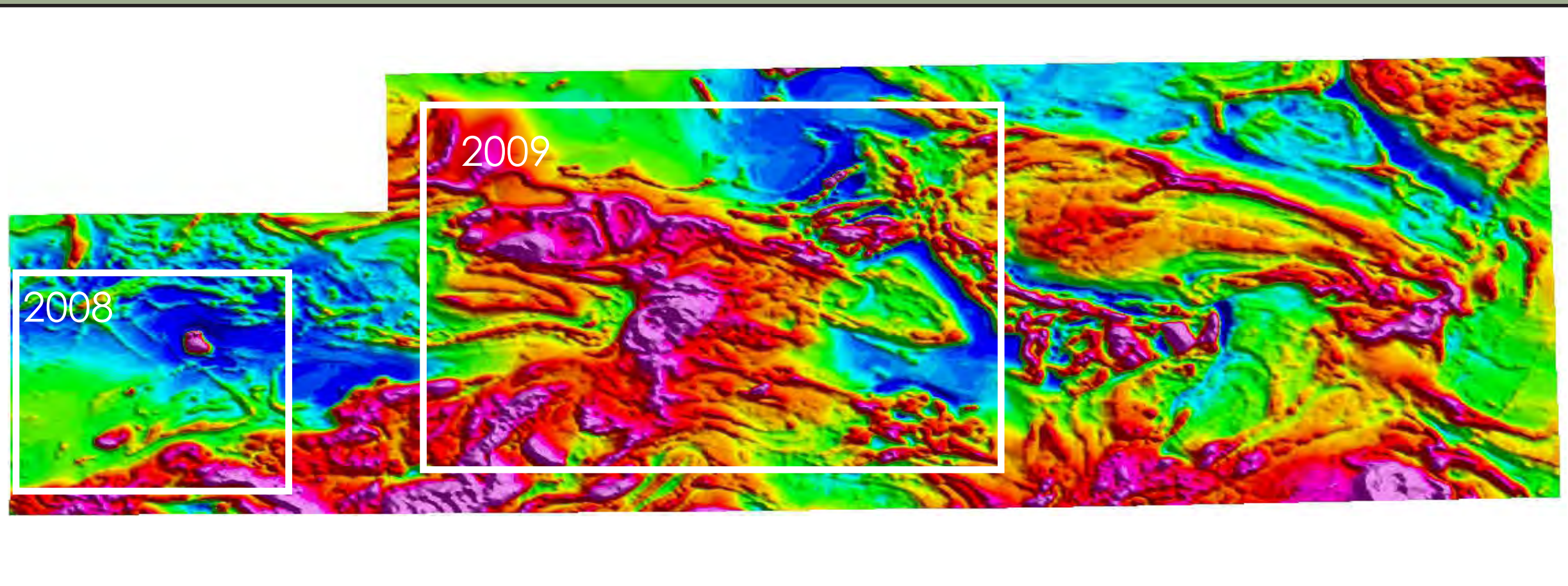
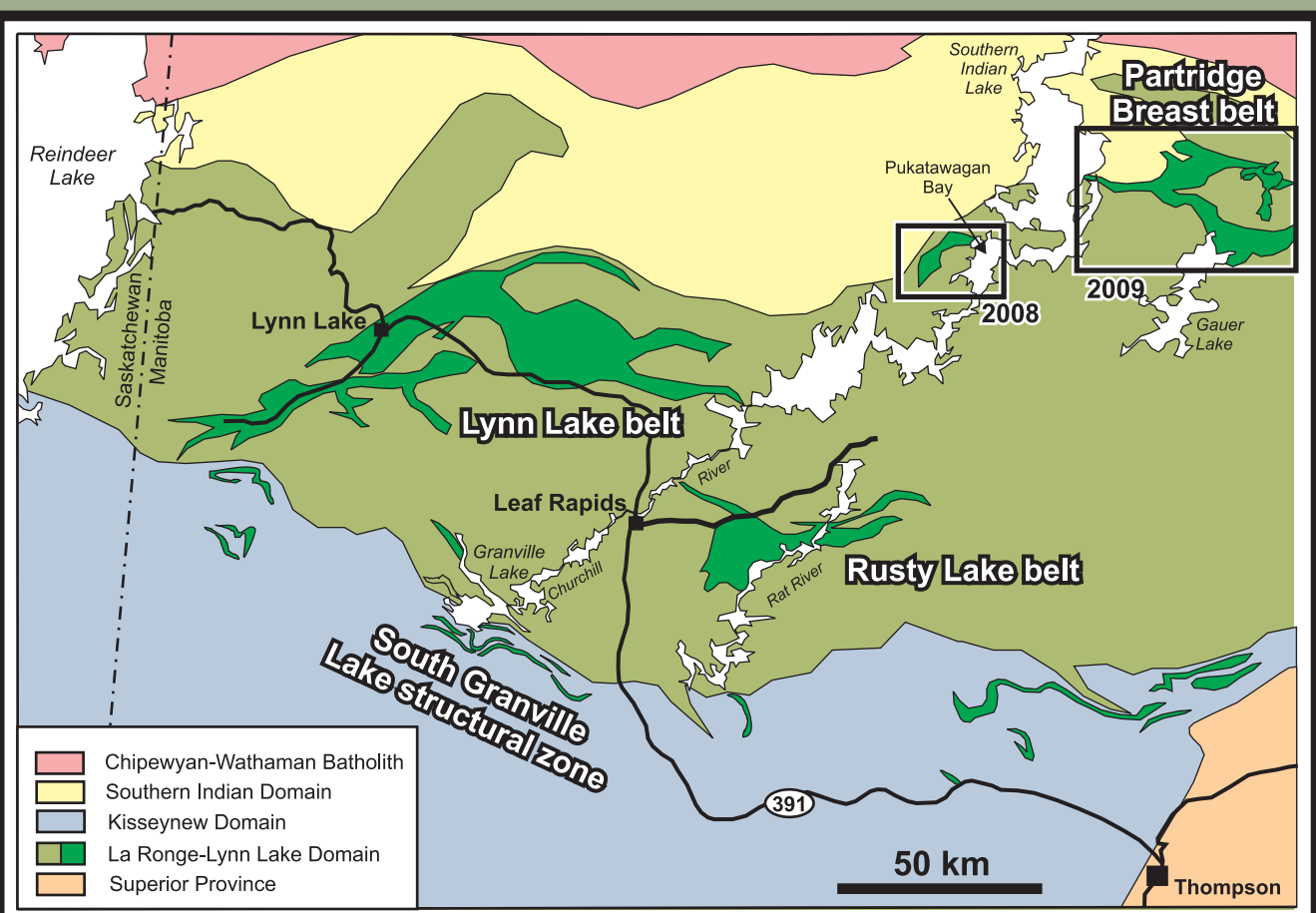


Introduction

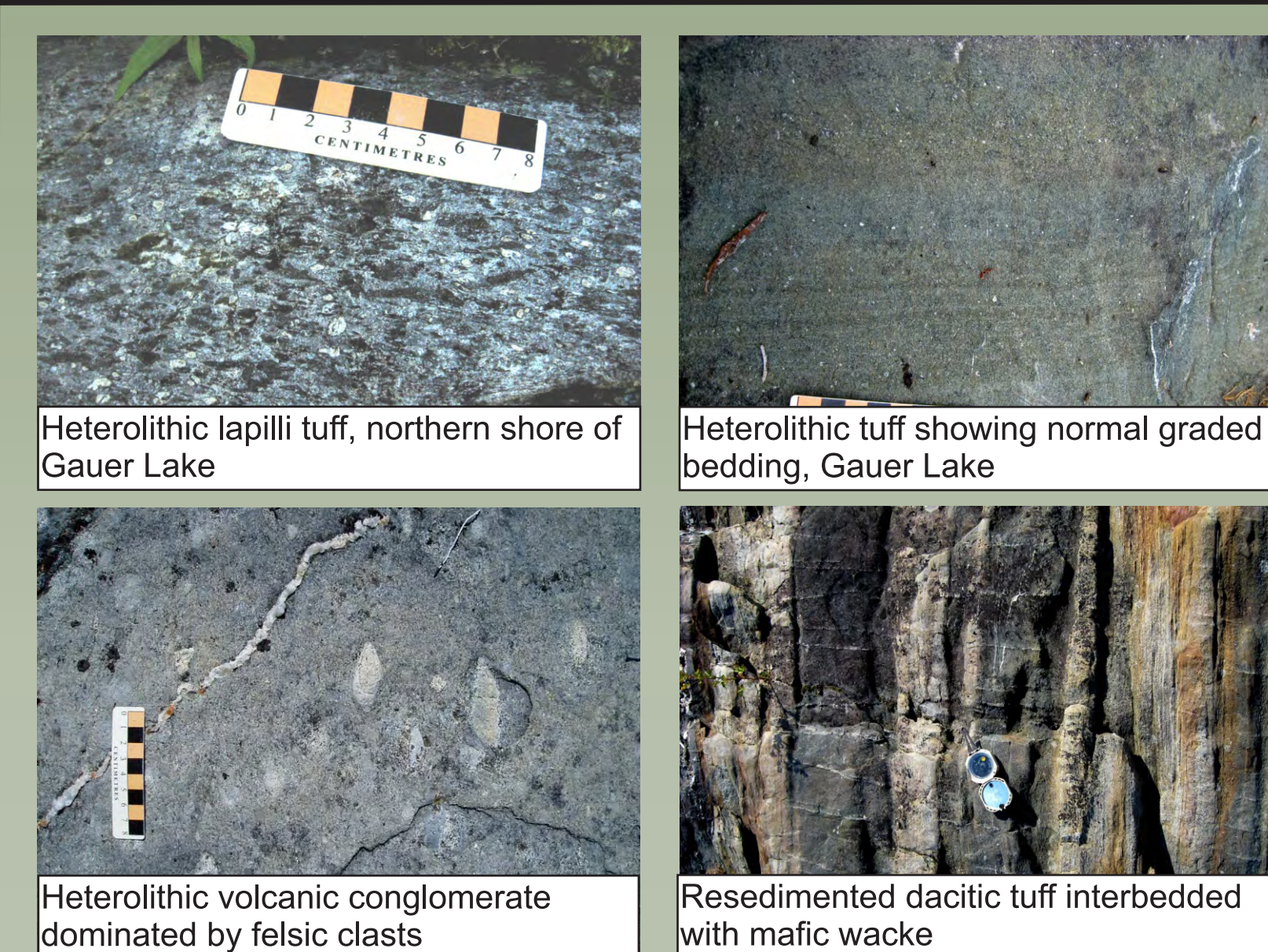
A two year mapping program in the Southern Indian Lake area was initiated in the summer of 2008. The project is a collaborative effort between the Manitoba Geological Survey and the Geological Survey of Canada as part of the Targeted Geoscience Initiative 3. Mapping was focused on two belts dominated by volcanic rocks in the Pukatawakan Bay and Partridge Breast Lake areas respectively. Collectively, the rocks in Southern Indian Lake record:

- 1) the development and closure of the Paleoproterozoic Manikewan ocean between the Archean Superior, Hearne, and Sask cratons;
- 2) the development of arc volcanic complexes and associated forearc basin sedimentation centred around an Archean cratonic fragment;
- 3) the accretion of the volcano-sedimentary arc complex to the southern margin of the Hearne craton;
- 4) widespread continental arc magmatism;
- 5) deposition and rapid burial of fluvial-alluvial orogenic sediments



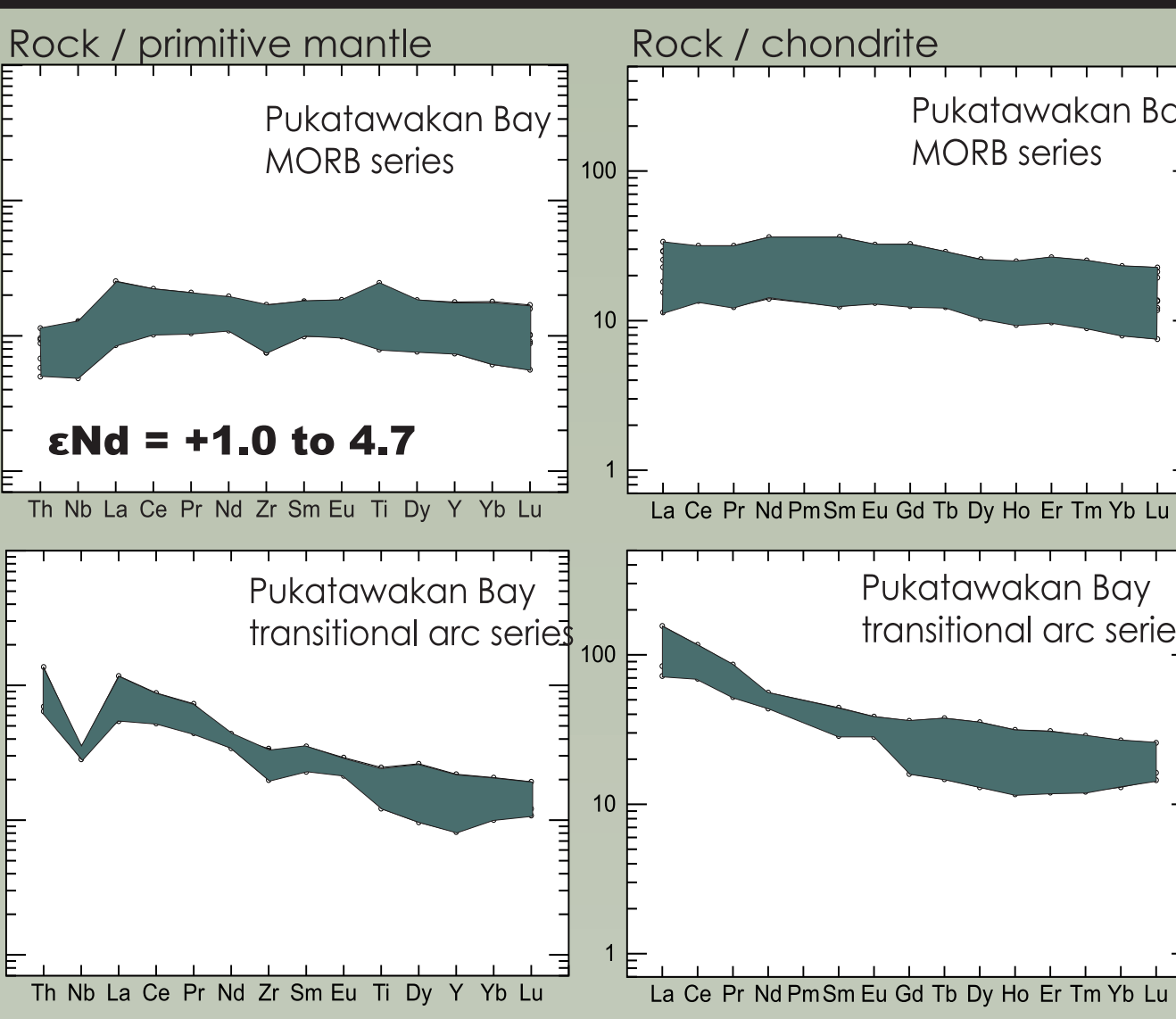
**Clastic sedimentary rocks**

- Polymictic conglomerate and crudely- to well-bedded quartz and feldspathic arenite extend from Strawberry Island to Gauer Lake and unconformably overlie the volcanic successions.
- This clastic sedimentary sequence is interpreted to be equivalent to the lithologically similar rocks which occur in the Whyme Bay area.



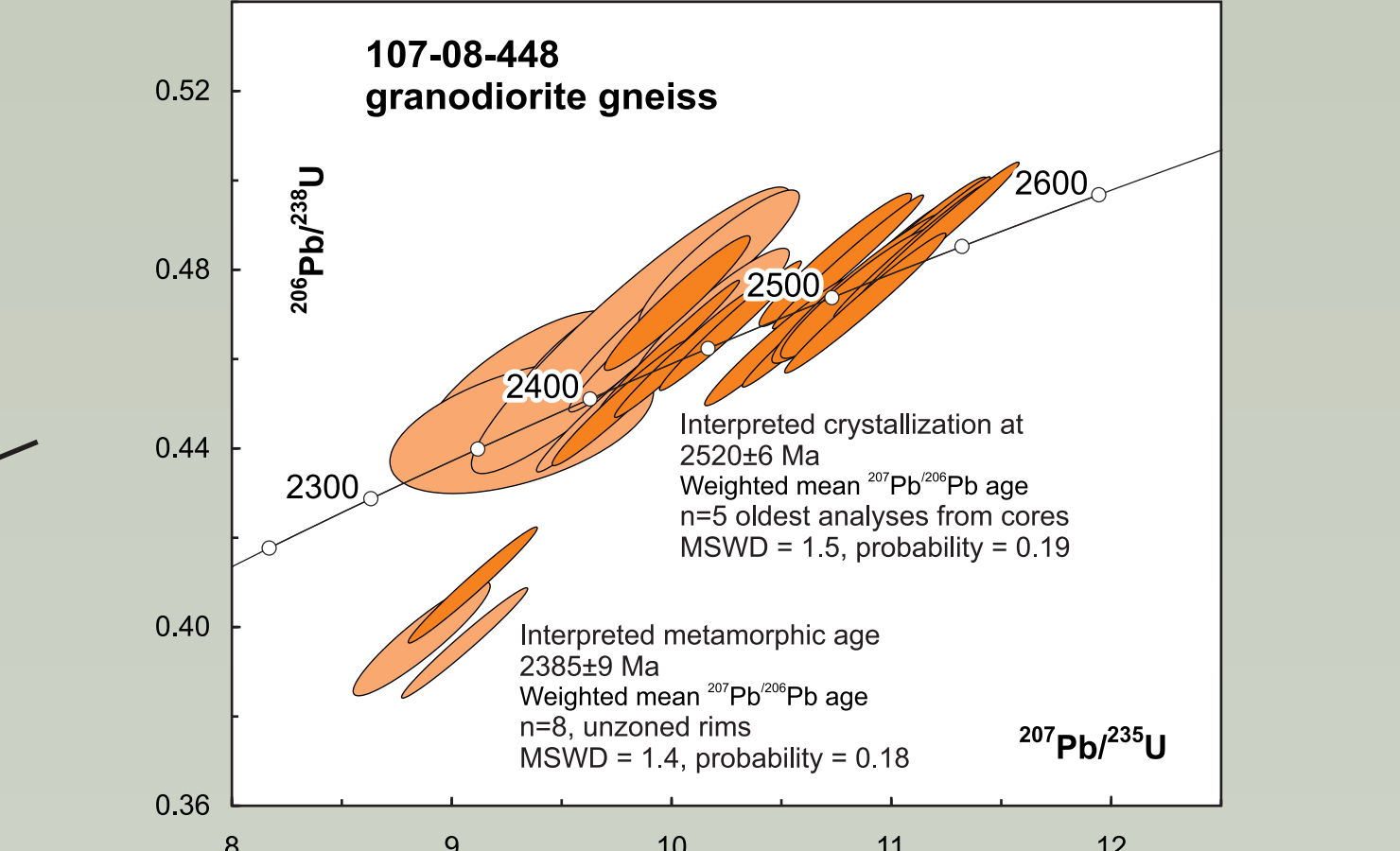
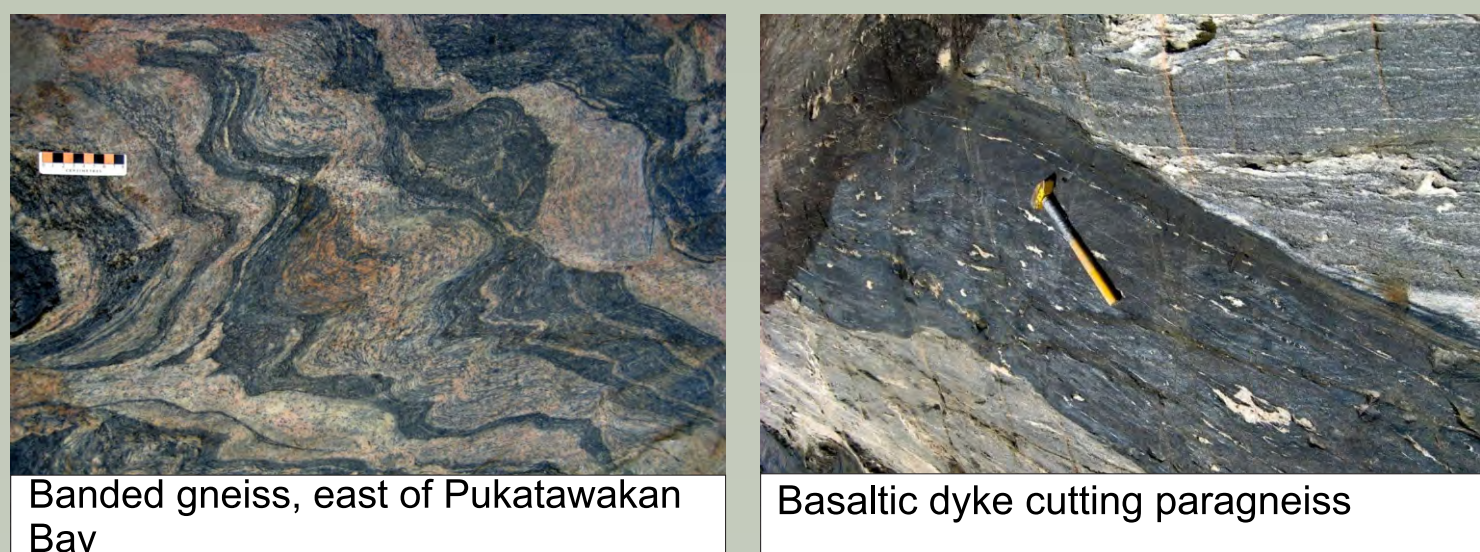
Ocean floor succession (Pukatawakan Bay assemblage)

- Continuous sequence of pillowed to massive basaltic flows to ortho-amphibolite with MORB to transitional arc trace element profiles locally interbedded with greywacke and iron formation.
- Tracer isotopic analyses yielded positive εNd values between +1.0 and +4.7 (at 1.9 Ga) and indicate a dominantly juvenile, depleted mantle source.
- This sequence of rocks may represent a preserved vestige of Manikewan oceanic seafloor.



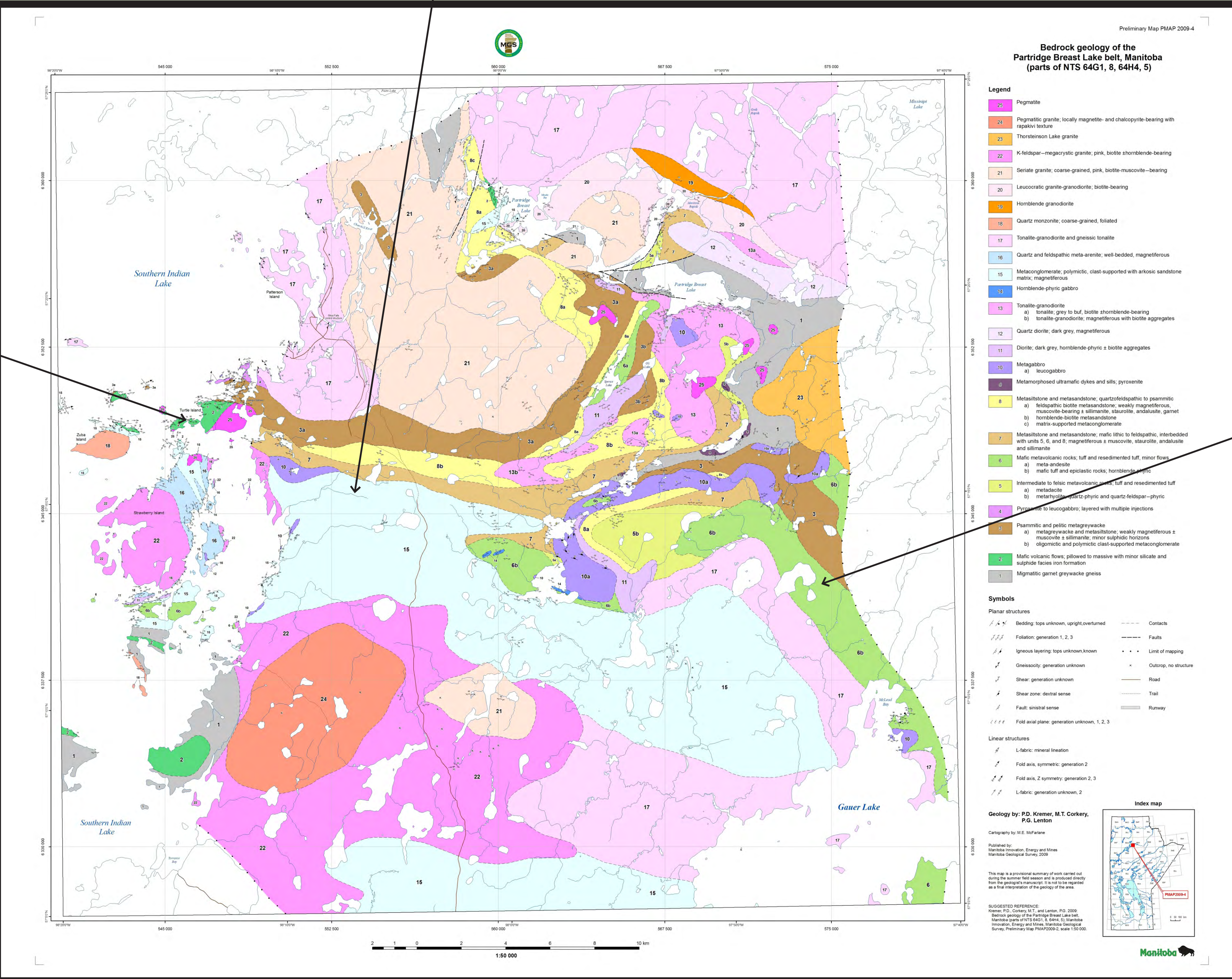
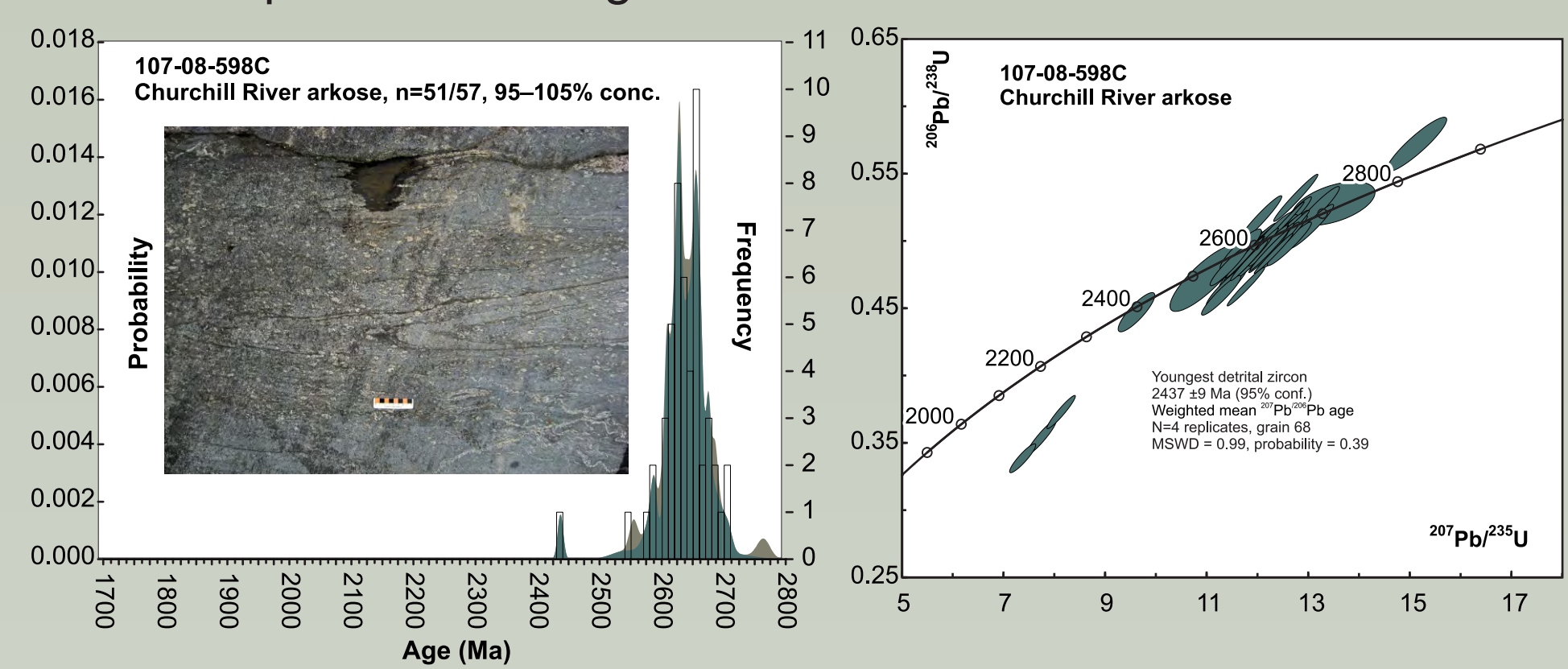
Archean gneiss

- Tonalitic to granodioritic orthogneiss is in fault contact with volcanic rocks of the Pukatawakan Bay assemblage.
- Strongly contaminated εNd value of -7.1.
- U-Pb geochronology and yielded a crystallization age of 2520 Ma, consistent with known ages for the Sask craton (metamorphic overprint ca. 2385 Ma).
- Marks the first documented case of Sask-aged Archean gneissic crust in this portion of the Trans-Hudson Orogen.



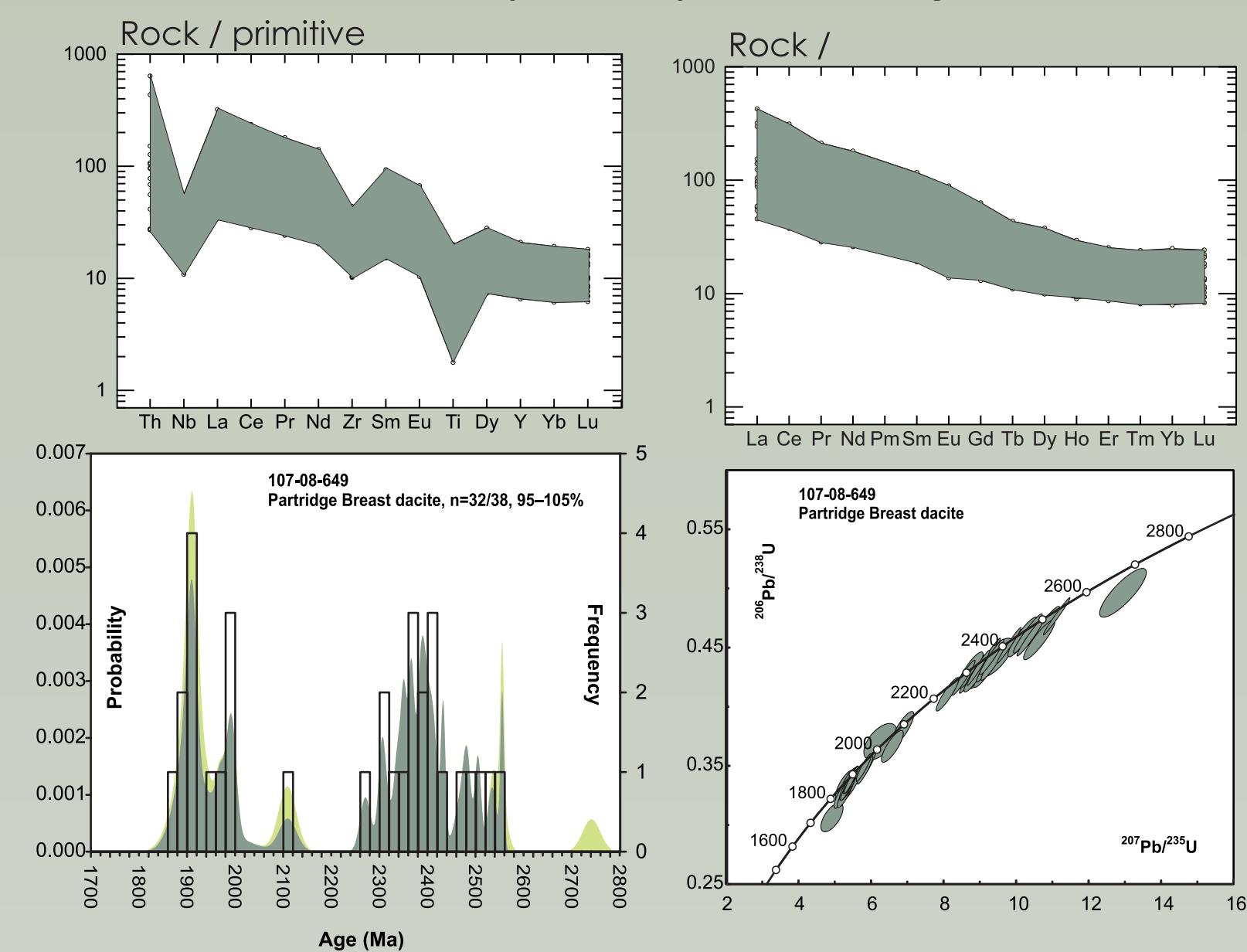
**Ocean floor succession**

- Pillowed to massive basalt flows are interbedded with psammitic to pelitic greywacke, iron formation and sulphidic horizons, similar to rocks reported in the Pukatawakan Bay assemblage.
- A sample of greywacke yielded detrital zircons ranging between 2.7 and 2.6 Ga.
- This detrital profile, dominated by Archean detritus stands in distinct contrast to the detrital profile of arc volcano-sedimentary rocks at Partridge Breast Lake and Whyme Bay.
- These rocks were most likely sourced from the southern margin of the Rae-Hearne craton, with no input from the advancing arc, and therefore represent an altogether different basin.



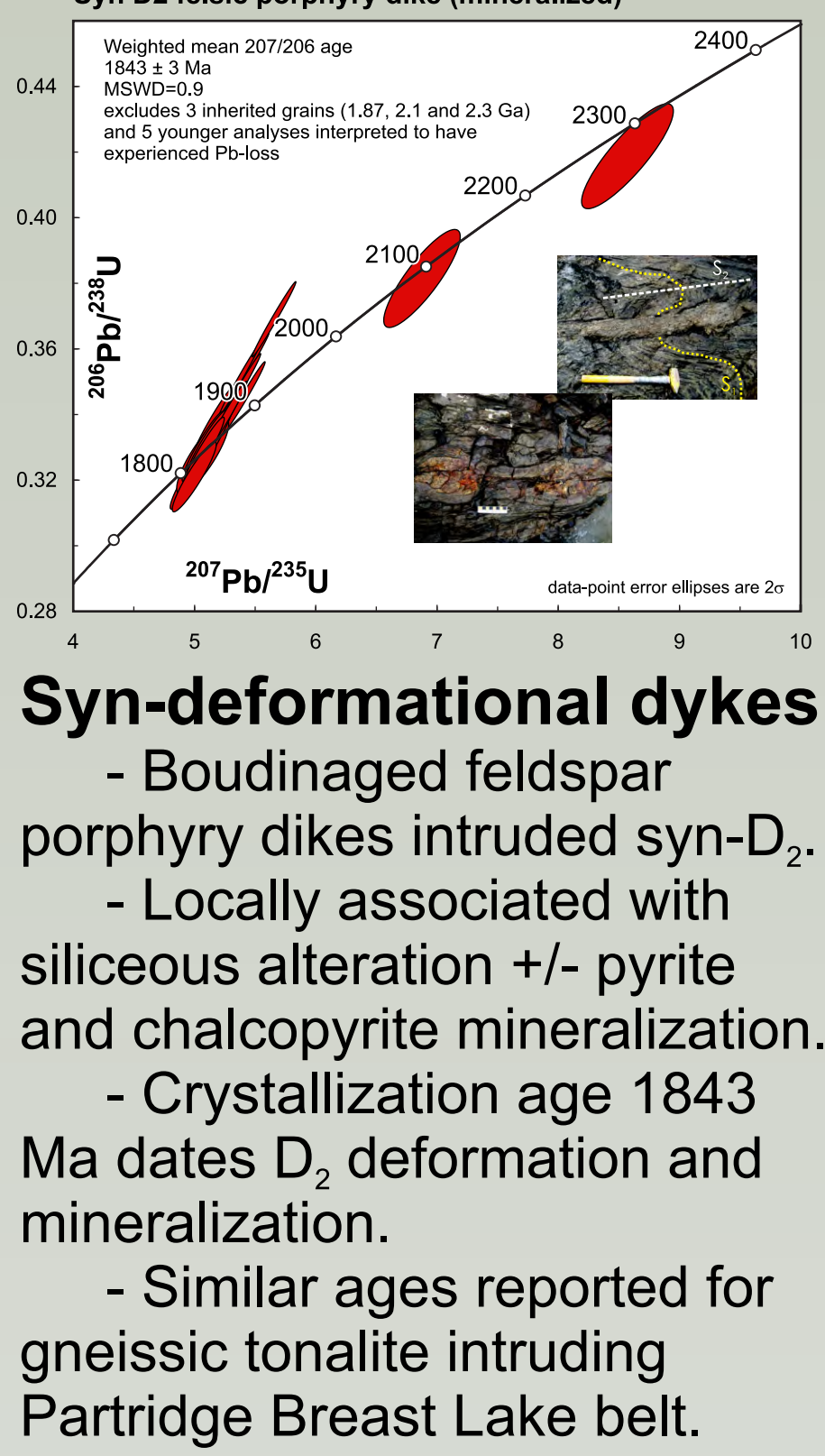
Arc succession (Partridge Breast Lake belt)

- Mafic to felsic volcanoclastic rocks with minor flows extend from Partridge Breast Lake southeastward to the northern shore of Gauer Lake.
- Volcanic arc rare earth and trace element geochemical profiles consistent with the Whyme Bay assemblage.
- Volcaniclastic rocks are interbedded with sedimentary rocks, suggesting some degree of reworking and/or syn-volcanic sedimentation into a forearc type basin.
- A sample of reworked dacitic tuff collected for U/Pb has a prominent detrital mode centred at ca. 1.91 Ga and older modes dominated by ca. 2.0 and 2.4 Ga zircons, consistent with the Whyme Bay assemblage.



Syn-deformational dykes

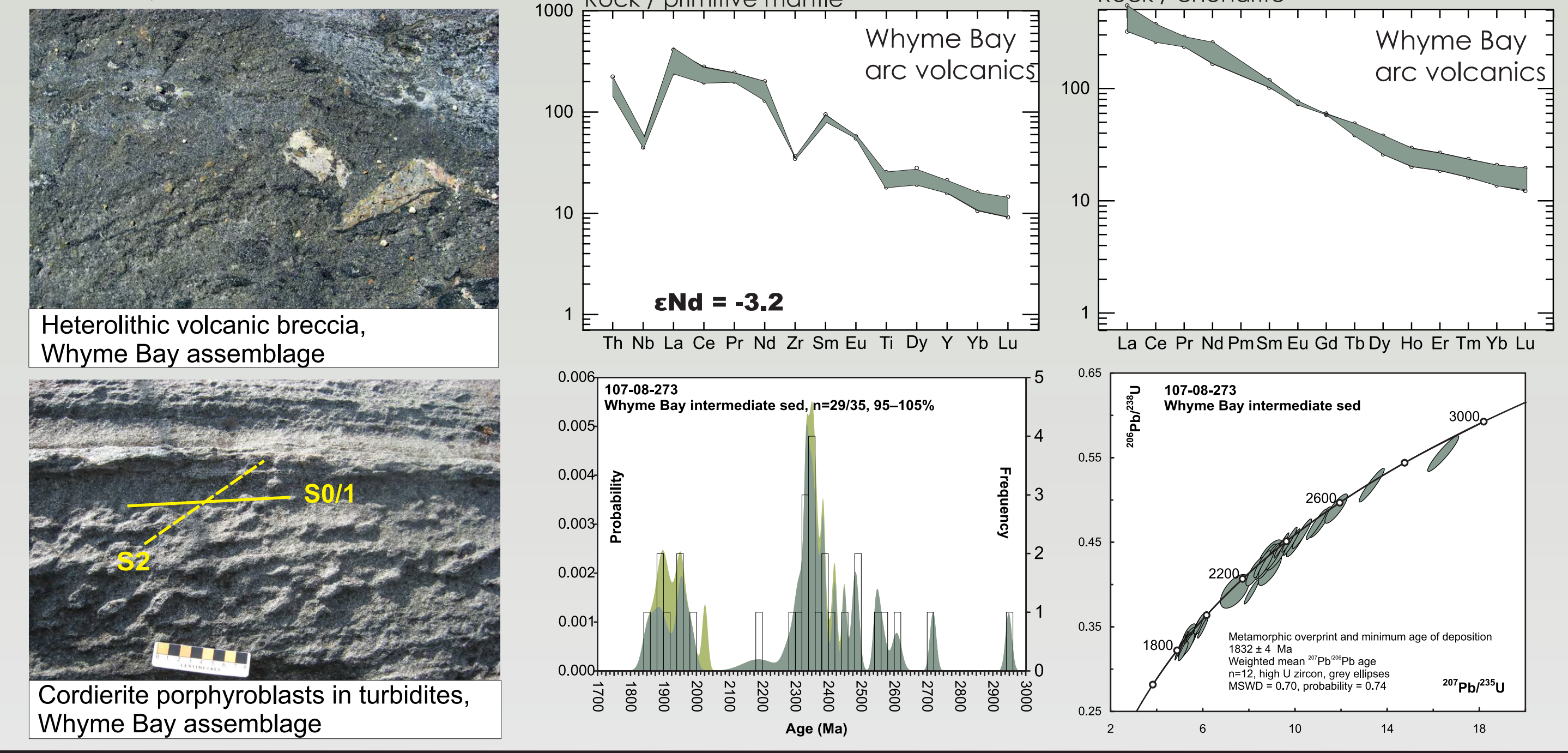
- Boudinaged feldspar porphyry dikes intruded syn-D<sub>2</sub>.
- Locally associated with siliceous alteration +/- pyrite and chalcopyrite mineralization.
- Crystallization age 1843 Ma dates D<sub>2</sub> deformation and mineralization.
- Similar ages reported for gneissic tonalite intruding Partridge Breast Lake belt.



Geological map of the Pukatawakan Bay area, in the west central portion of Southern Indian Lake, northern Manitoba

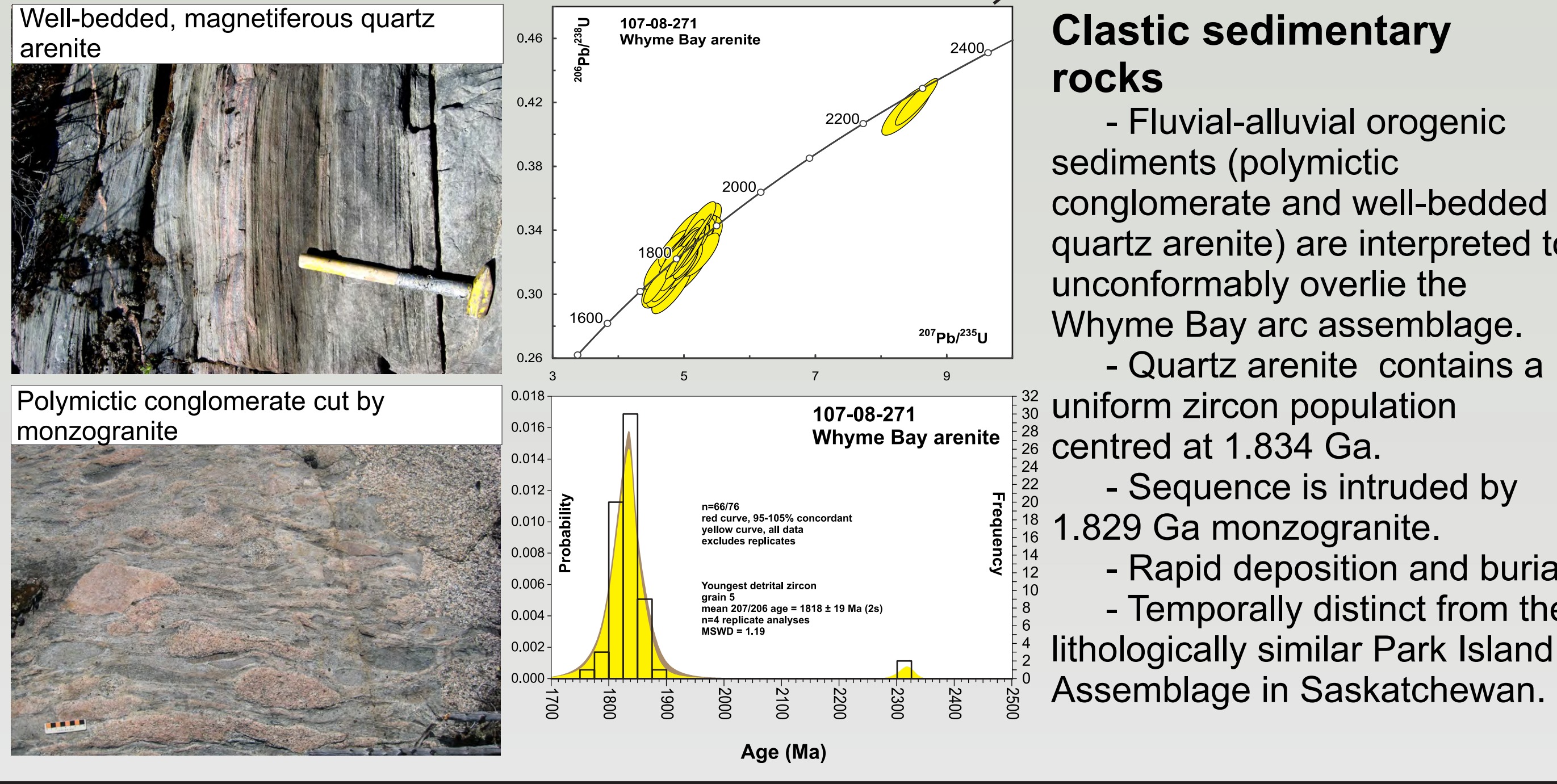
Arc succession (Whyme Bay assemblage)

- Mafic volcanic flows and volcanoclastic rocks with interbedded turbiditic sediments preserved as screens in monzogranite.
- Volcanic arc rare earth and trace element geochemical profiles.
- Contaminated εNd value of -3.2 (at 1.9 Ga).
- Depleted mantle Nd model age of 2.58 Ga suggests interaction with and/or recycling of ancient continental rocks in a subduction zone setting.
- 2 detrital zircon modes at ca. 2.34 Ga and 1.90 Ga indicate two distinct sources: 1) Sask craton-aged rocks, and 2) arc volcanic rocks.



Clastic sedimentary rocks

- Fluvial-alluvial orogenic sediments (polymictic conglomerate and well-bedded quartz arenite) are interpreted to unconformably overlie the Whyme Bay arc assemblage.
- Quartz arenite contains a uniform zircon population centred at 1.834 Ga.
- Sequence is intruded by 1.829 Ga monzogranite.
- Rapid deposition and burial
- Temporally distinct from the lithologically similar Park Island Assemblage in Saskatchewan.



Mineral Potential of Southern Indian Lake

The work conducted in the Southern Indian Lake area has identified a variety of mineral exploration targets in an area that has seen little such activity in recent decades. Emerging geoscience data, both in Manitoba and Saskatchewan, are establishing temporal links between volcanic rocks in the Southern Indian Lake, Rottenstone, Lynn Lake - Leaf Rapids domains, and therefore indicate the possible presence of a variety of mineral deposit types at the regional scale (e.g. VMS, orogenic lode gold, magmatic Ni-Cu-PGE). Some of the prospects identified include:

VMS

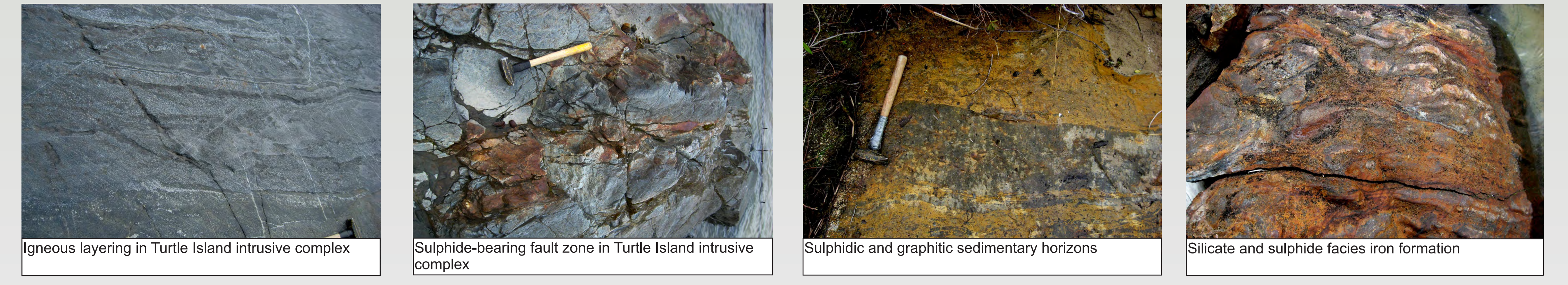
- Historical Cu values greater than 2% have been reoprted in numerous locations throughout the arc volcanic sequences. Frohlinger (1972) reported assay results up to 2.2% Cu from a narrow malachite-rich fracture in volcanic rocks of the Whyme Bay assemblage. Surface grab samples collected from trenches around Peanut Lake (immediately north of Partridge Breast Lake) returned Cu values of 4.74% and 6.85%. The samples consisted of disseminated to laminated pyrite, chalcopyrite and pyrrhotite hosted in garnet-biotite-quartz-hornblende-magnetite gneiss (in Manitoba Assessment File 93051, 1986)

Sediment-Hosted base metals

- Malachite-rich showings occur near the base of the clastic sedimentary sequence around Partridge Breast Lake. Assay results from the margin of a weakly gossanous tonalitic intrusion cutting these sedimentary rocks yielded anomalous Zn values of 1.36% and elevated As values, and could indicate the presence of sediment-hosted Cu-Zn-Pb mineralization.

Magmatic Ni-Cu-PGE

- Sulphidic and graphitic sedimentary horizons and iron formation on the northwestern shore of Turtle Island contain up to 70% pyrite and pyrrhotite with minor chalcopyrite. Perhaps more interesting is the fact that this sequence is intruded by the sulphide-bearing, ultramafic to intermediate Turtle Island intrusive complex, which shows evidence of multiple injections in a fluidly dynamic magma chamber. The host sedimentary rocks may have provided the source of sulphur to the intruding magma which allowed for the fractionation of magmatic Ni-Cu platinum-group element sulphides.



IOCG

- Widespread late to post-tectonic plutonism associated with the margins of long-lived Archean cratons presents a prospective setting for iron-oxide copper-gold type mineralization. Samples collected from a late granitic pegmatite returned assay values up to 1.55 g/t Au, 2.0 g/t Ag and 0.41% Zn with elevated values of Bi and Be. In addition, the presence of locally intense potassic alteration throughout plutonic and supracrustal rocks in the study area is also considered a favourable indication. Lastly, abundant magnetite and pyrite-chalcopyrite sulphides have been identified in late pegmatitic granite with rapakivi-type feldspar zoning on the eastern shore of Southern Indian Lake. The exposures correspond to a significant magnetic high on the aeromagnetic survey.



Orogenic Lode Gold

- Pyrite ± chalcopyrite ± pyrrhotite occur as disseminations and stringers along the sheared contact between Archean gneiss and the Proterozoic successions to the northwest and to the east of Pukatawakan Bay. The localized mineralization in the shear zones is associated with siliceous ± carbonate ± chloritic ± sericitic alteration.

