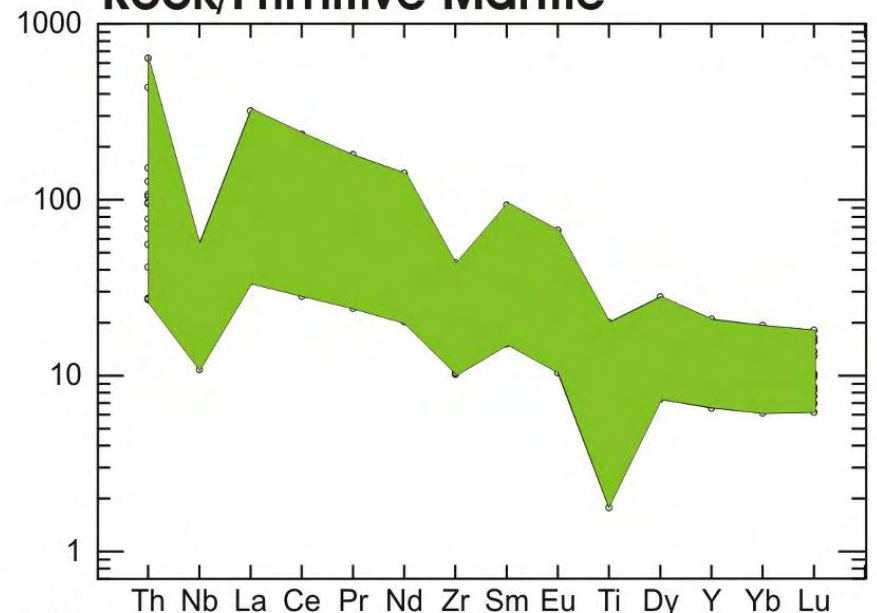




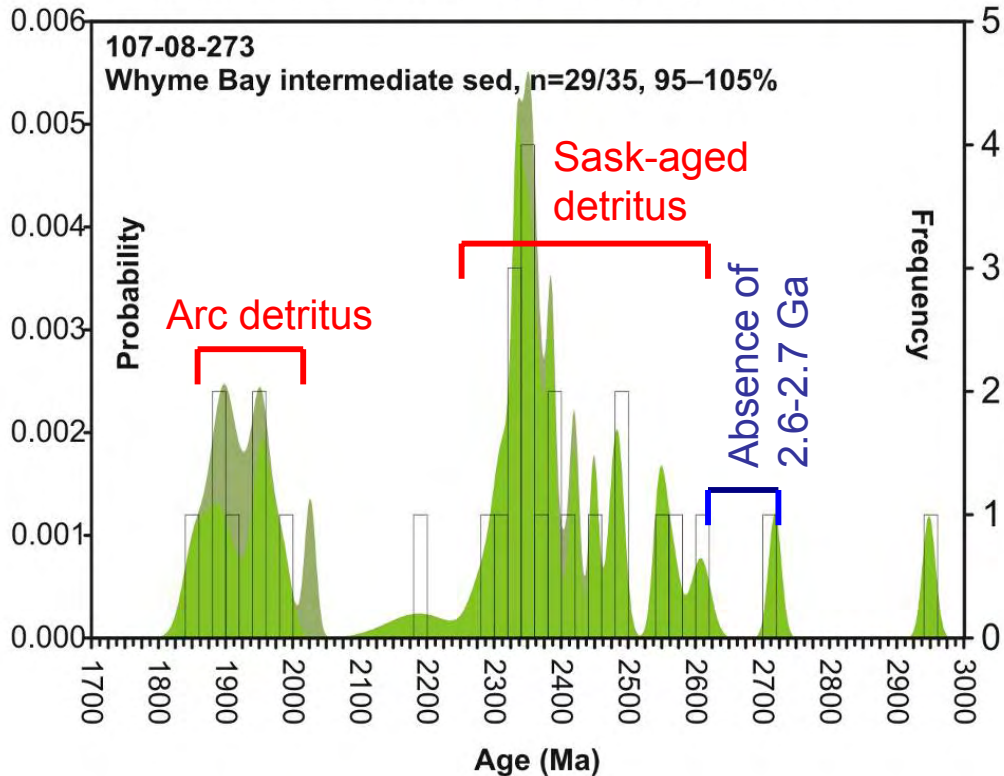
Pukatawakan Bay Rock/Primitive Mantle



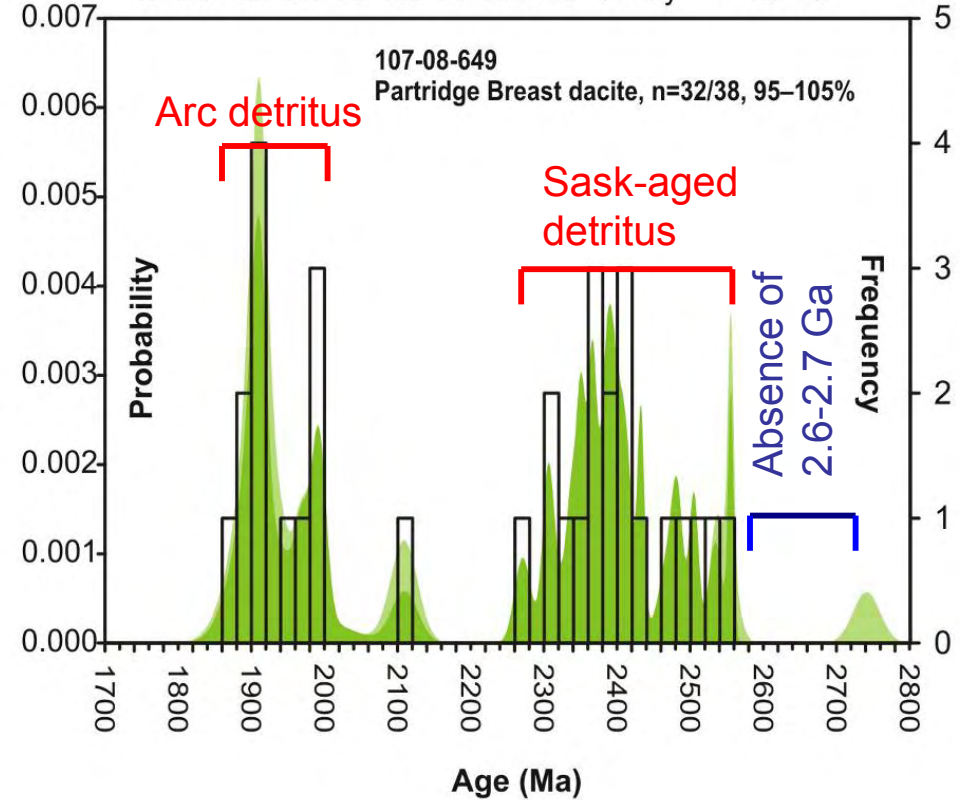
Partridge Breast Lake Rock/Primitive Mantle



107-08-273
Whyme Bay intermediate sed, n=29/35, 95–105%

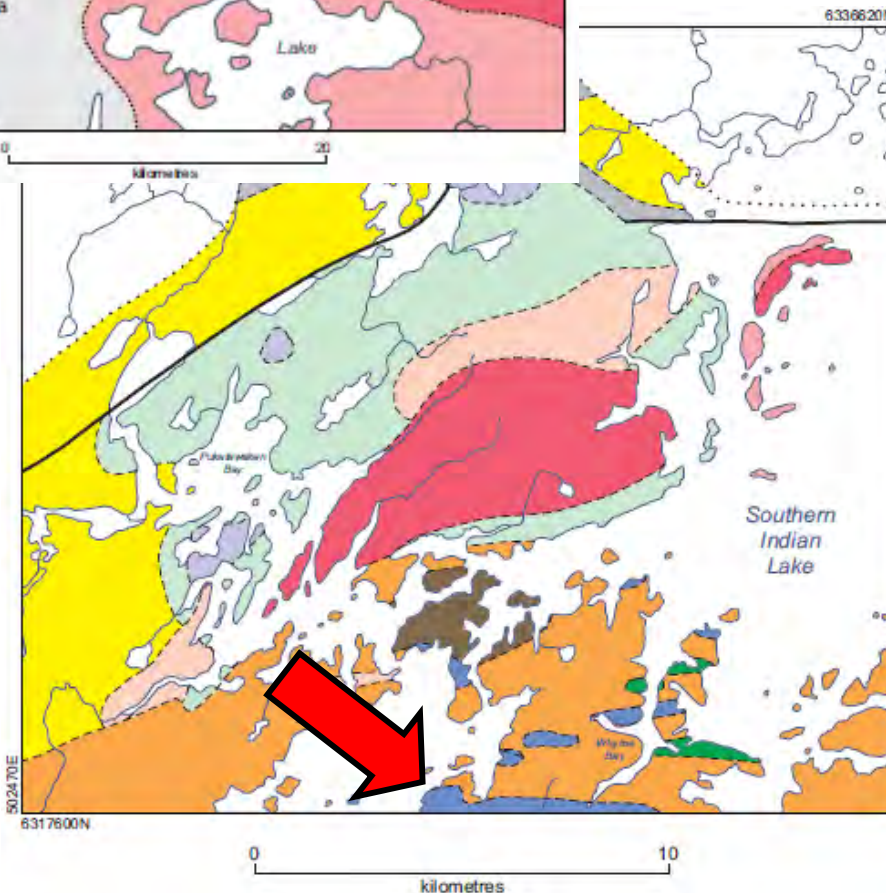
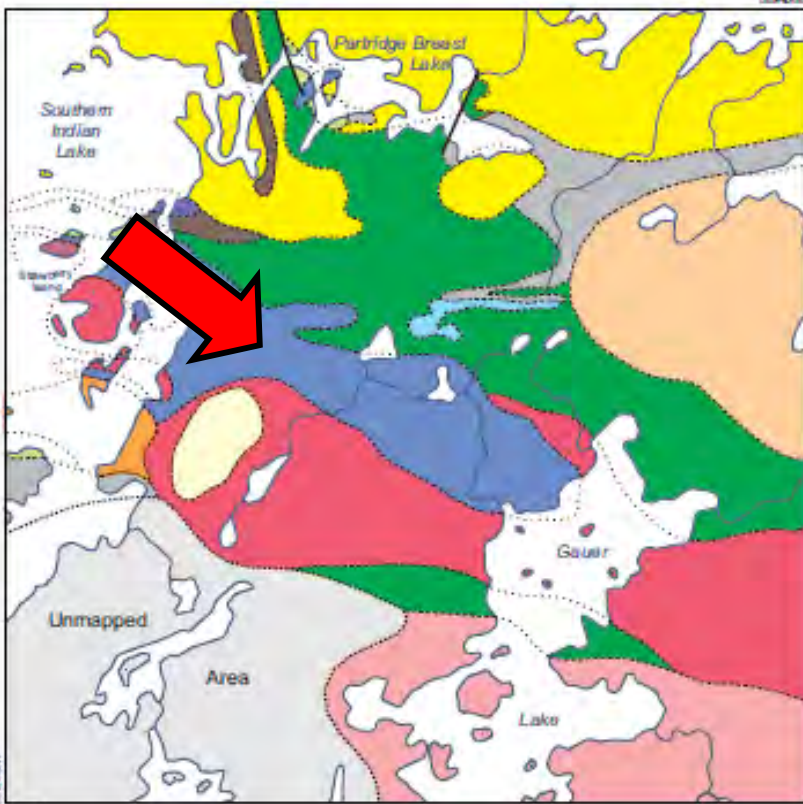


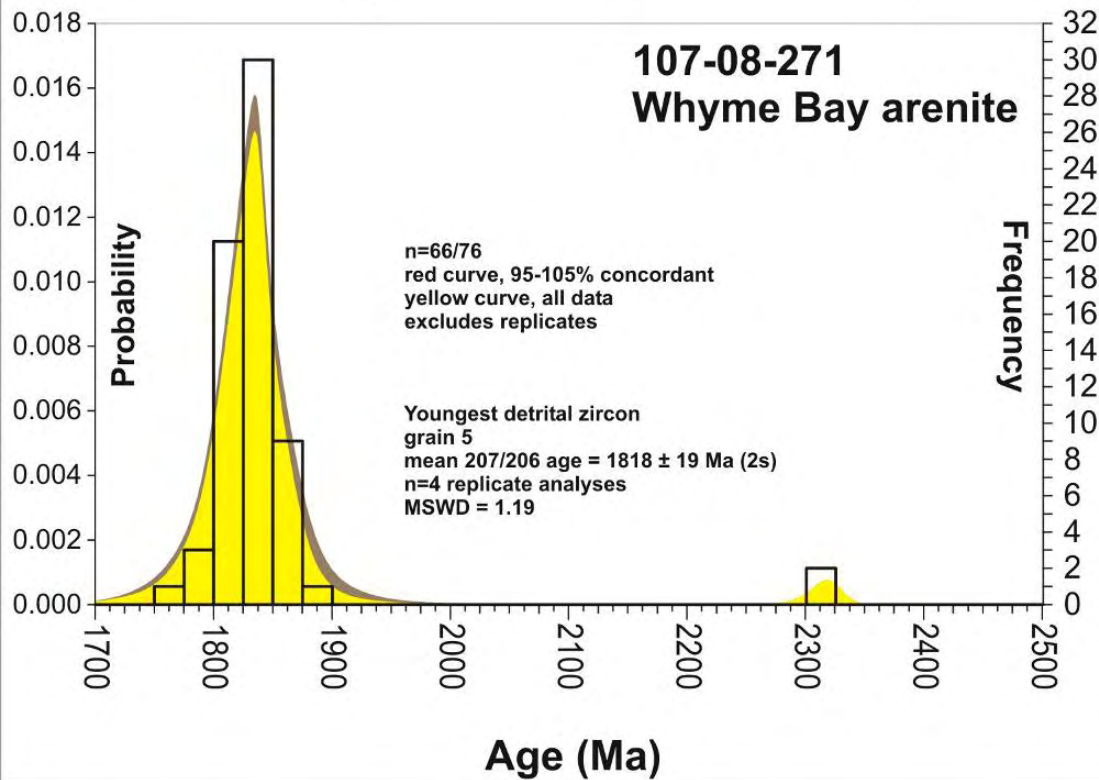
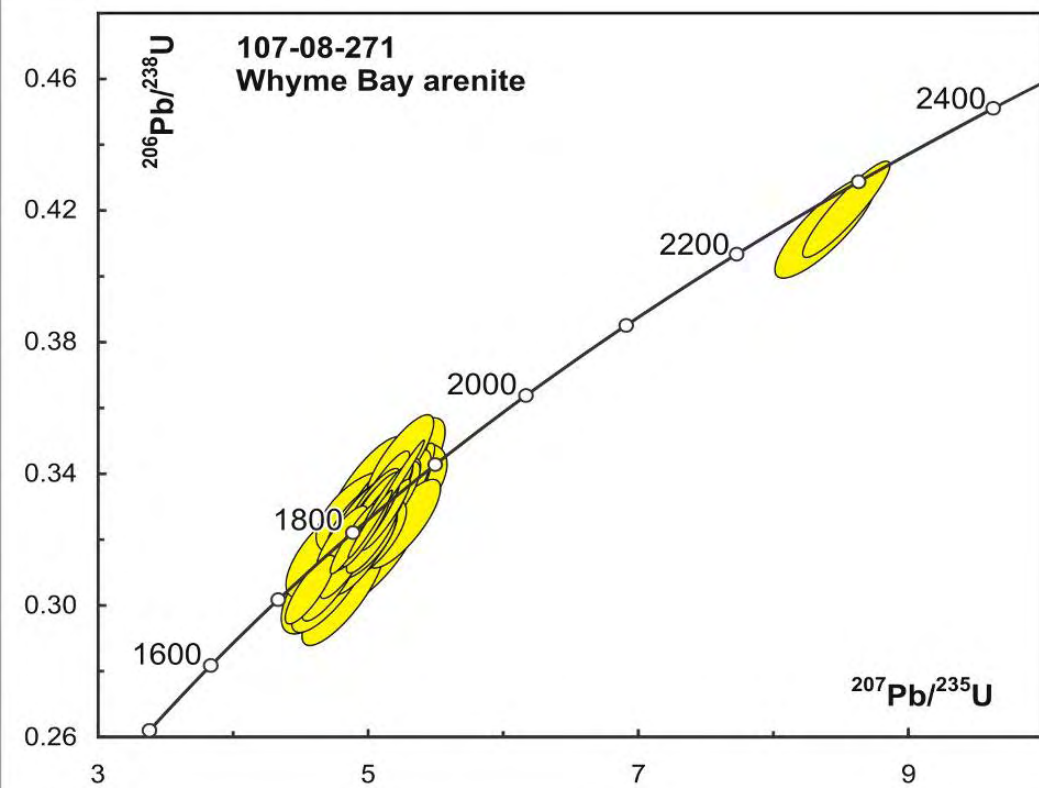
107-08-649
Partridge Breast dacite, n=32/38, 95–105%



Clastic sedimentary rocks

- Well-bedded quartz and feldspar arenite and clast-supported, polymictic conglomerate
 - Magnetite-bearing
- Uniform detrital zircon mode ca. 1.835 Ga
- Intruded by 1.829 Ga monzogranite
 - Rapid deposition and burial





Exploration opportunities

- **VMS**

- 2.2% Cu (Pukatawakan Bay); 4.7%, 6.85% (Partridge Breast Lake)

- **Magmatic Ni-Cu-PGE**

- Layered ultramafic intruding sulphur-rich sediments

- **Sediment-hosted base metals**

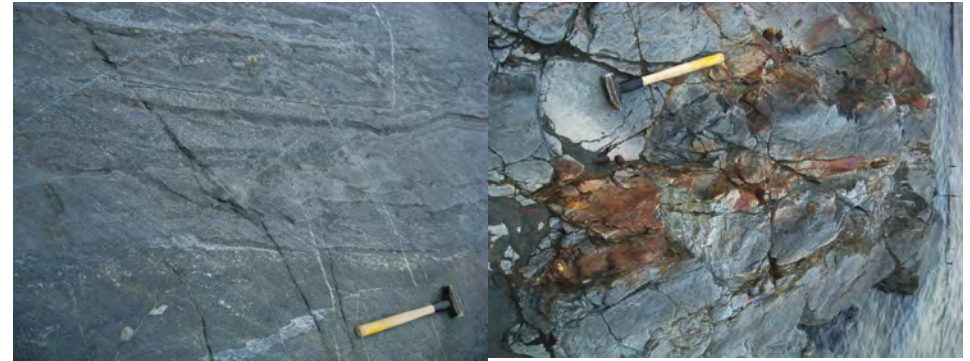
- 1.36% Zn (Partridge Breast Lake)

- **Orogenic lode gold**

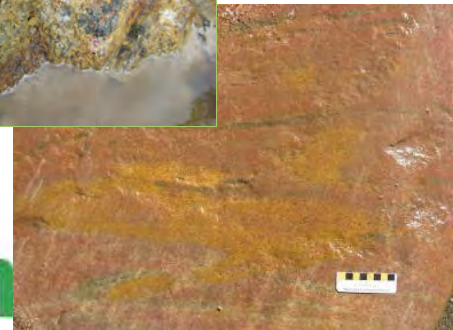
- Shear-hosted py-cp-pyr

- **IOCG**

- 1.55 g/t Au, 2.0 g/t Ag, 0.41% Zn, elevated Bi and Be



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Conclusions

- Juvenile MORB-like tholeiitic basalt sequence
 - Preserved vestige of the Manikewan Ocean seafloor
 - Sourced from Hearne craton margin (2.6 – 2.7 Ga)
- Recognition of exposed Sask craton-aged crust
 - Influential in the nucleation and development of intraoceanic volcanic arcs
- Volcanic arc successions
 - Proxy geochronology: 1.86 – 1.91 Ga
 - Consistent with known volcanic ages elsewhere in the THO
 - Contaminated isotopic signatures, prominent 2.3 – 2.5 Ga detrital modes in forearc sediments
 - Influence of Sask-aged intraoceanic crustal fragment



Acknowledgements

A sunset over a body of water with silhouettes of trees in the foreground. The sky is a mix of orange, yellow, and red, with the sun low on the horizon. The water reflects the colors of the sky. In the foreground, there are dark silhouettes of trees and a path leading towards the water.

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