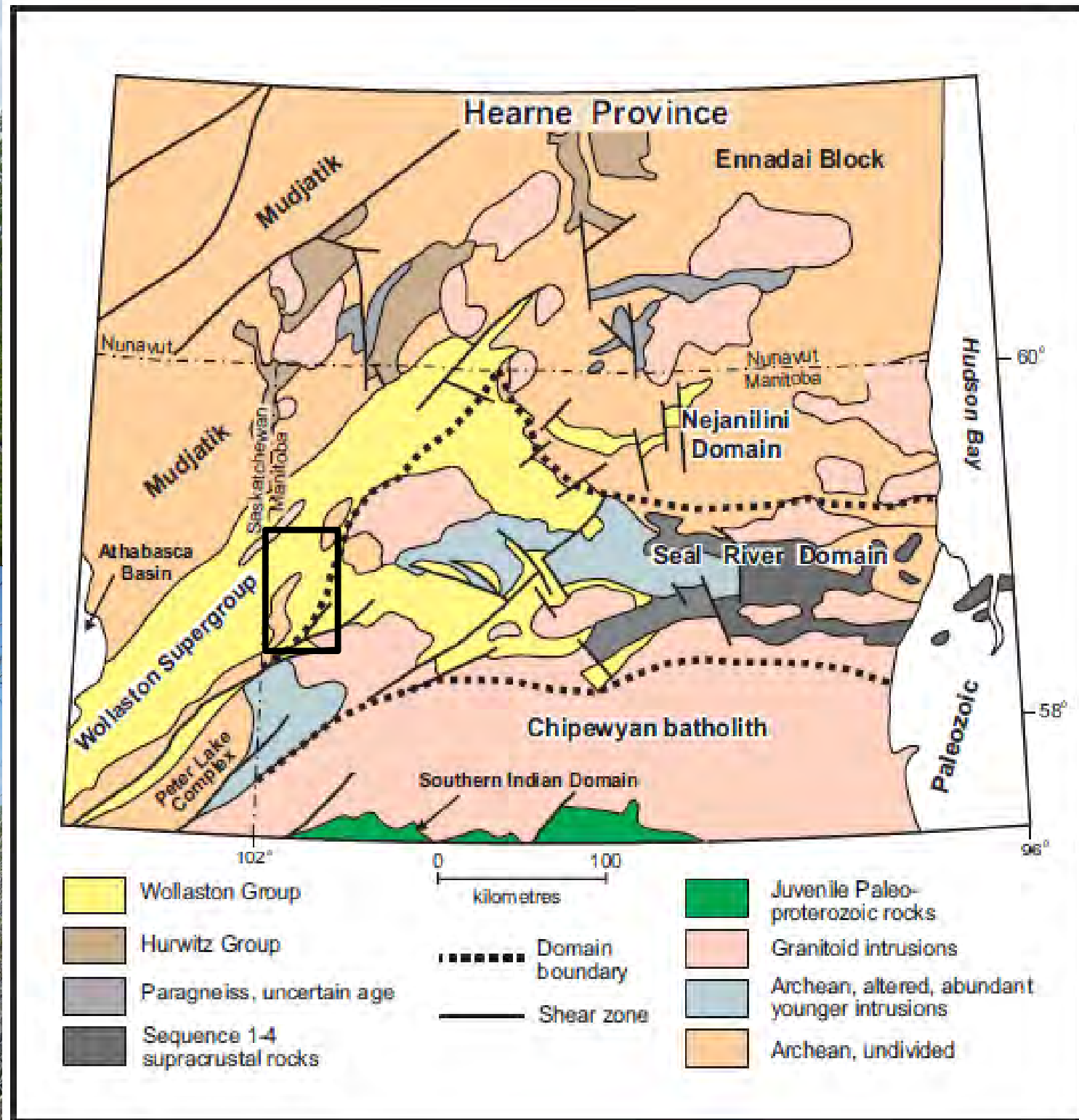


Far North Geomapping Initiative: Preliminary Results From Geological Mapping in the Misty Lake Area, Northwestern Manitoba

**Paul Kremer, Chris Couëslan, Anders Carlson
(MGS)**

**Nicole Rayner
(GSC)**

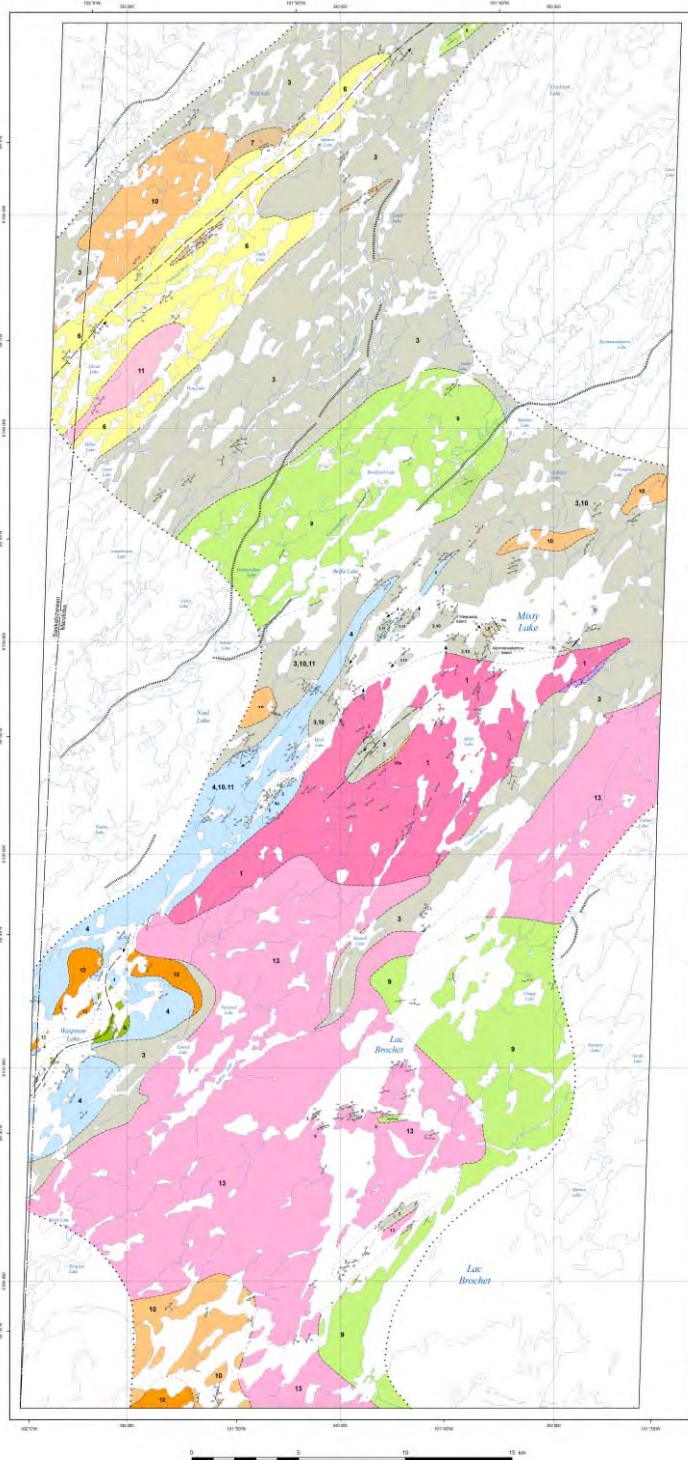






Misty Lake Mapping Program

Geology of the Misty Lake area, northwestern Manitoba (parts of NTS 64K12, 13, 64N4)



- Legend**
- Alkali metasomatism: alkali-cloropyroxene-amphibole ± fluorite ± zirconite ± calcite
 - 13 Granite to megacrystic; medium-grained to pegmatitic, massive
 - 12 Lithogranite; locally pegmatitic
 - 11 Megacrystic to megacrystic; medium-grained to pegmatitic, locally strongly magnesian
 - 10 Tonalite, granodiorite, granite; medium to coarse grained, massive to weakly foliated or irregularly to garnet or cordierite porphyroblastic; quartz and feldspar
 - 9 Quartz and feldspar; aplitic; calcareous aplitic with minor calcite and interlayers
 - 8 Felspar-sagen porphyries
 - 7 Massive to crudely bedded aplitic aplitic
 - 6 Pegmatitic biotite gneiss; well-layered, non-porphyroblastic, megacrystic
 - 5 Calcite and marls
 - 4 Aplitic to sericitic gneiss-cordierite porphyroblastic; quartz aplitic with calcite inclusions; well-layered
 - 3 Pegmatitic to aplitic gneiss; garnet-cordierite to sillimanite porphyroblastic; variably magnesian; weakly to moderately magnesian
 - 2 Enderbite; fine to medium-grained, massive
 - 1 Tonalite to granodiorite; biotite ± hornblende ± orthopyroxene-bearing; well-bedded; locally granitic

- Symbols**
- Planar structure**
- Bedding; top unknown
 - Foliation; generation 1, 2
 - Fold axial plane; generation unknown, 2
 - Vein
- Linear structure**
- L-fabric; generation 2; mineral lineation, bedding
 - Fold axis; generation unknown, 1, 2
 - Fold axis; S symmetry; generation 1, 2
 - Fold axis; Z symmetry; generation 2
 - Fold axis; symmetric; generation unknown, 2
- Geological contact; approximate; underwater**
- Fold axial trace; generation 2
 - Episk
 - Limit of mapping
 - Trail

Geology by: P.D. Kremer, A.R. Carlson, and C.G. Coustain
Cartography by: M.E. McFarlane
Published by: Manitoba Innovation, Energy and Mines; Manitoba Geological Survey, 2010
 This map is a professional drawing of field notes and data during the summer field season and is produced directly from the geologist's manuscript. It is not to be regarded as a final interpretation of the geology of the area.
SUGGESTED REFERENCE:
 Kremer, P.D., Carlson, A.R. and Coustain, C.G. 2010. Geology of the Misty Lake area, northwestern Manitoba (parts of NTS 64K12, 13, 64N4). Preliminary Map PMAP2010-2, scale 1:50,000.



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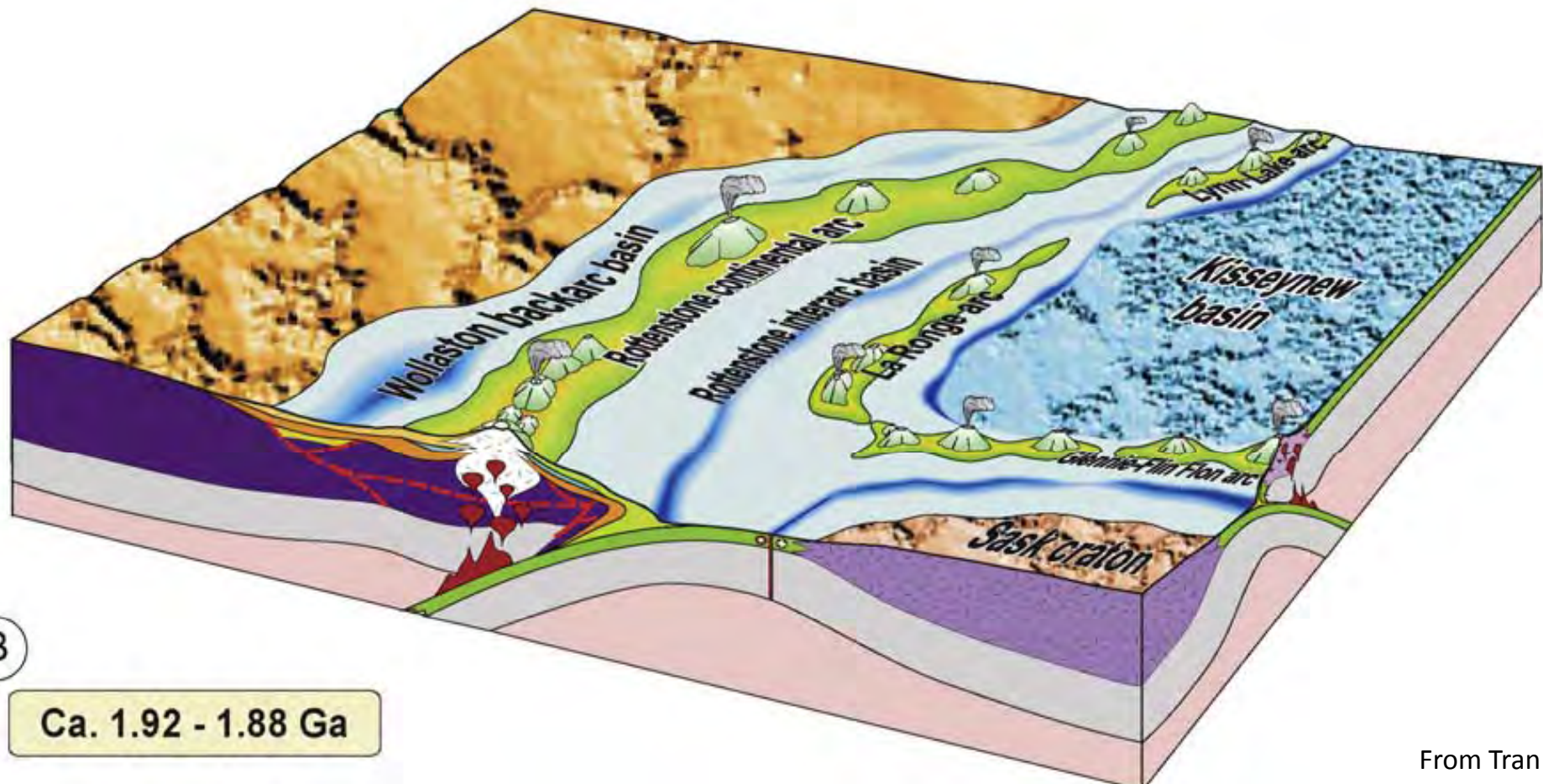


- Six week bedrock mapping
- Area dominated by metasedimentary rocks of the Wollaston Supergroup
 - correlative to established stratigraphy in Saskatchewan
- Structural inliers of Archean basement rock
- Widespread granitic magmatism
- Post-metamorphic alkali metasomatism
 - Potential for metasomatic-related mineral deposits



Geological Framework

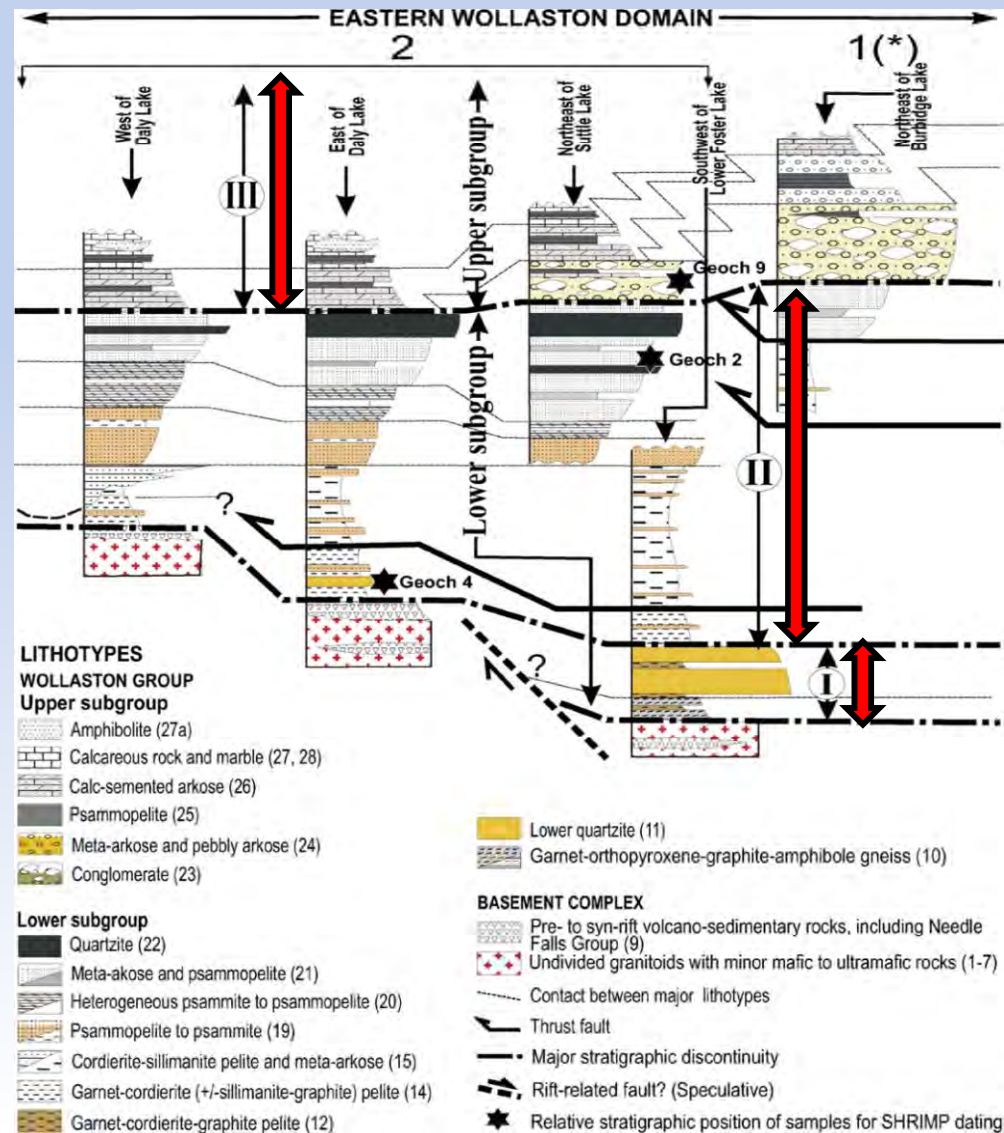
- Wollaston Supergroup comprises sedimentary succession(s) overlying the southeastern Hearne craton margin
- Stratigraphy represents various stages in an evolving rift – passive margin – foreland/backarc basin setting



Wollaston Supergroup

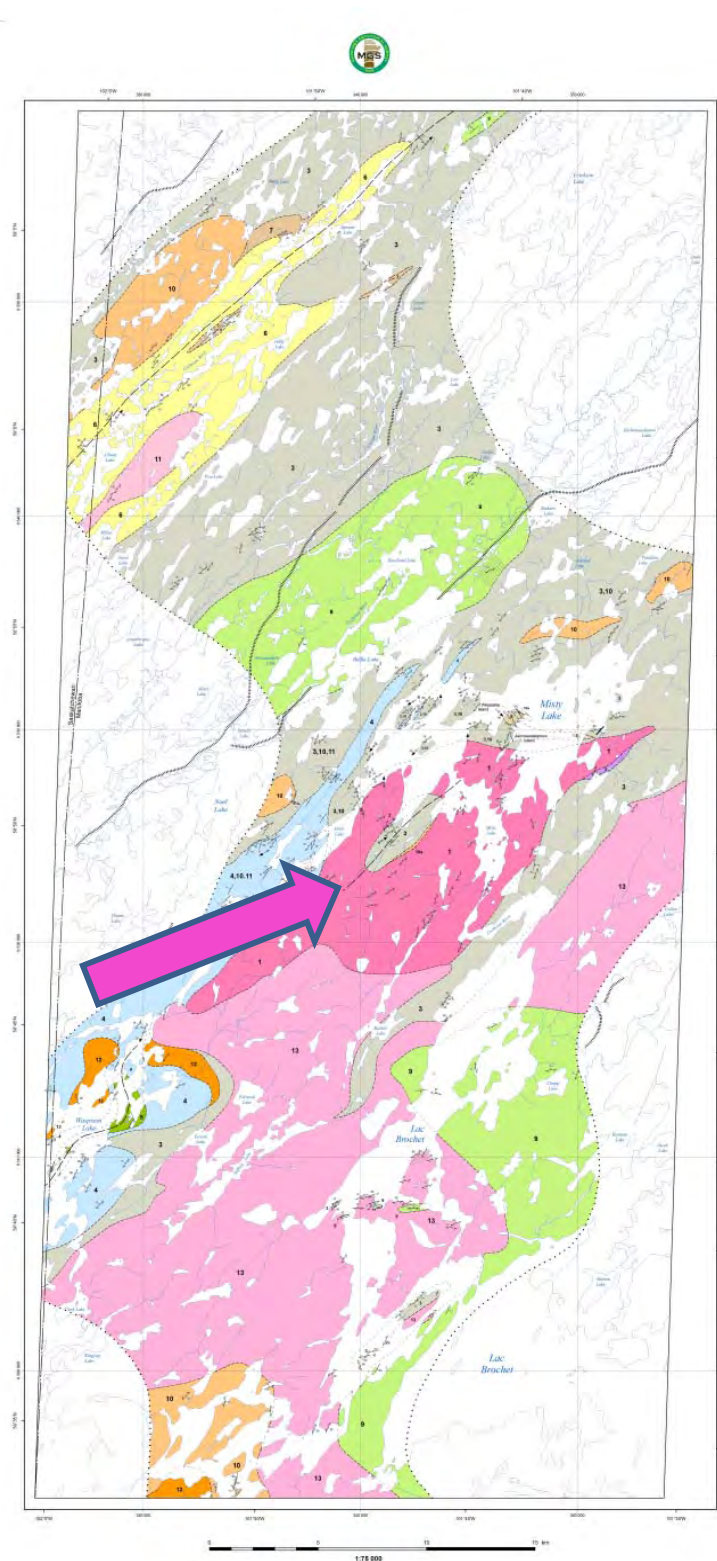
- Stratigraphy is well-established in Saskatchewan
- Sequence I (Courtenay Lake and Souter Lake Groups)
 - Conglomerate and arkose ± volcanic rocks; quartzite and semi-pelite
- Sequence II (Daly Lake Group)
 - Graphitic pelite and semi-pelite with minor quartzite, calcsilicate and marble, ct-gt-sill semi-pelite and pelite, arkose
- Sequence III (Geikie River Group)
 - Conglomerate, arkose, calcareous arkose, calcsilicate and marble

From Tran et al., 2008

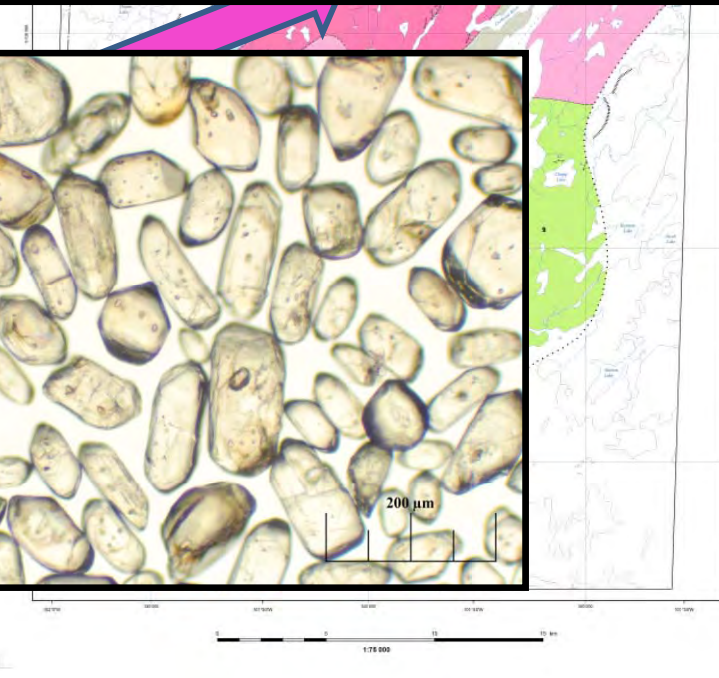
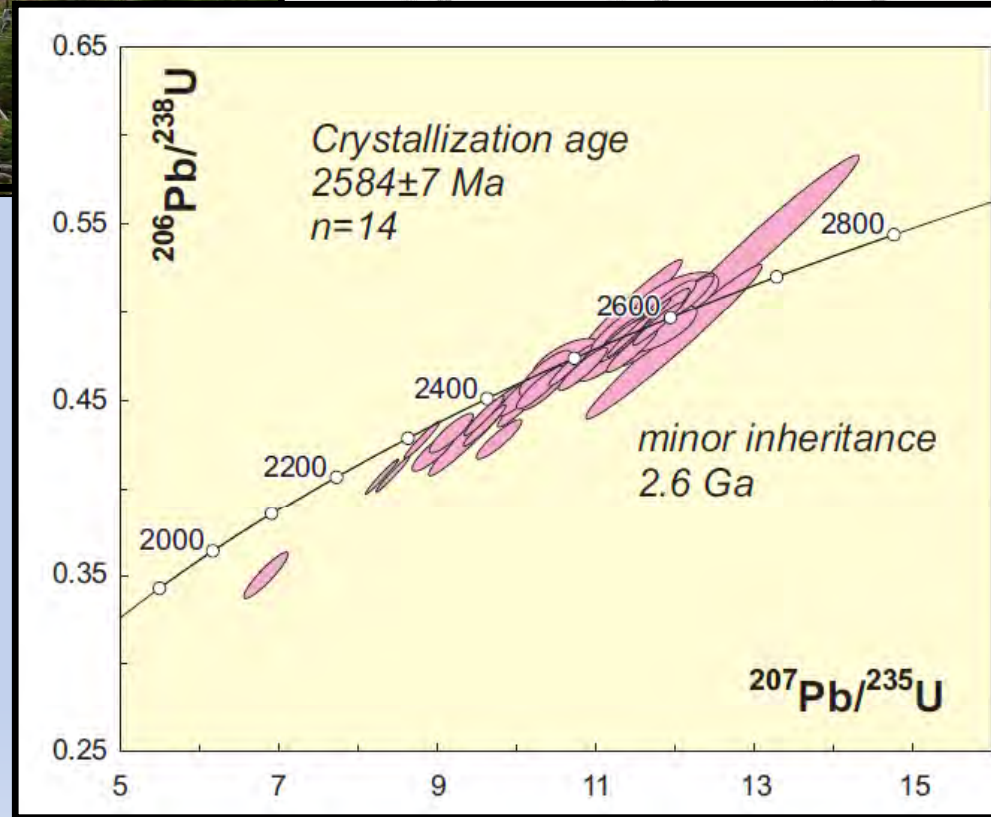


Archean Basement Rocks in the Misty Lake Area

- Foliated to locally gneissic tonalite to granodiorite
- Forms the core of a structural dome
- 2584 ± 7 Ma crystallization age

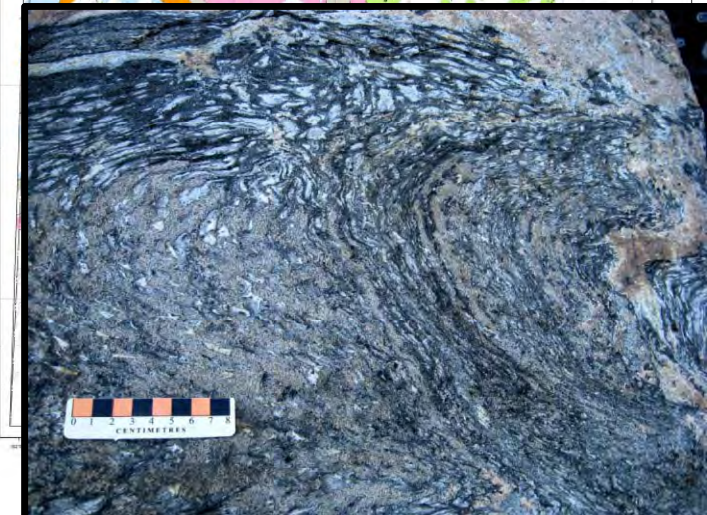
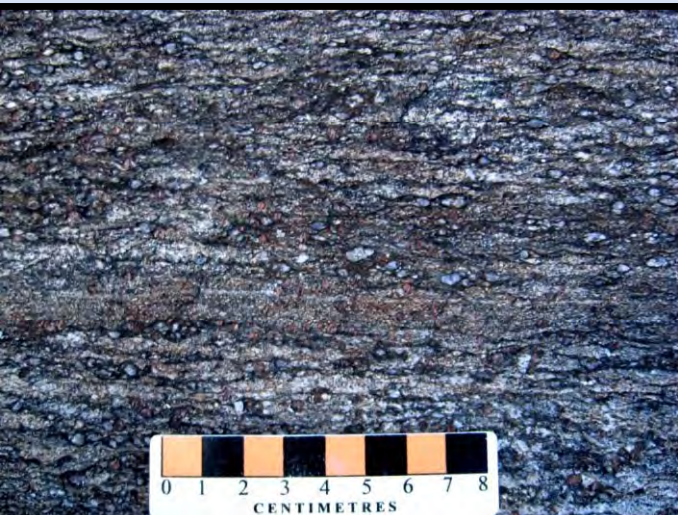
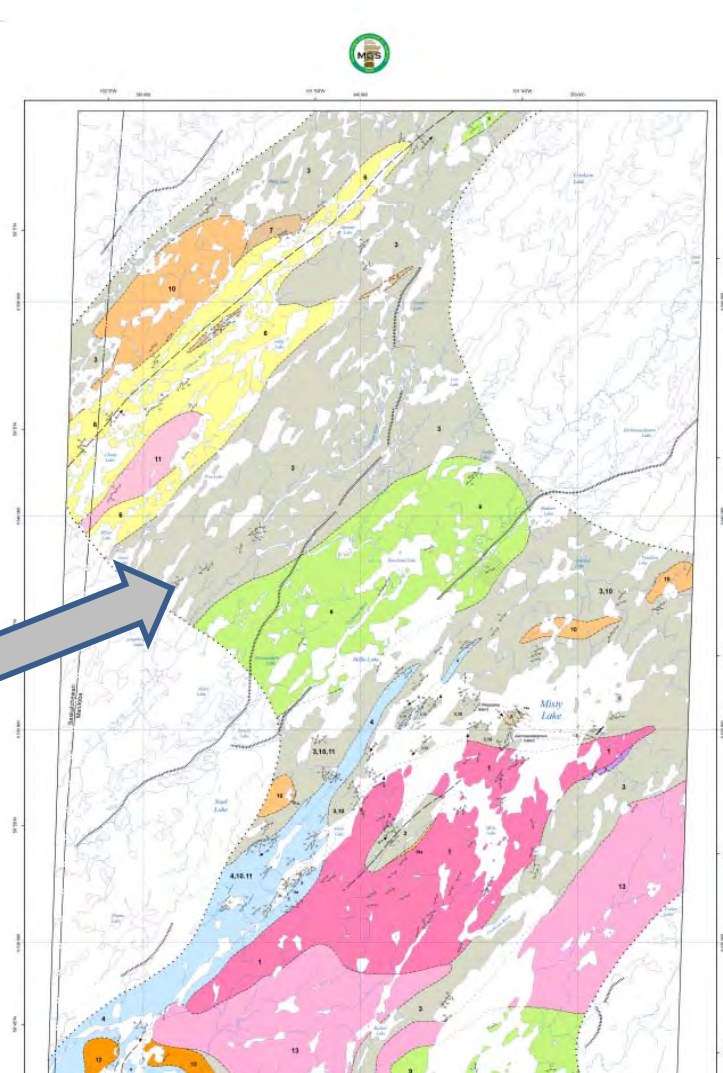


Archean Basement Rocks in the Misty Lake Area



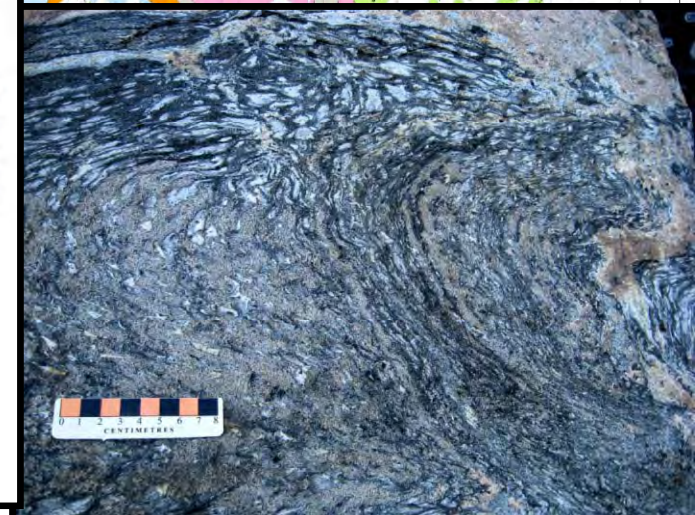
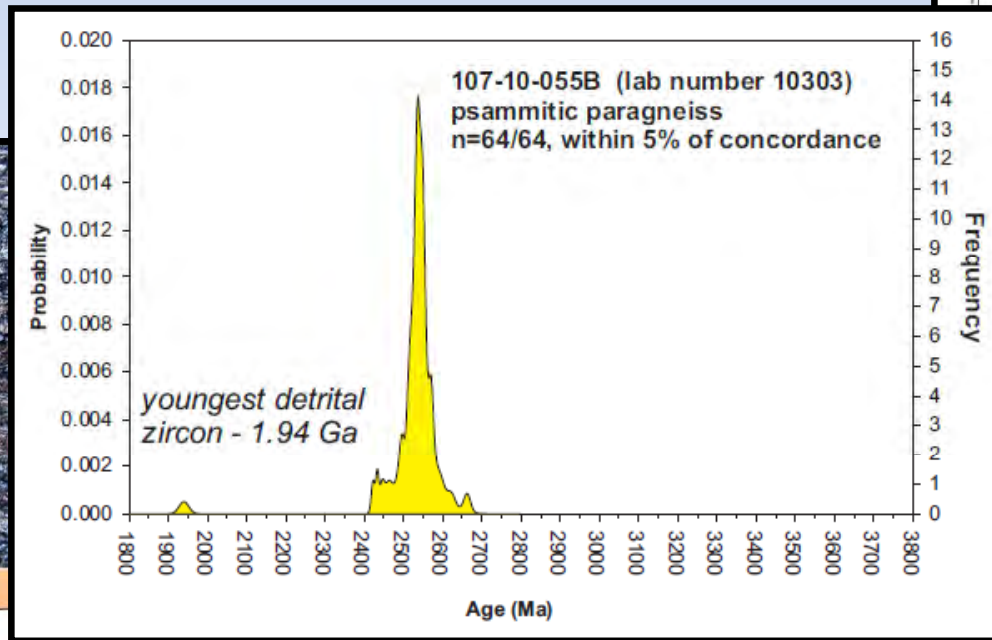
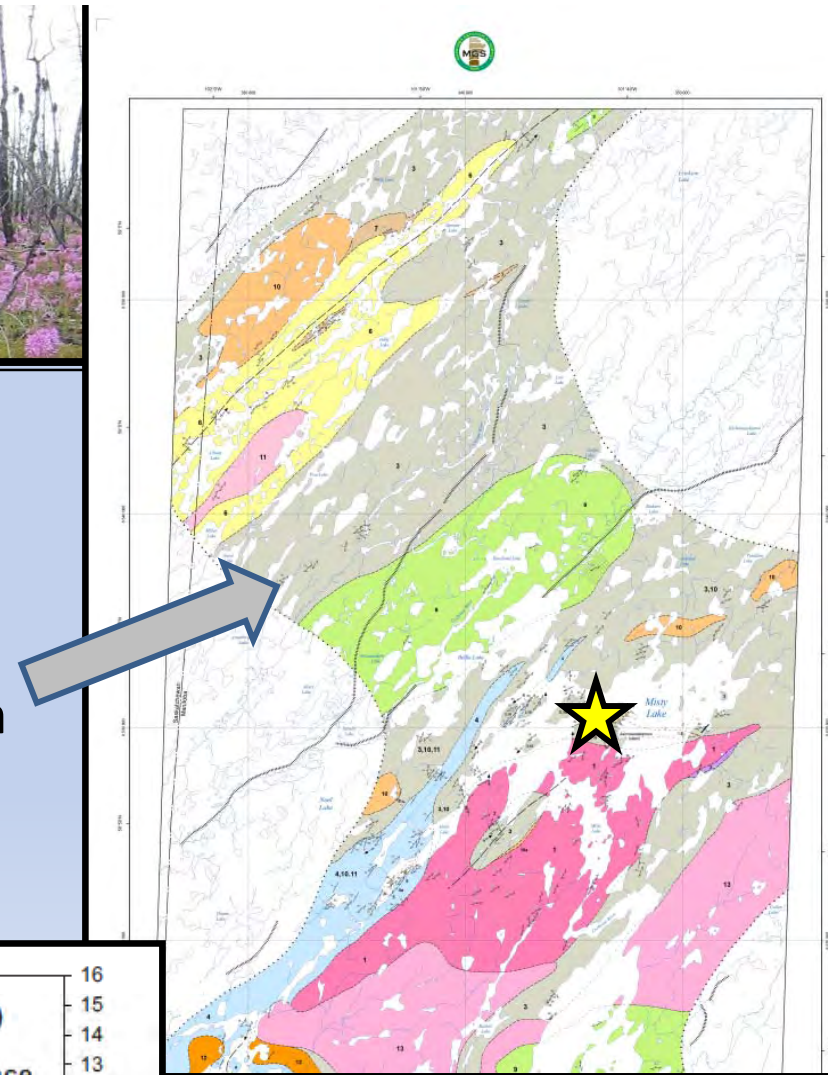
Metasedimentary rocks in the Misty Lake Area

- Psammitic to pelitic gneiss
 - Gt-cd \pm sill porphyroblastic
 - Variably migmatitic
 - Leucogranitic to granodioritic anatectic dikes
 - Base of sequence?
- Detrital zircon analyses consistent with derivation from local Archean rocks
 - 2.5-2.6 Ga dominates; minor 1.94 Ga



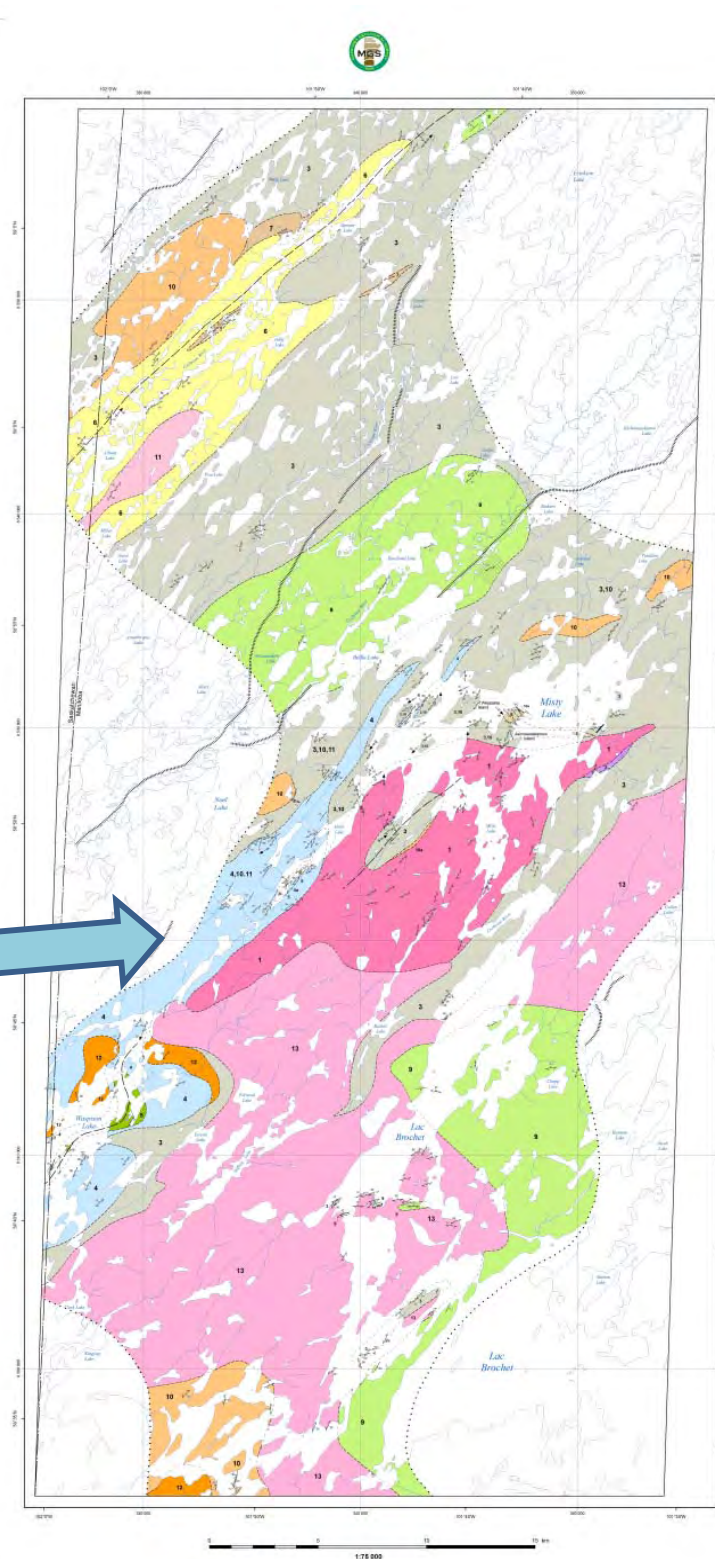
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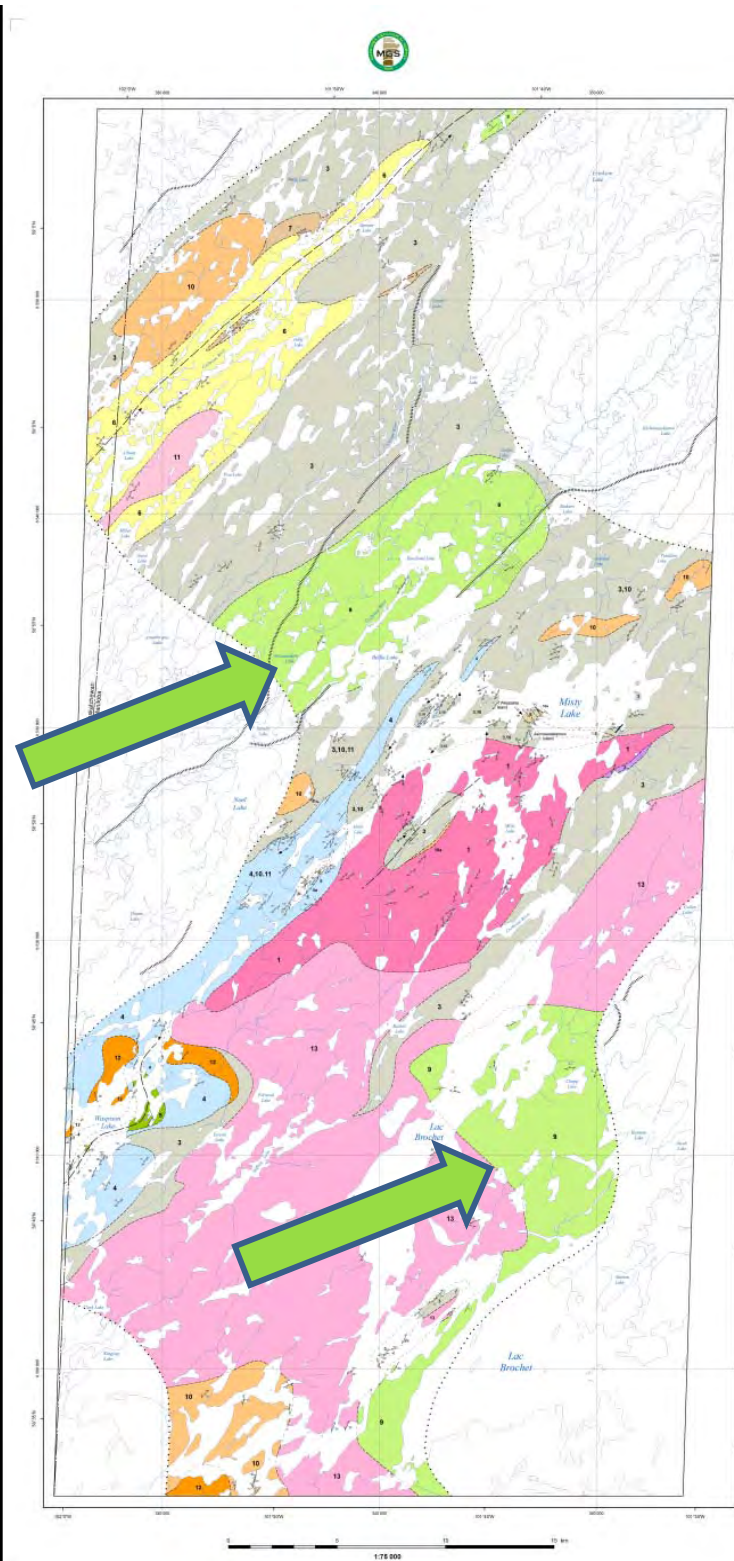
Metasedimentary Rocks in the Misty Lake Area

- Arkosic to semi-pelitic gneiss
 - Characterized by increase in detrital and metamorphic kfsp
 - Cd-porphyroblastic
 - Syenogranitic anatectic dikes
- Rare marble and calcsilicate layers



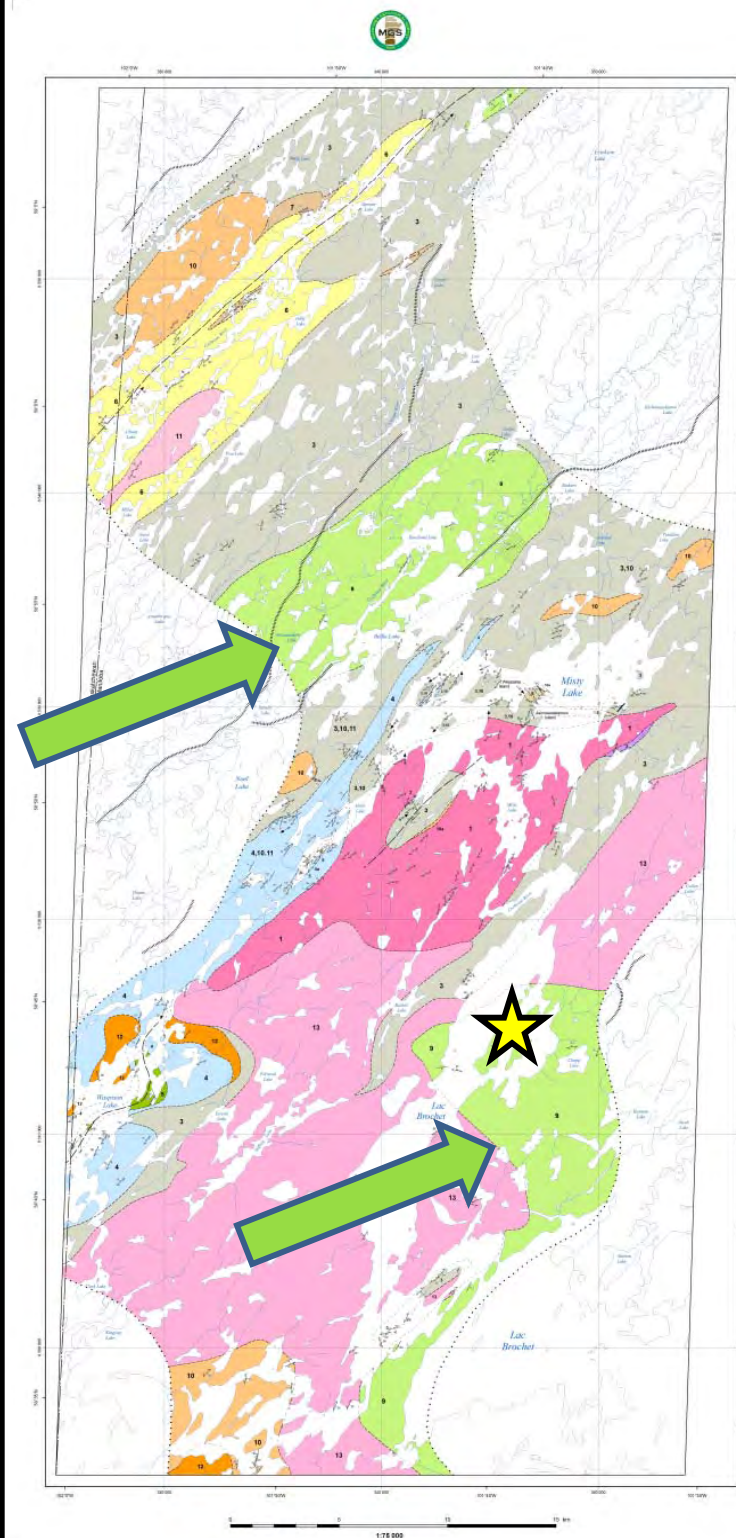
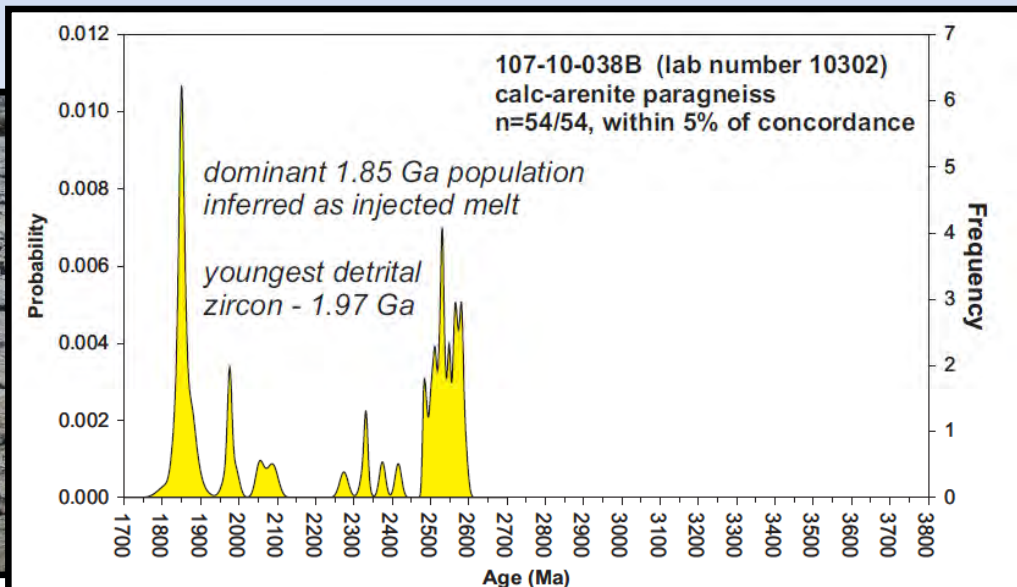
Metasedimentary Rocks in the Misty Lake Area

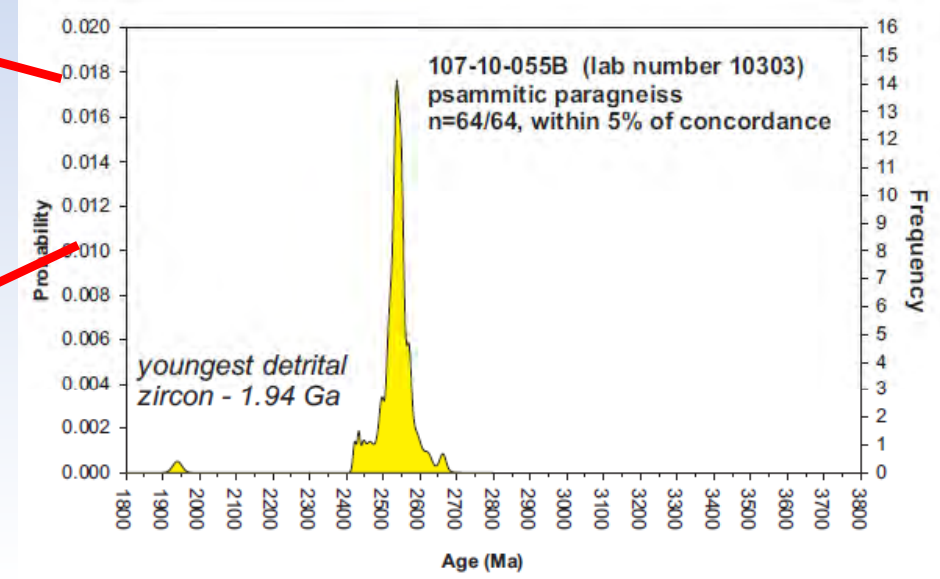
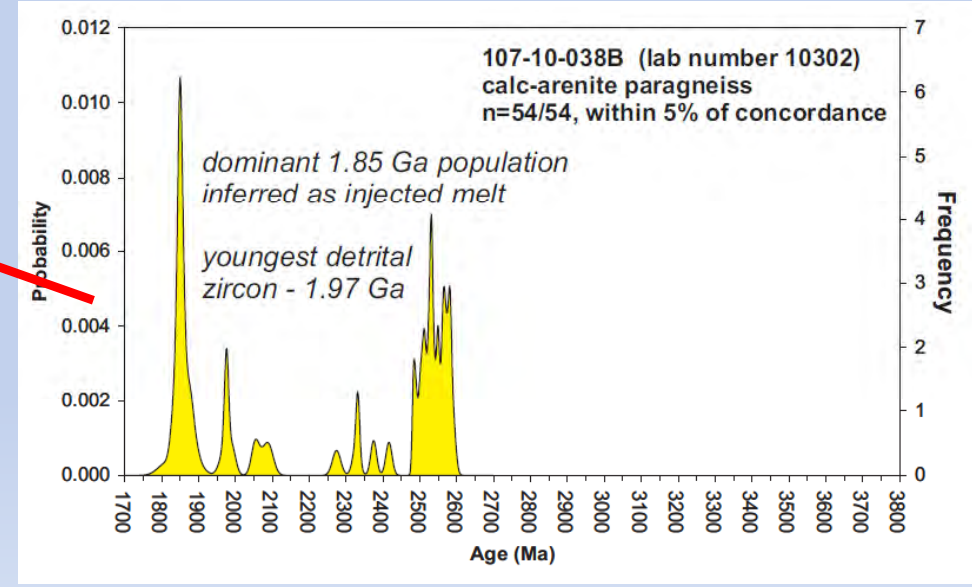
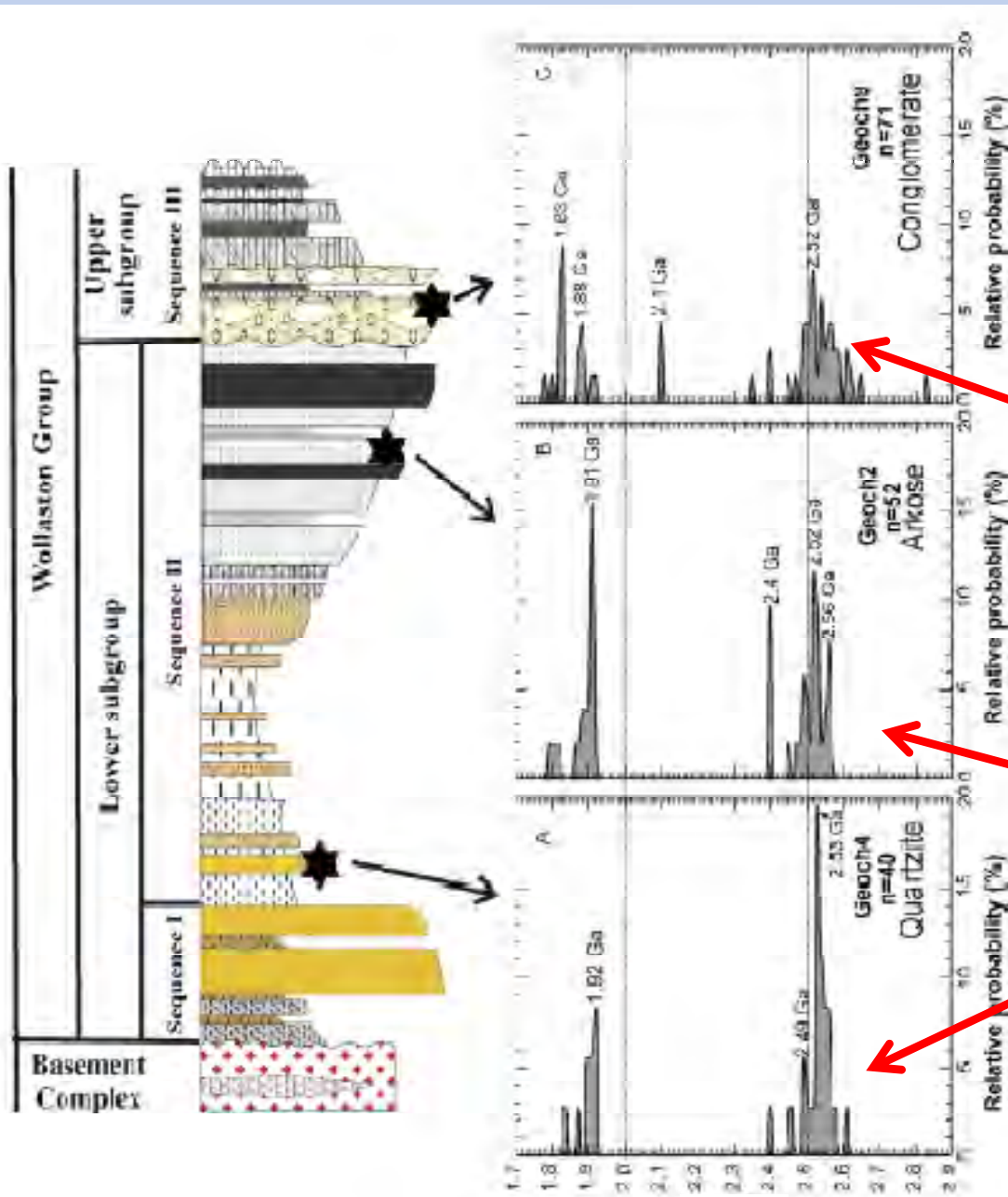
- Quartz and feldspathic arenite to calcareous arenite
 - Well-bedded, medium-grained
 - Rare calcsilicate interlayers
 - Diopside veins
- Detrital zircon analyses similar to psammitic rocks
 - Addition to 2.0-2.3 Ga zircons



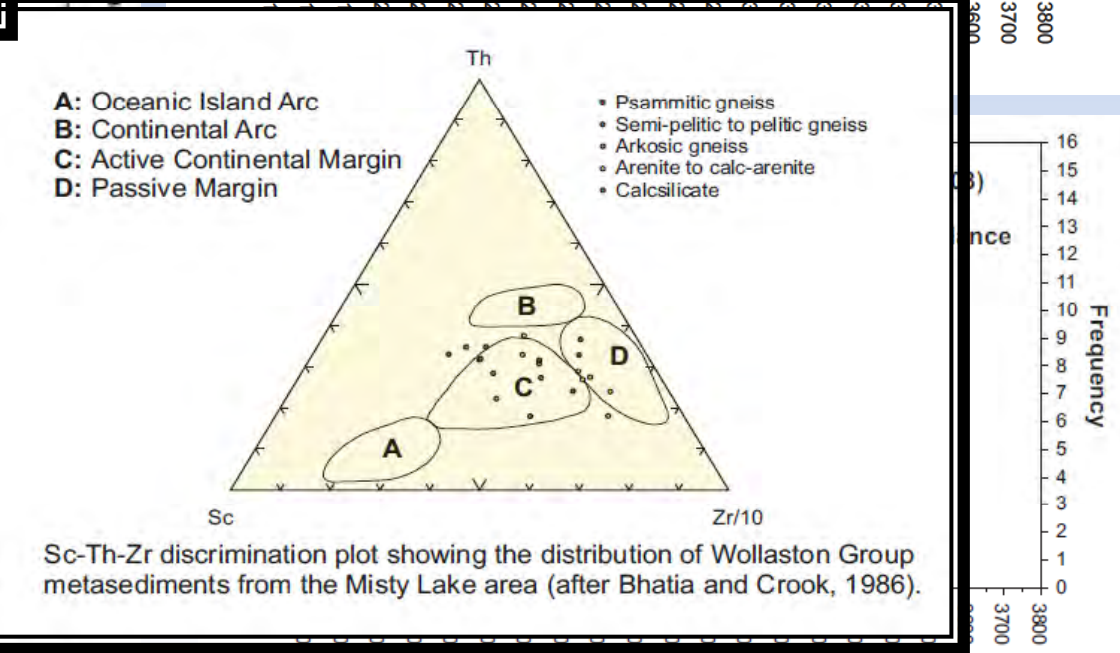
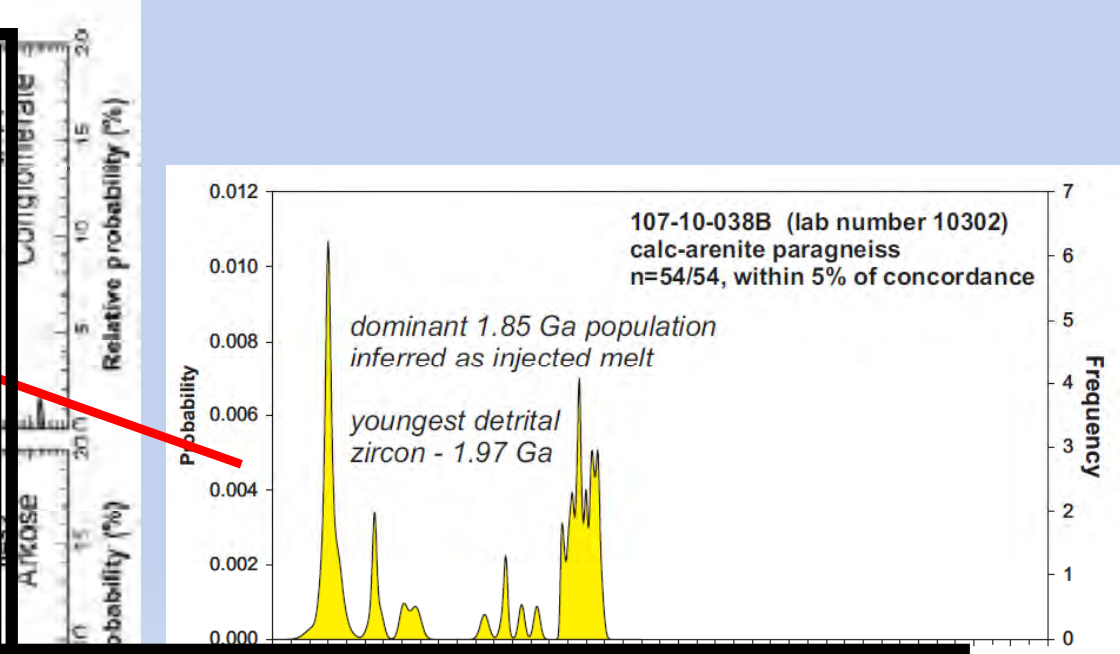
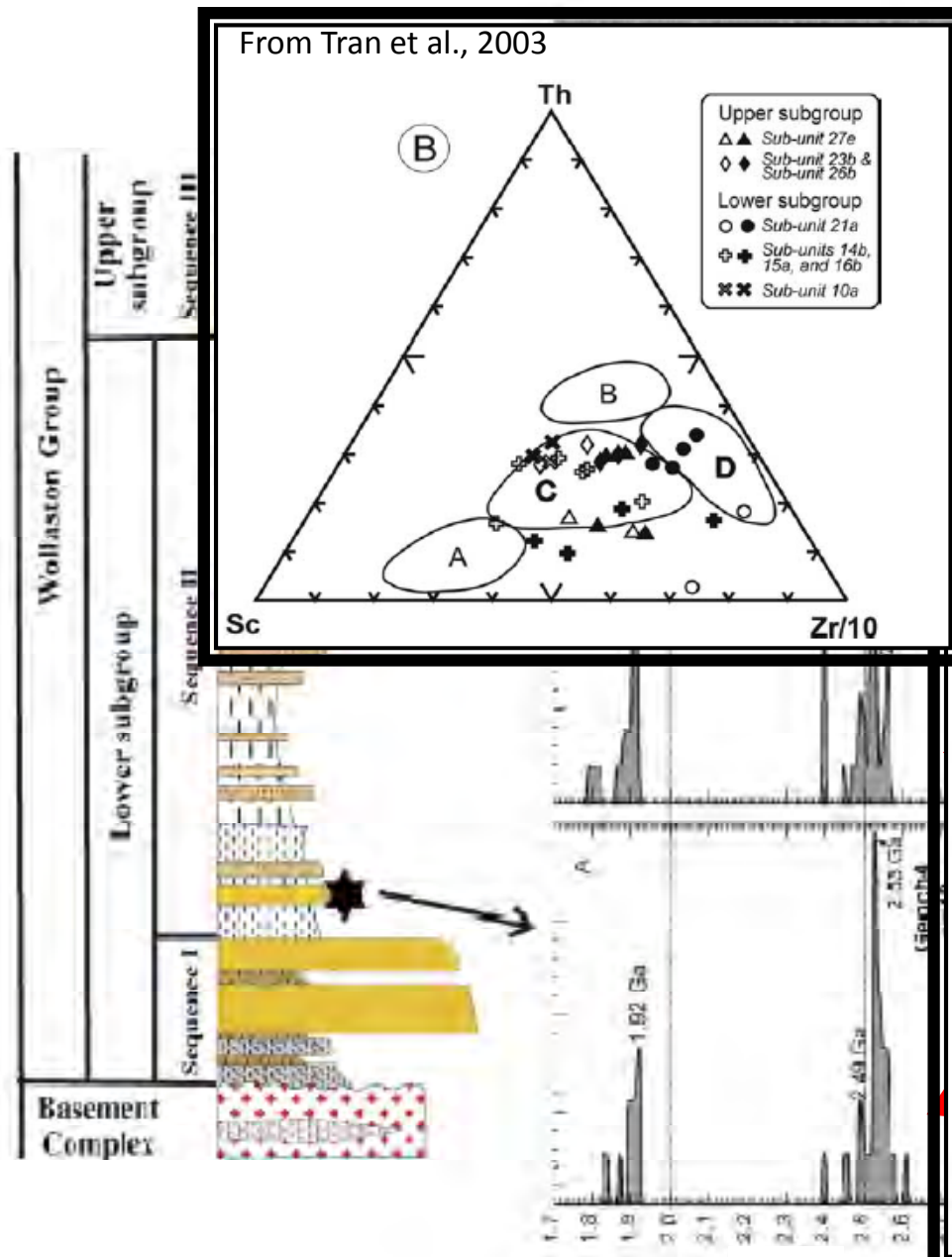
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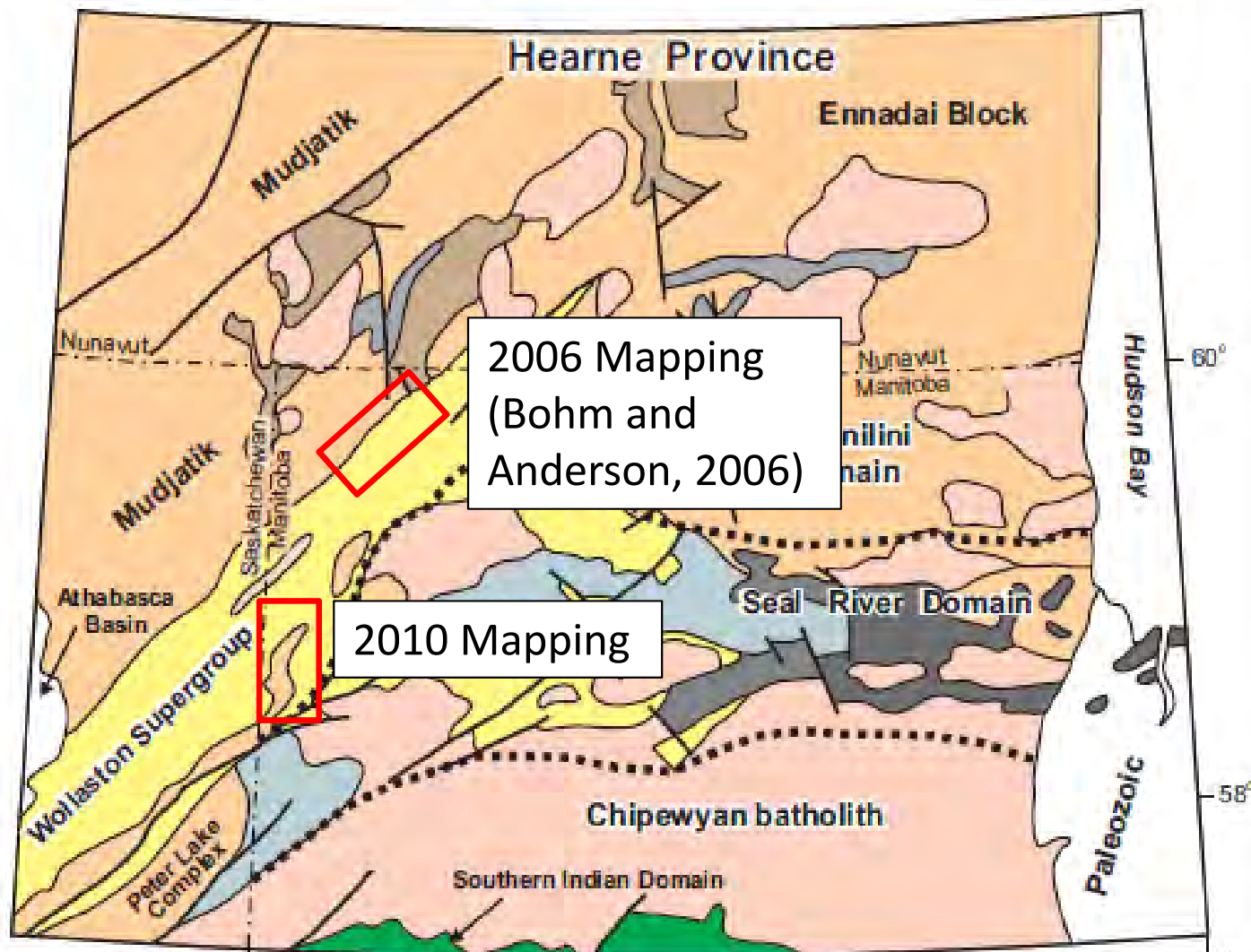




From Tran et al., 2008


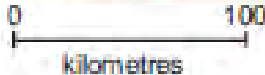











From Tran et al., 2008

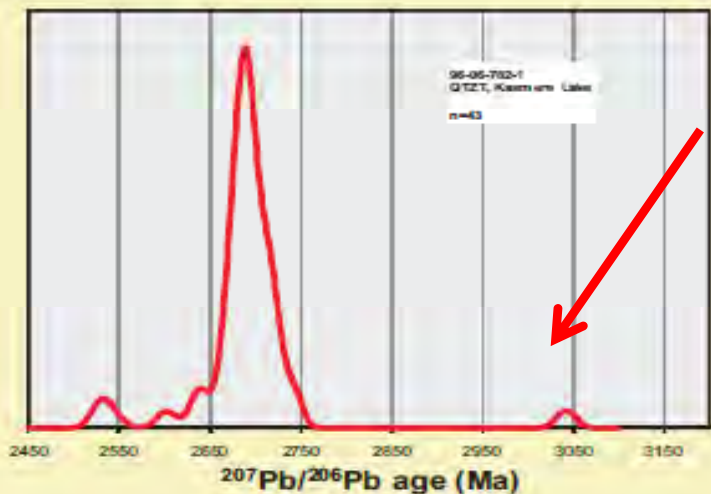
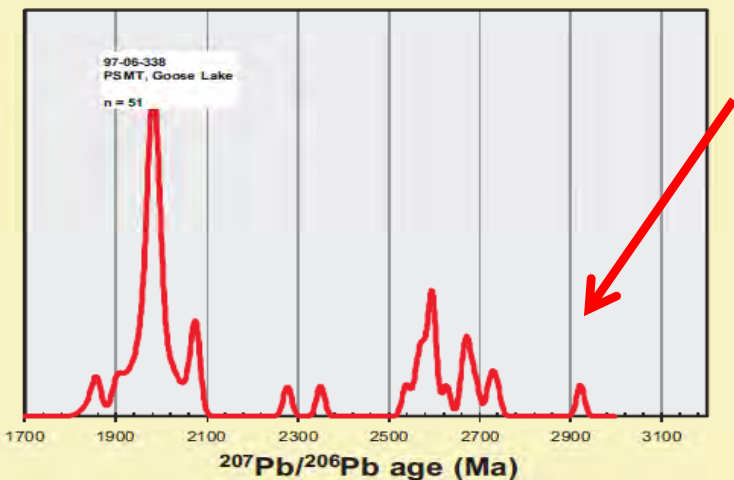
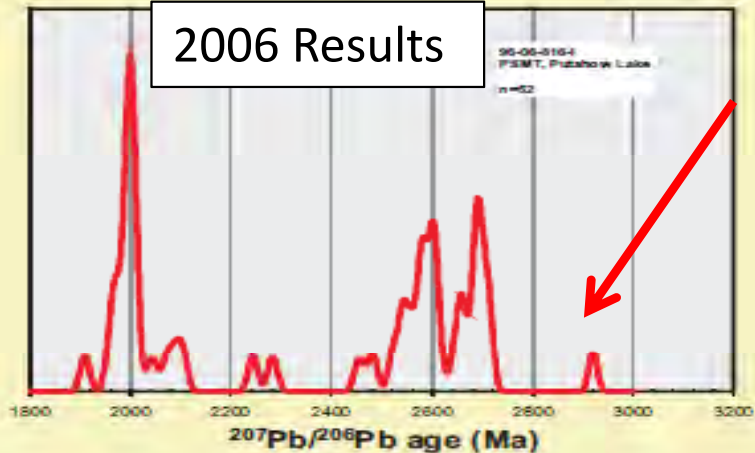


2006 Mapping
(Bohm and Anderson, 2006)

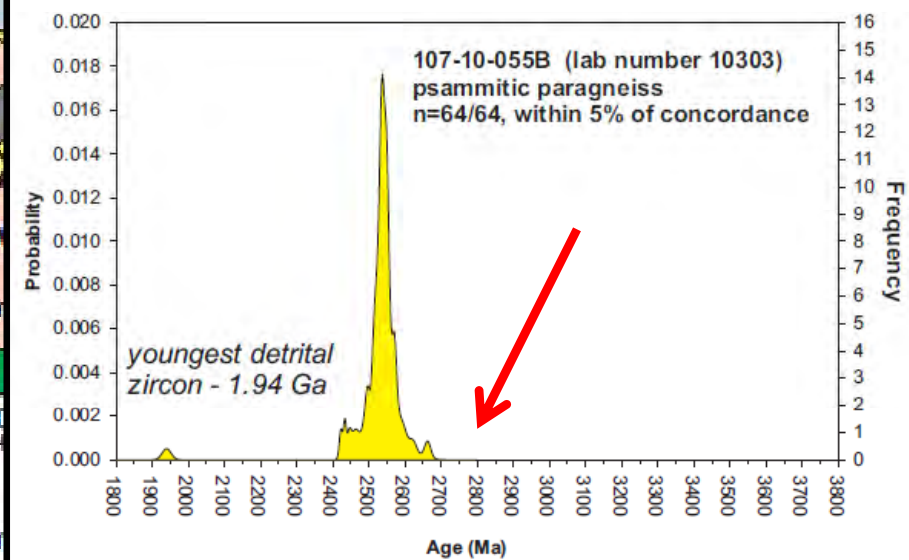
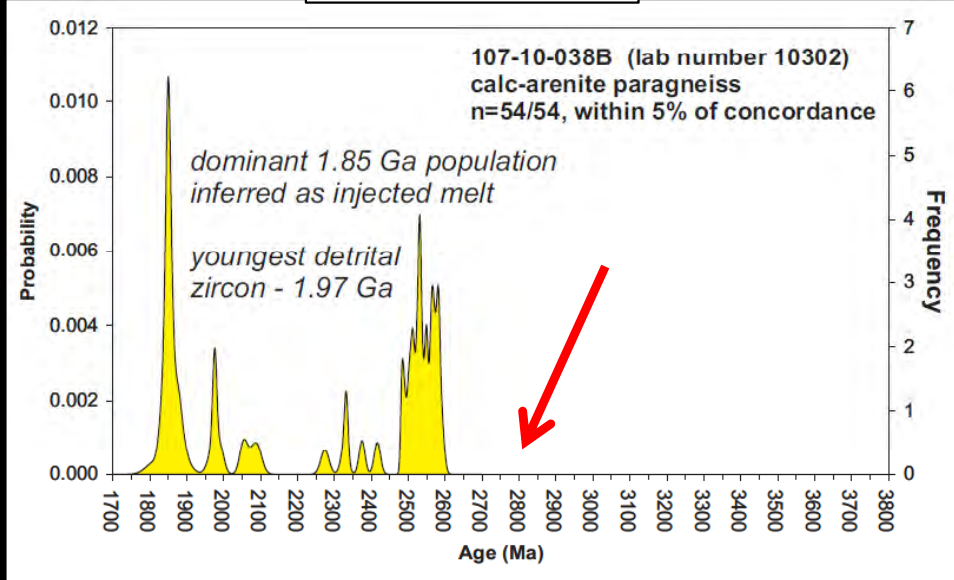
2010 Mapping

- | | | |
|---|--|---|
|  Wollaston Group |  |  Juvenile Paleo-proterozoic rocks |
|  Hurwitz Group |  Domain boundary |  Granitoid intrusions |
|  Paragneiss, uncertain age |  Shear zone |  Archean, altered, abundant younger intrusions |
|  Sequence 1-4 supracrustal rocks | |  Archean, undivided |

2006 Results



2010 Results



Structure and Metamorphism

- D_1
 - Rarely preserved F_1 isoclinal folds
 - Composite S_0 - S_1 transposition foliation
- D_2
 - NE-trending, tight to isoclinal upright folds, shallowly to moderately NE and SW plunging
 - Weak to moderate S_2 foliation
 - Synchronous with peak metamorphism
- D_3
 - NW-trending, gentle to open folds

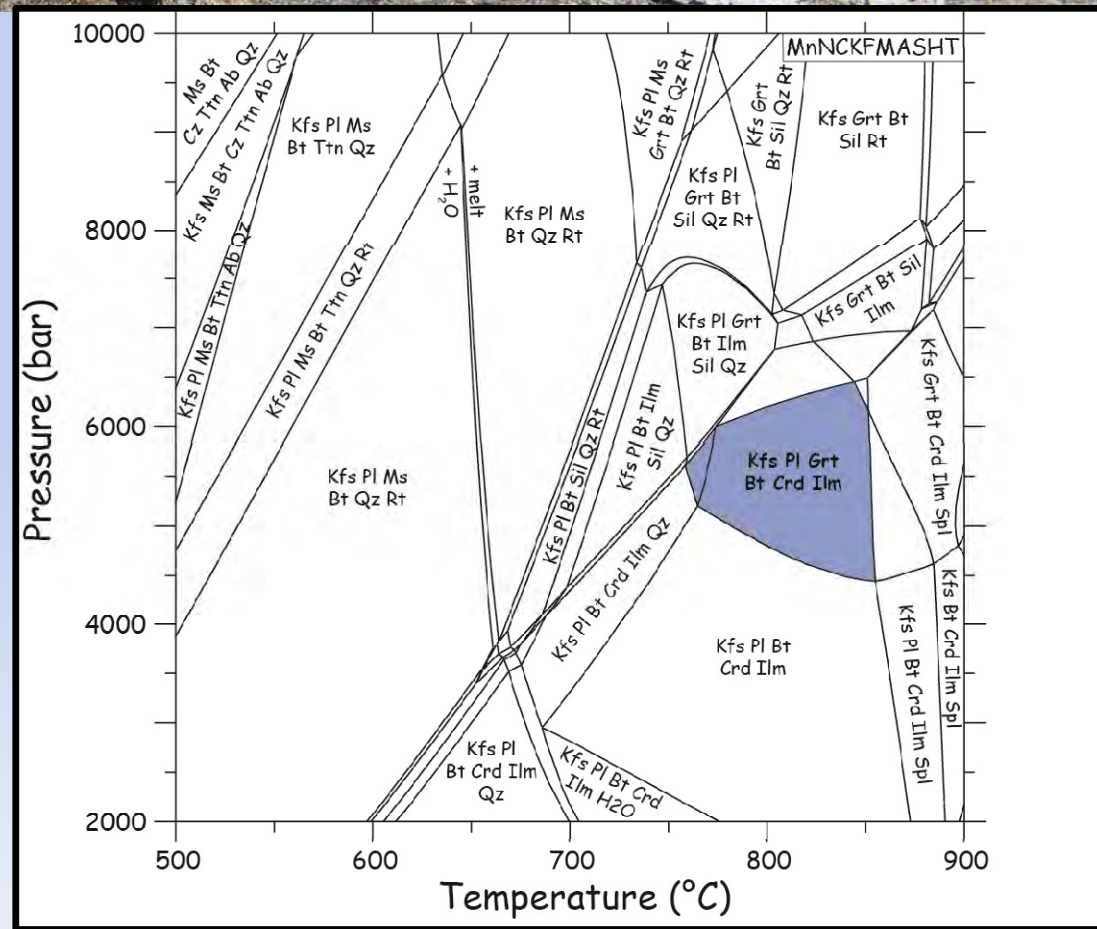
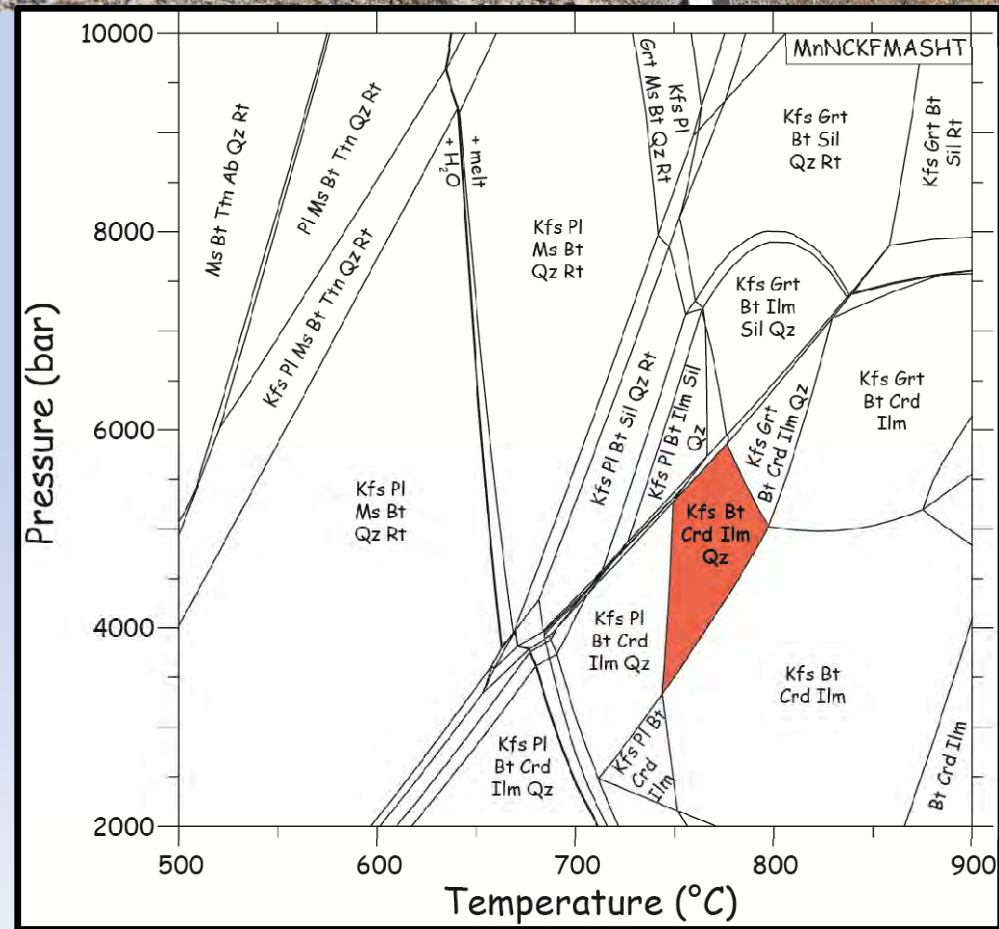


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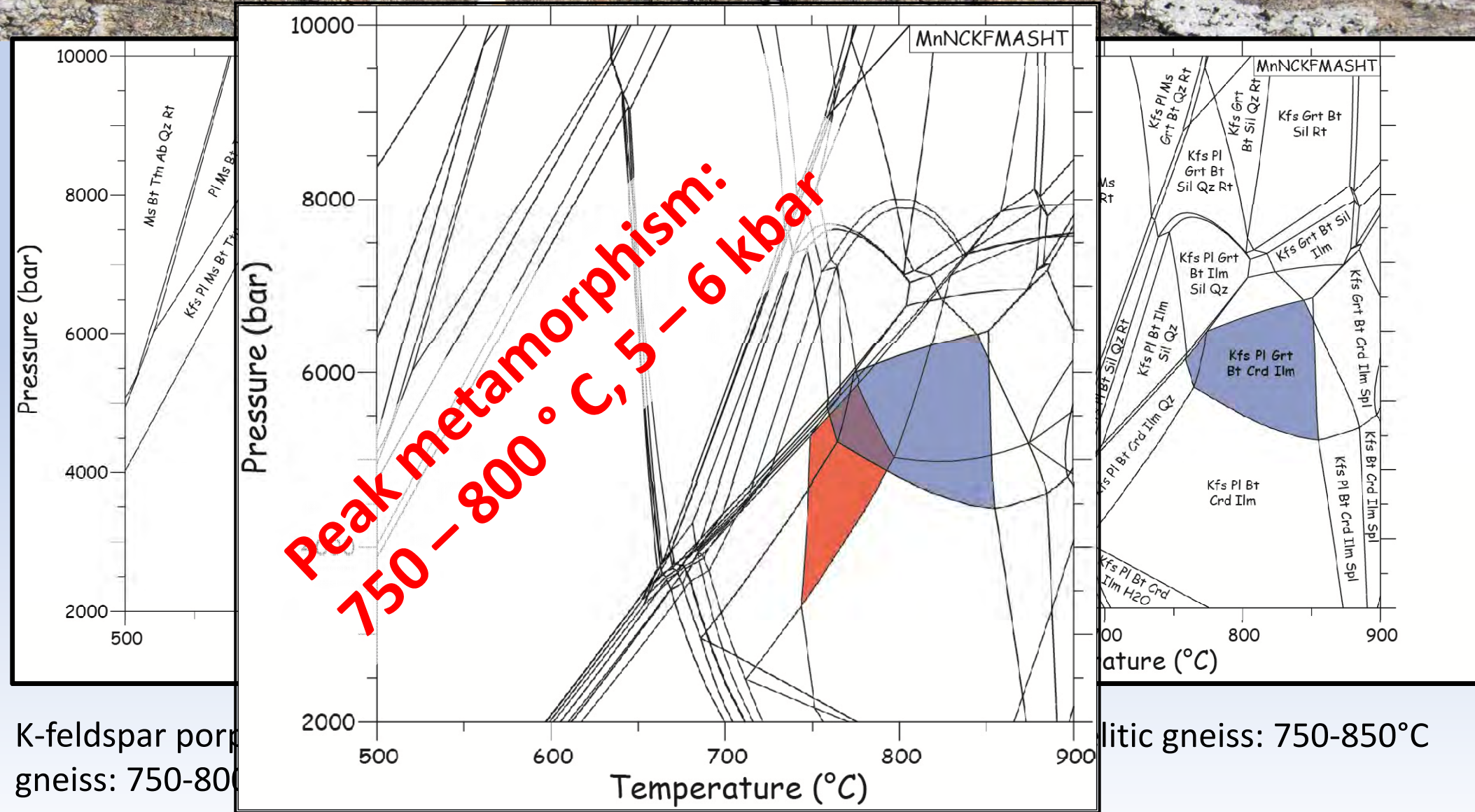
Structure and Metamorphism



K-feldspar porphyroblastic arkosic biotite gneiss: 750-800°C and 3.5–6 kbar

Psammitic to semi-pelitic gneiss: 750-850°C and 4.5–6.5 kbar

Structure and Metamorphism

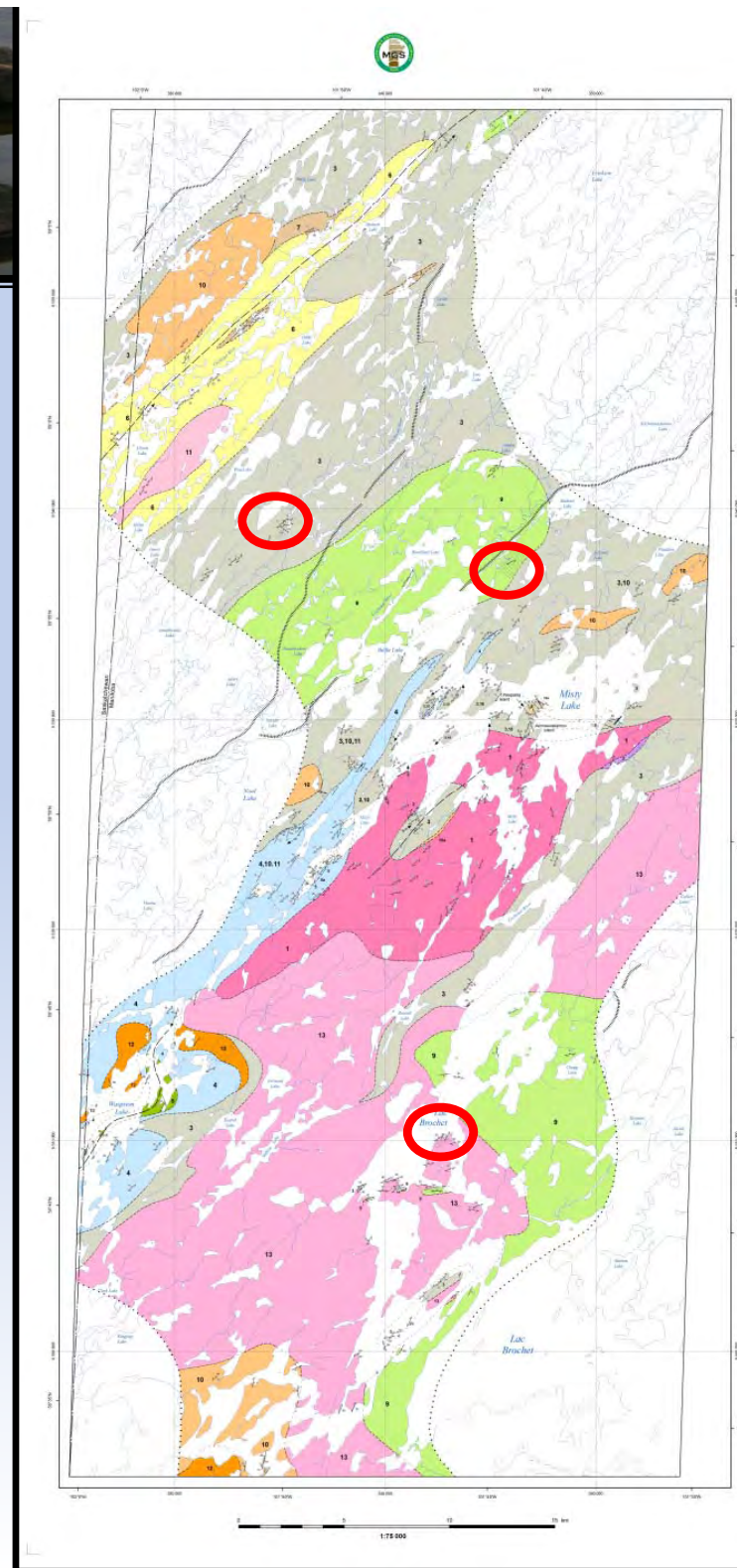


K-feldspar porphyroblasts
gneiss: 750-800°C

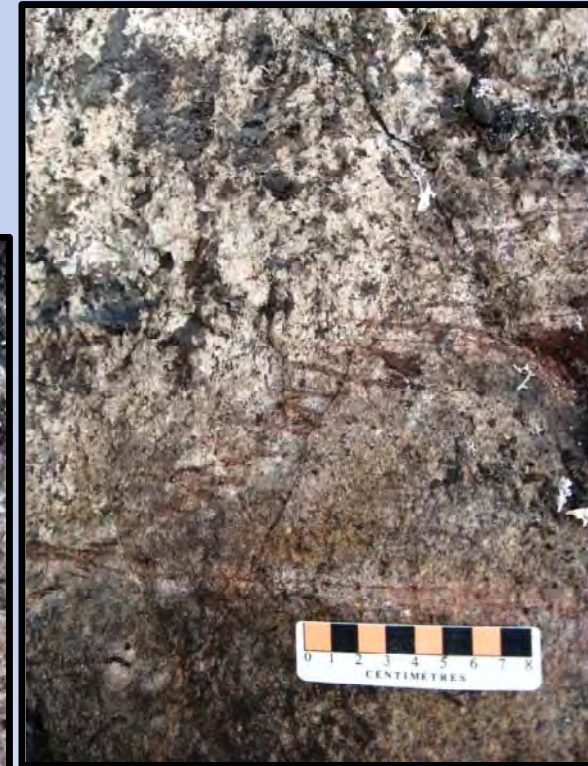
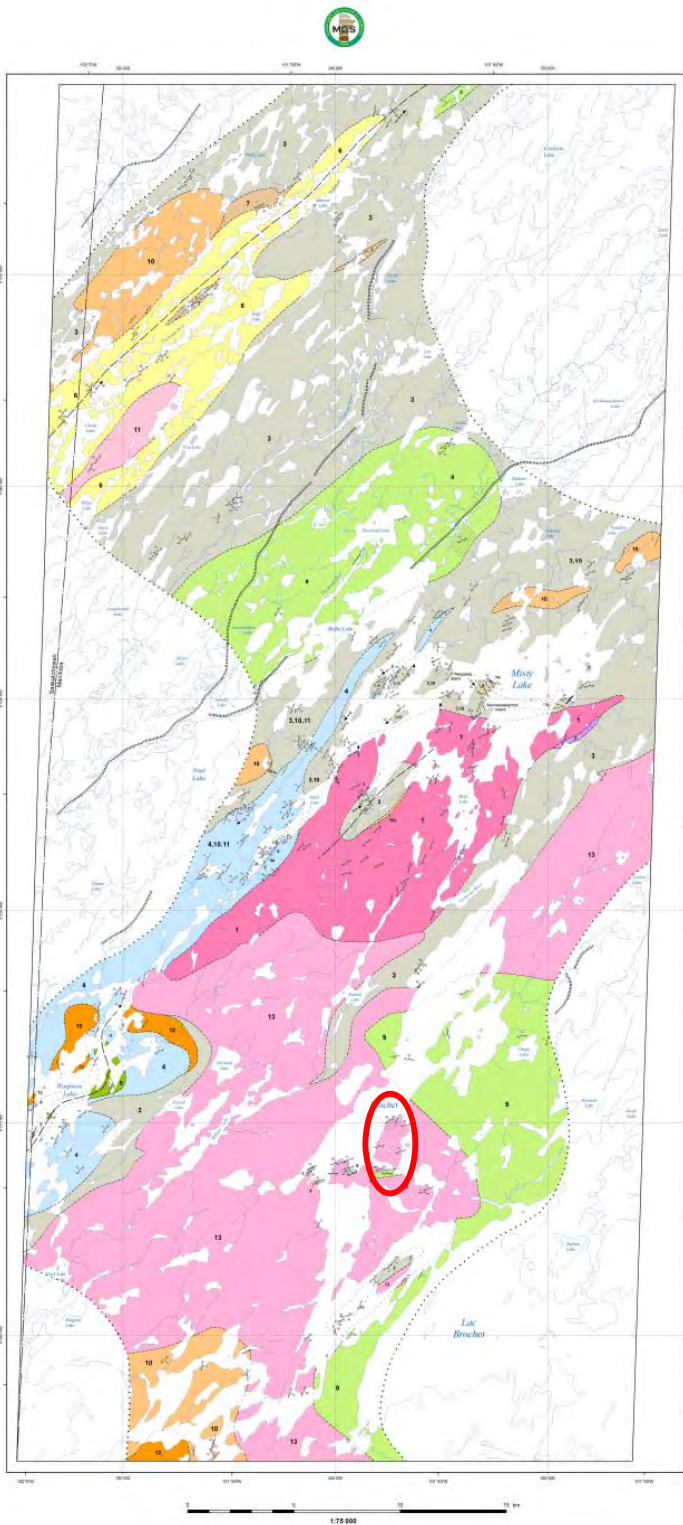
Plutonic gneiss: 750-850°C

Alkali Metasomatites

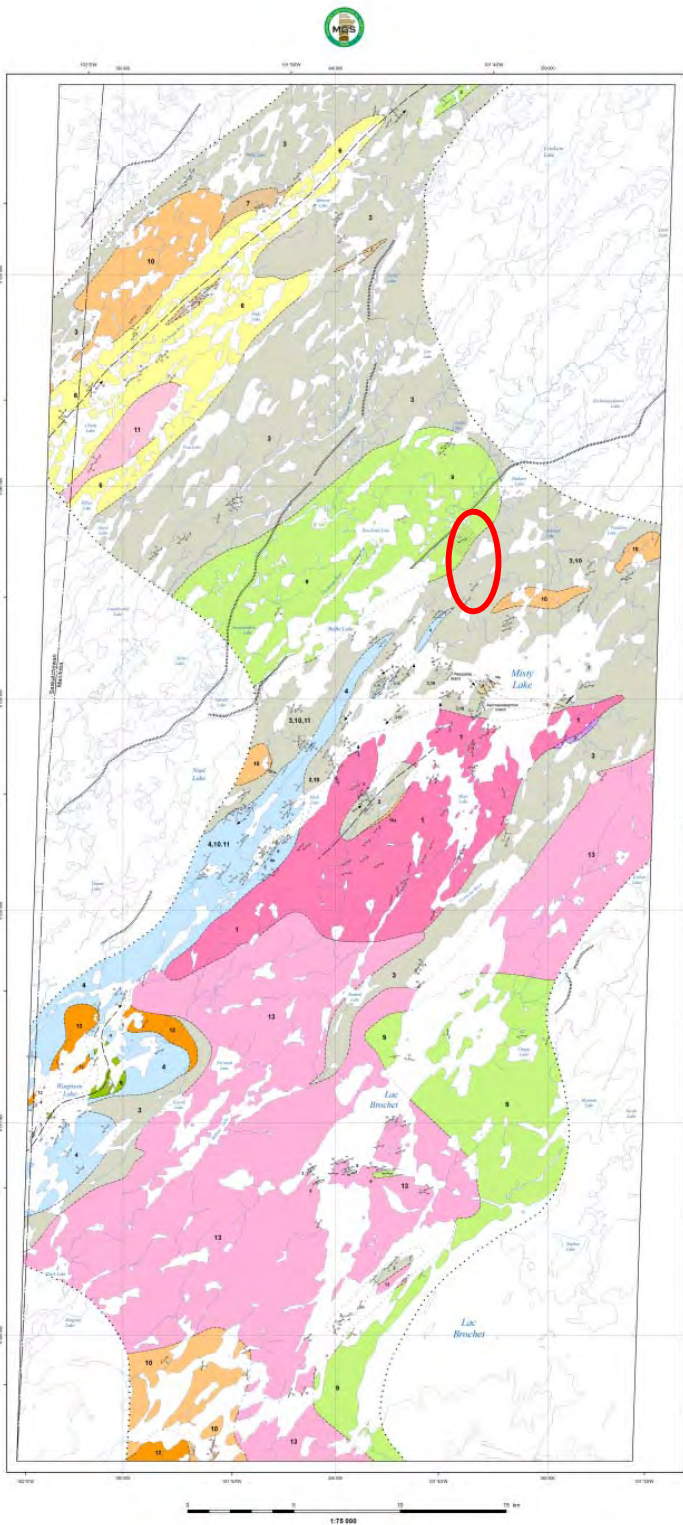
- Zones of moderate to intense metasomatism
 - Affect both metasedimentary and granitic rocks
- Characterized by alb-cpx-amph ± fl ± scap ± calc
 - Partial to complete replacement of host rock types
- Locally marked by U, Th 4-5x background values, minor HREE enrichment relative unmetasomatized equivalents



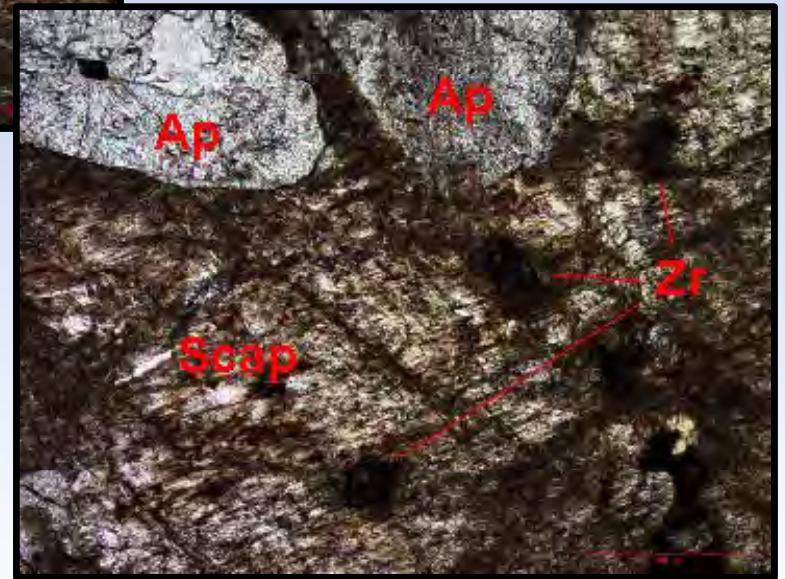
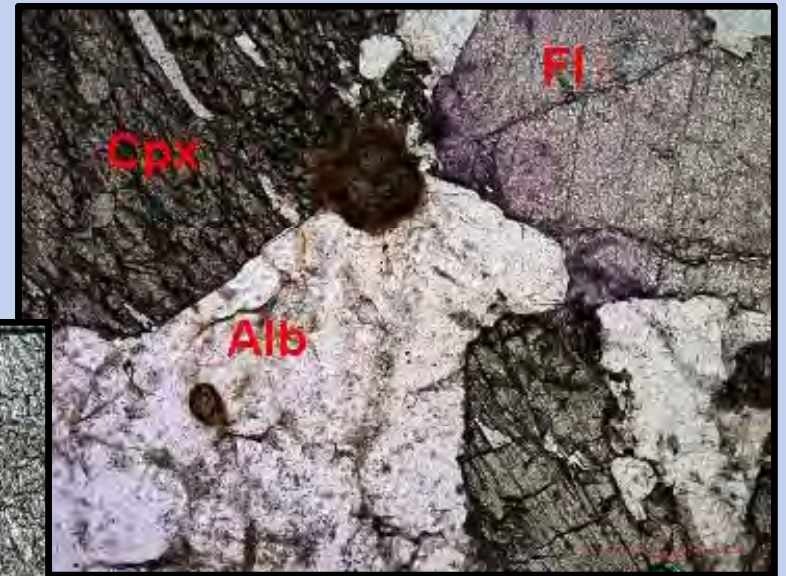
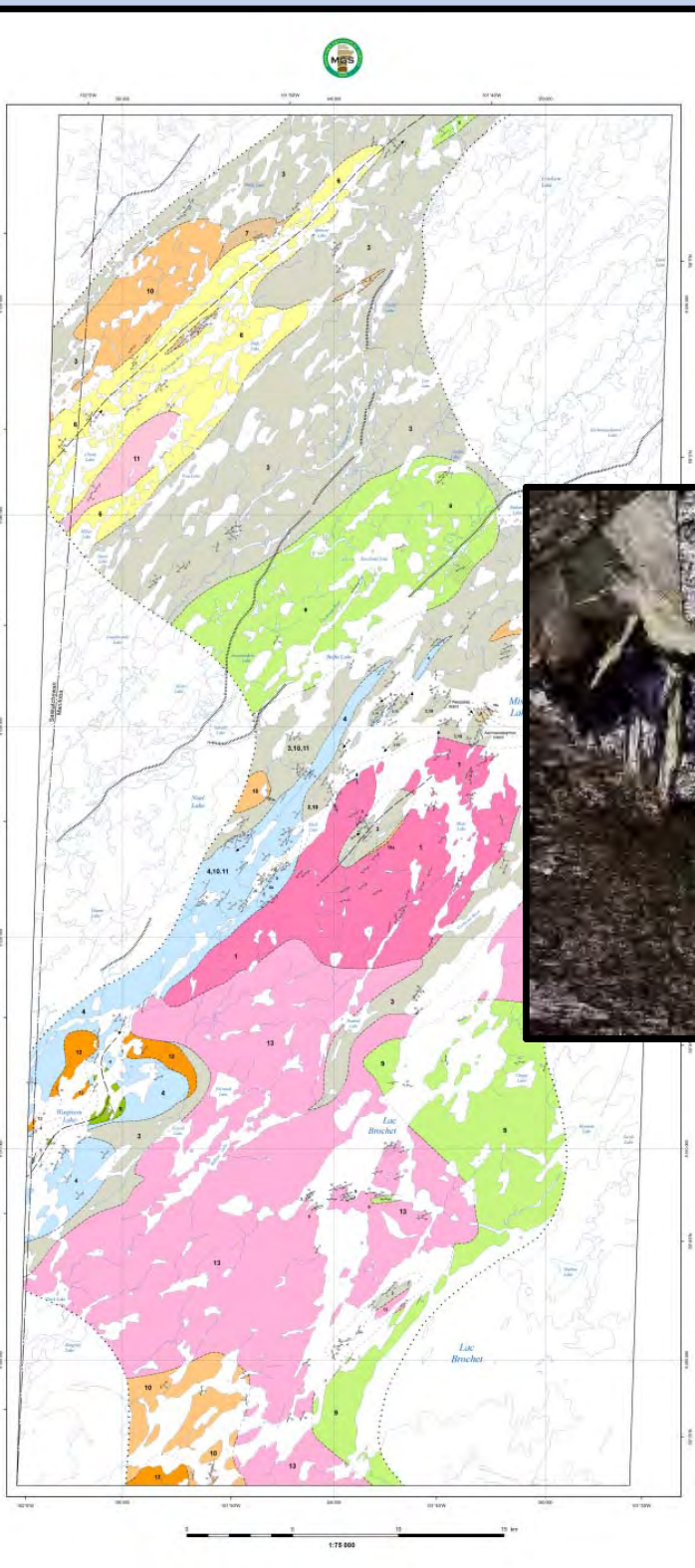
Alkali Metasomatites



Alkali Metasomatites



Alkali Metasomatites



Economic Considerations

- Alkali metasomatites
 - Metasomatite-related U deposits
 - Carbonatite-hosted REE-Nb-F
 - Peralkaline granitoid Zr-Nb-Y-REE-F
- LREE enrichment up to 10%
 - 4.39% Ce, 2.91% La, and 1.53% Nd (CanAlaska Uranium Ltd., 2009)
- Strata correlative to the Daly Lake Group in Saskatchewan
 - Basement-hosted U
 - Synorogenic U
 - Karin Lake, Sand Lake, Burd Lake occurrences
 - Stratiform Pb-Zn
 - Sito Lake, Fable Lake
 - Stratabound Cu



Summary

- Good correlation between metasedimentary rocks in the Misty Lake area and the Wollaston Supergroup in Saskatchewan
 - Daly Lake and Geikie River Groups
- Sediments are locally sourced from Archean basement rocks exposed in the area
- Peak metamorphism: 750-800 C, 5-6 kbar
- Intense alkali metasomatism suggests the potential for a variety of mineral deposit types