

The LDI Intrusive Suite: Geology, tectonic setting, magmatic evolution, and possible controls of sulphide mineralization



International Ni-Cu Symposium



Thunder Bay 2024



Lakehead
UNIVERSITY



IMPALA

CANADA

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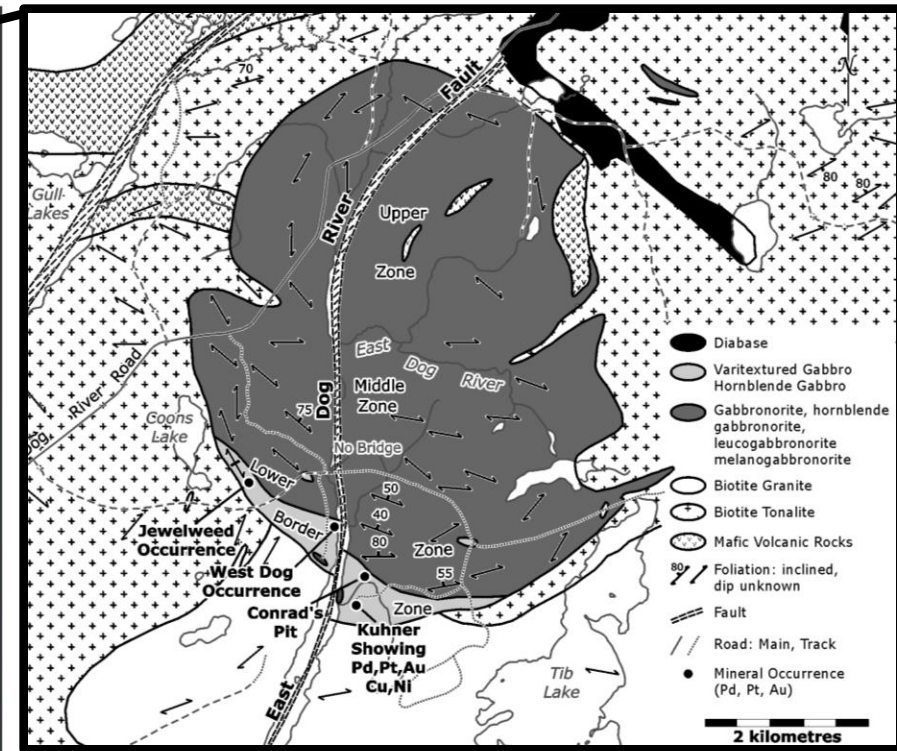
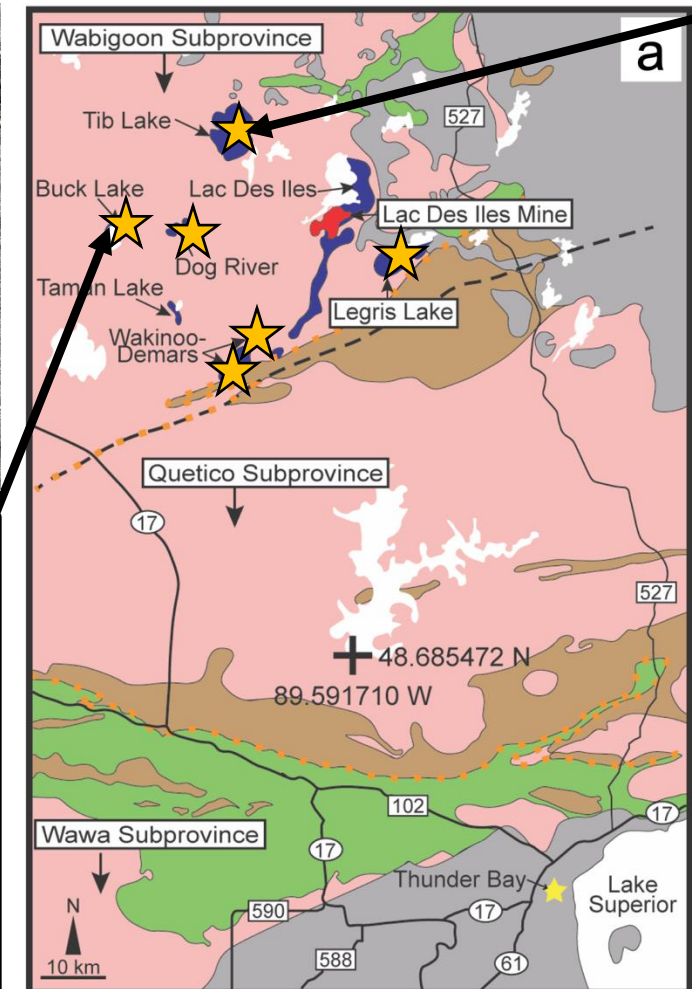
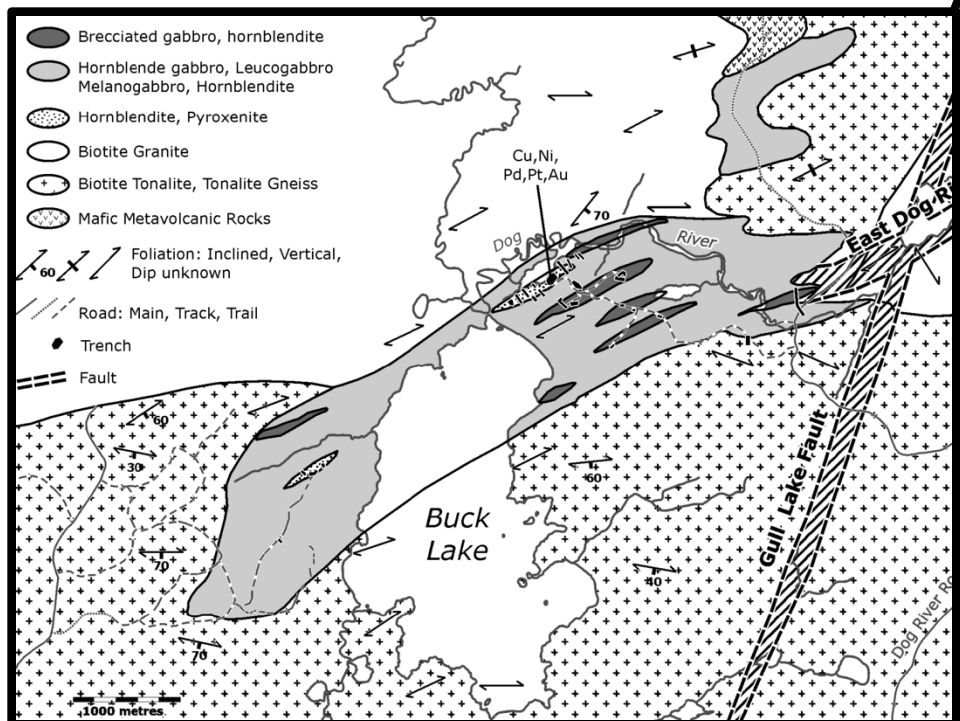
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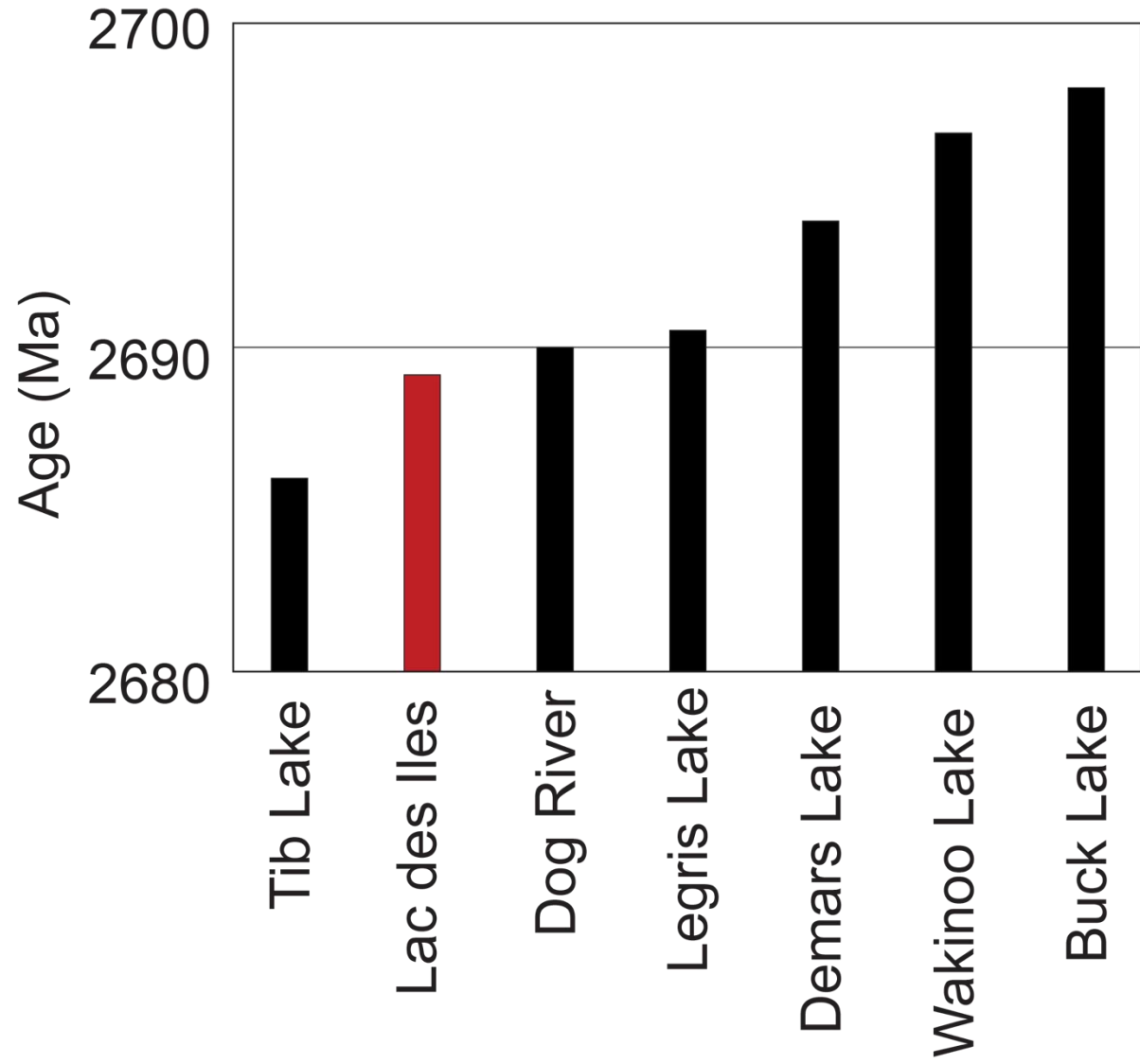
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The Lac Des Iles Intrusive Suite (LDI-IS): Hornblende-bearing mafic-ultramafic intrusions associated with LDI (spatial, geochemical, genetic?).

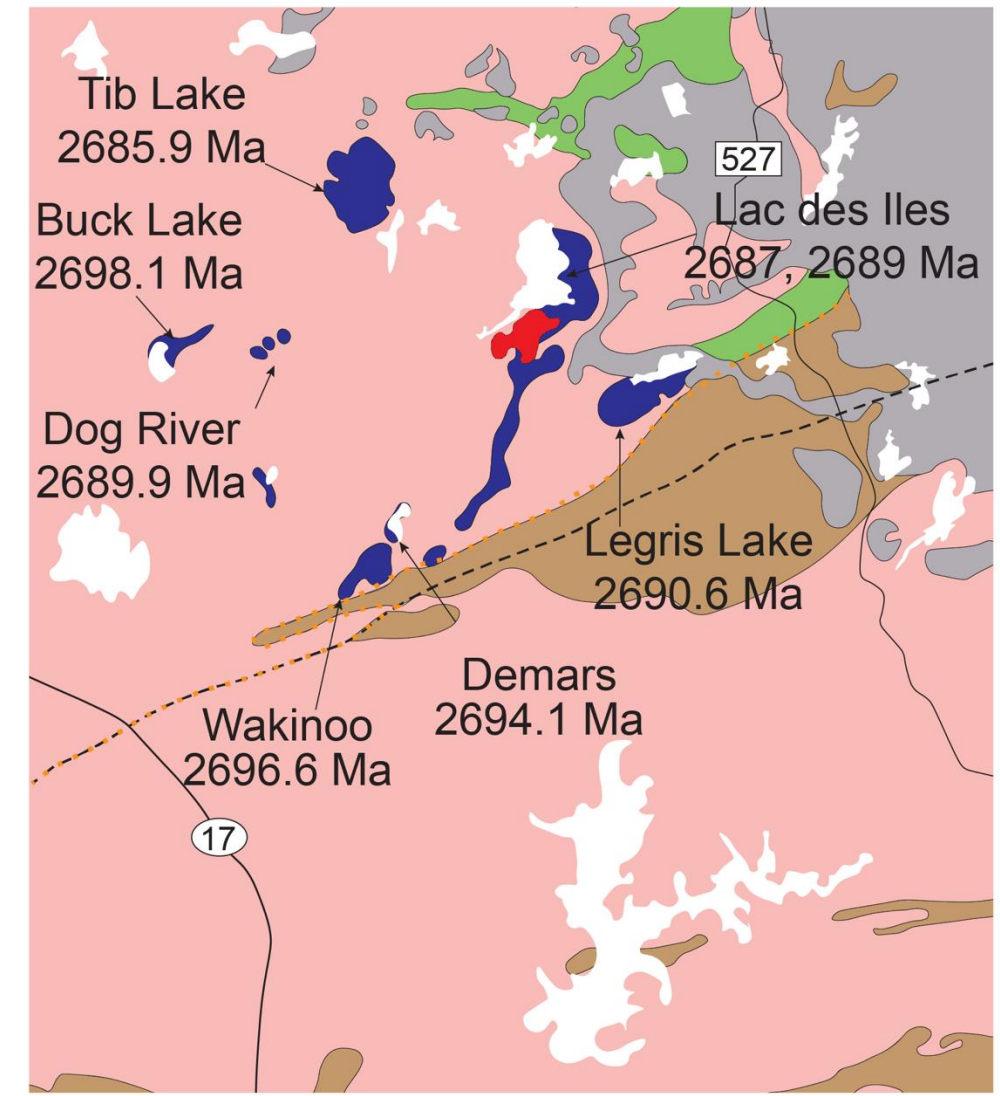


Progressive S to N sweep of magmatism from 2698.1 to 2685.9 Ma

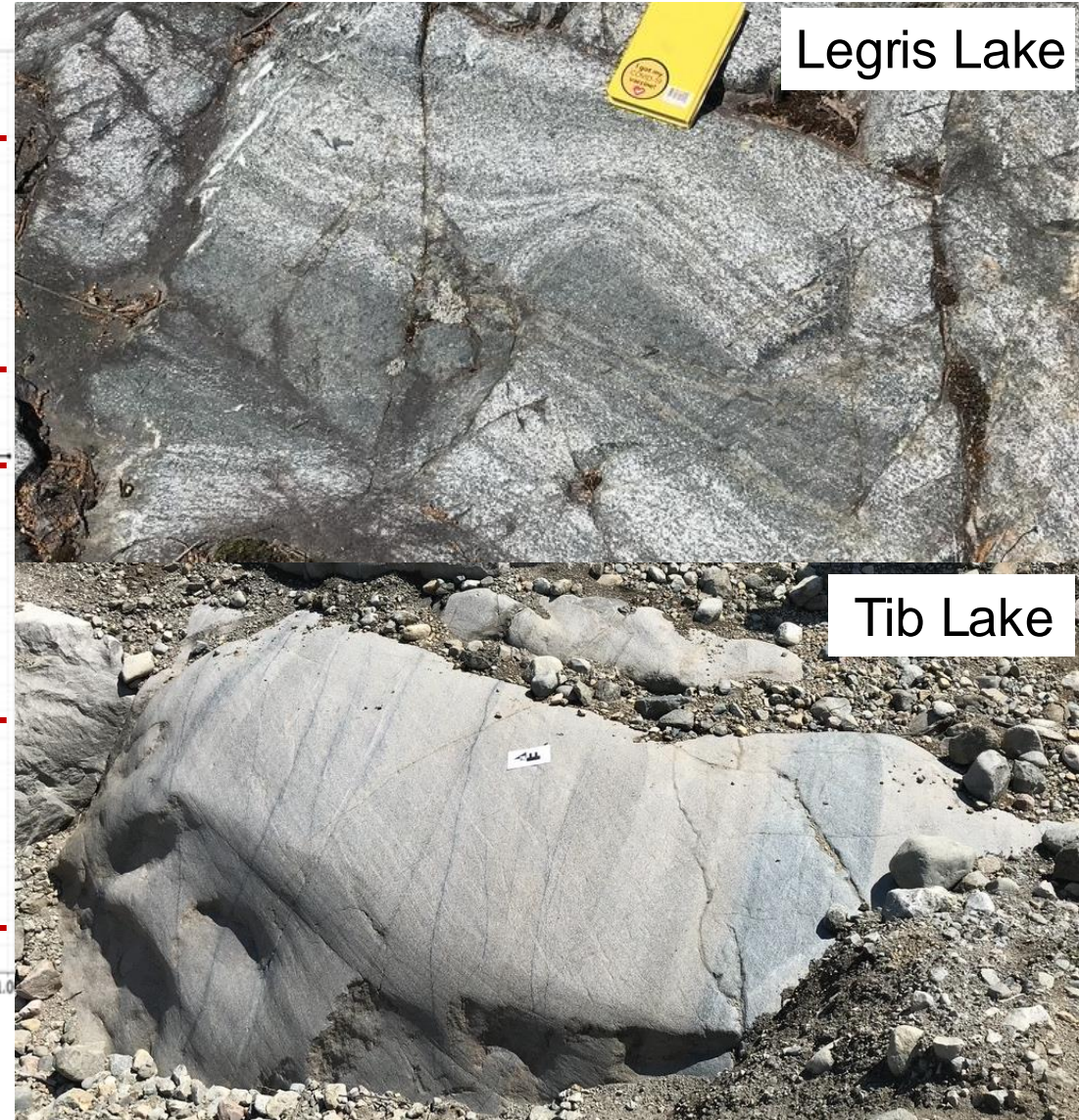
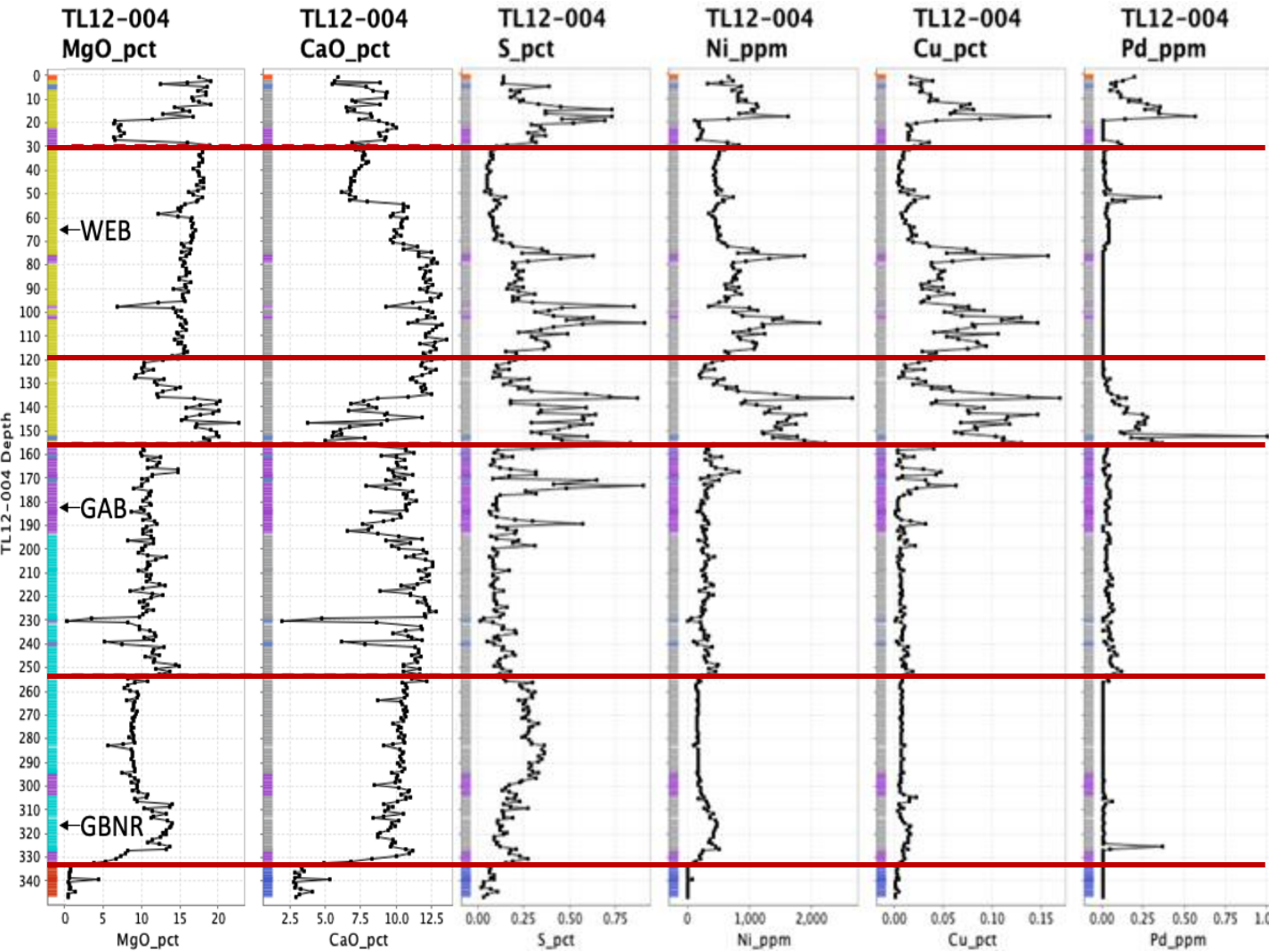
North ← South



TIMS U-Pb dates

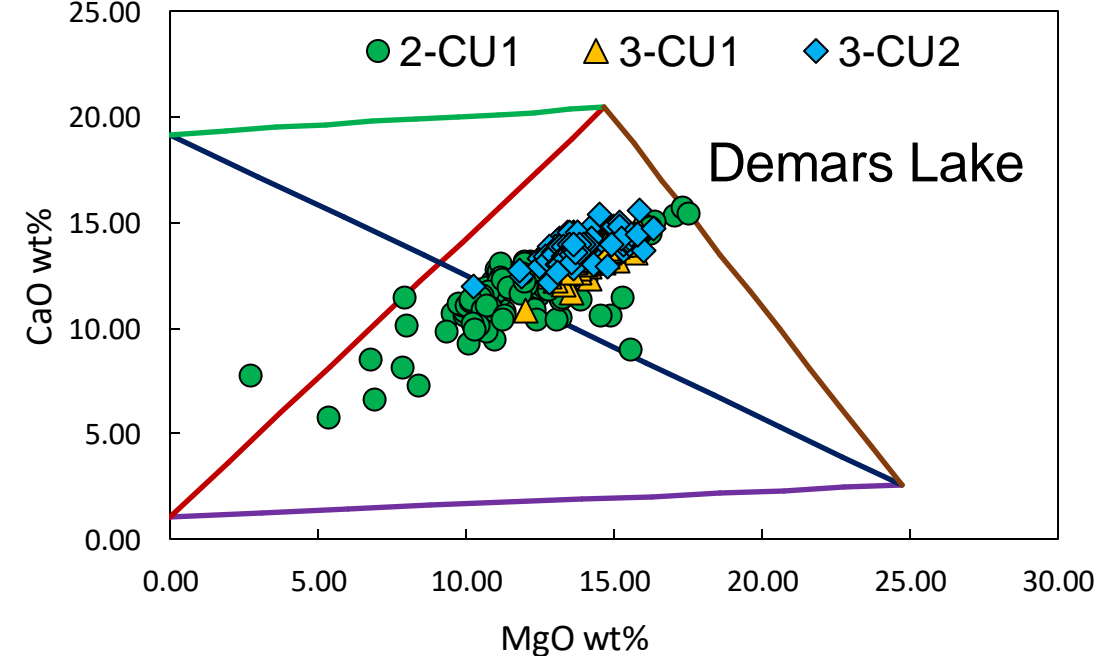
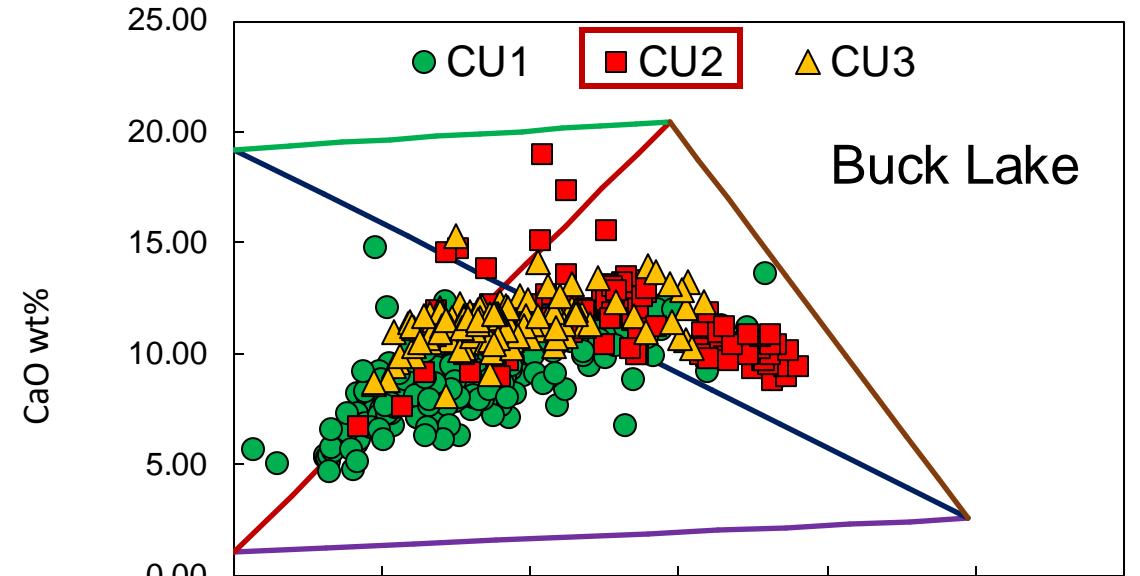
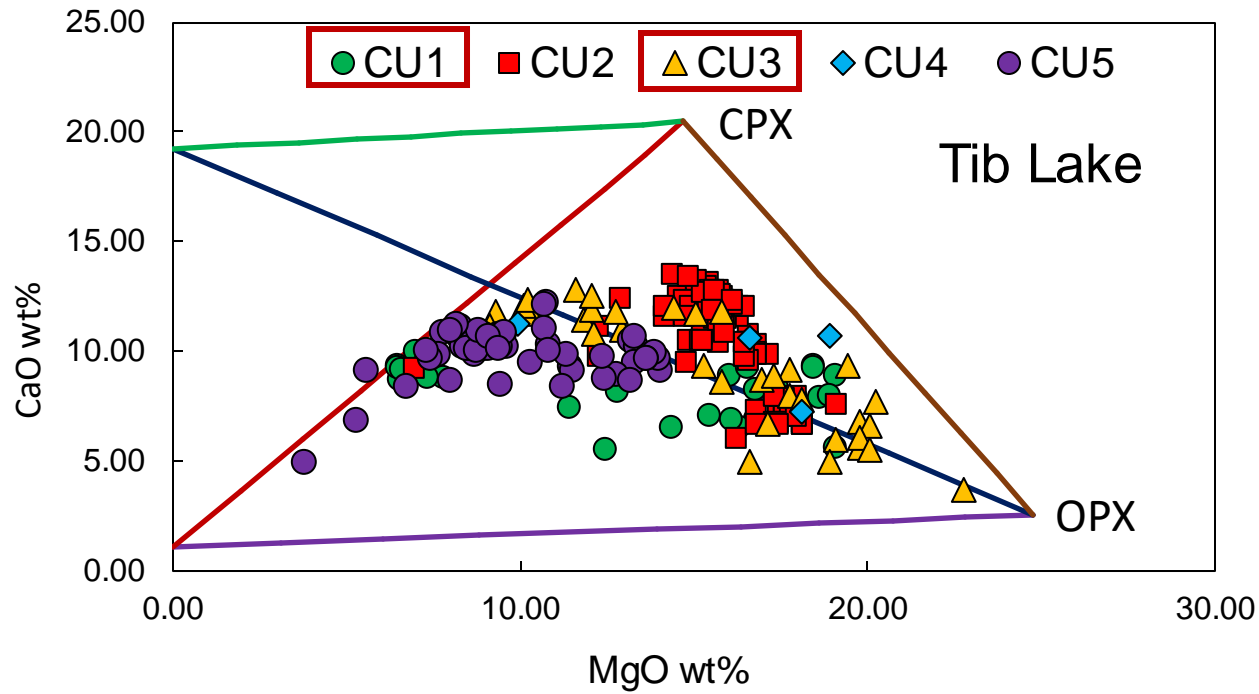


Tib, Wakinoo, Demars, Buck, and Legris Lake: well preserved magmatic layering with PGE-bearing cyclic units

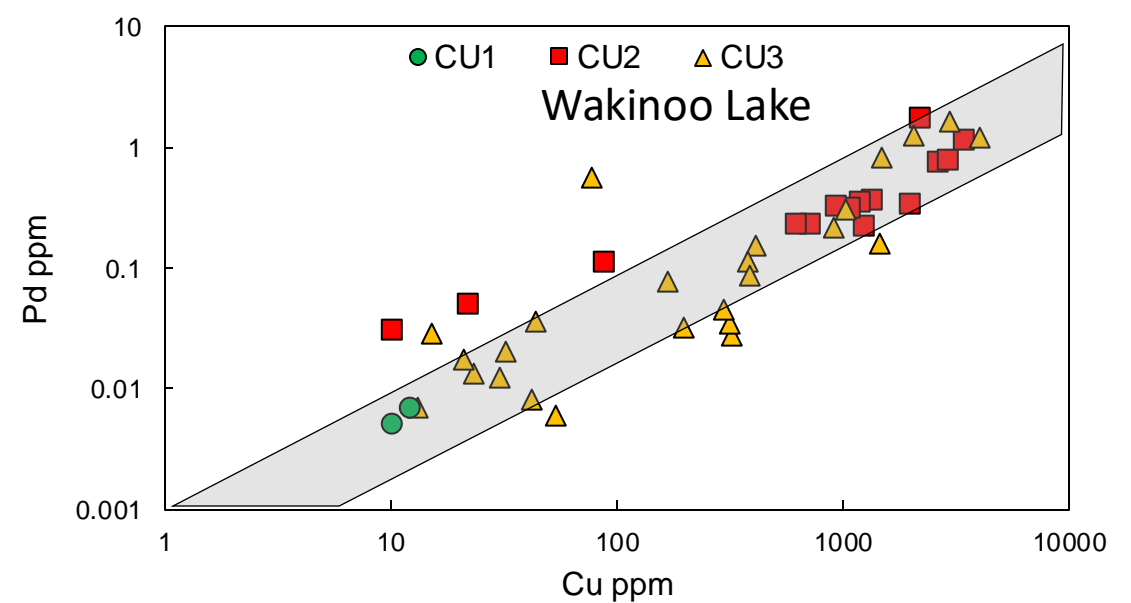
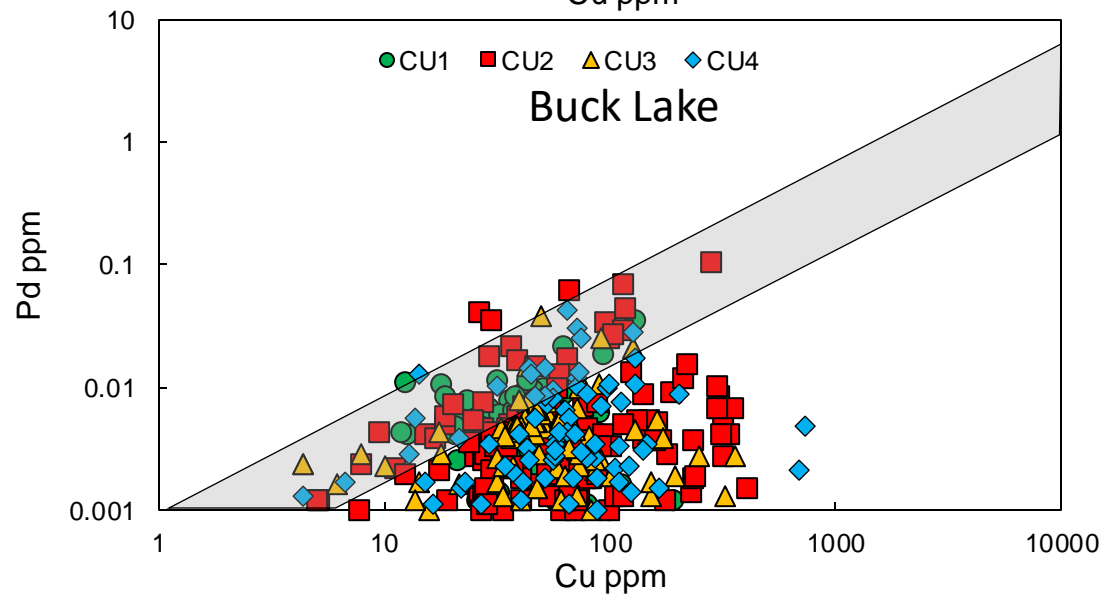
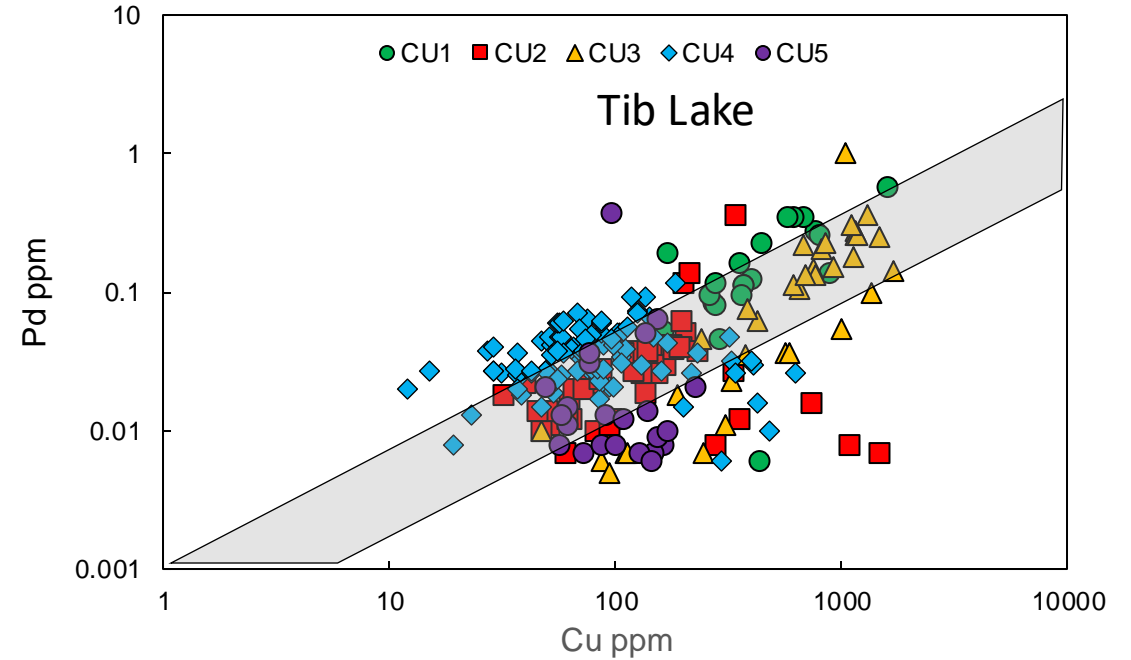
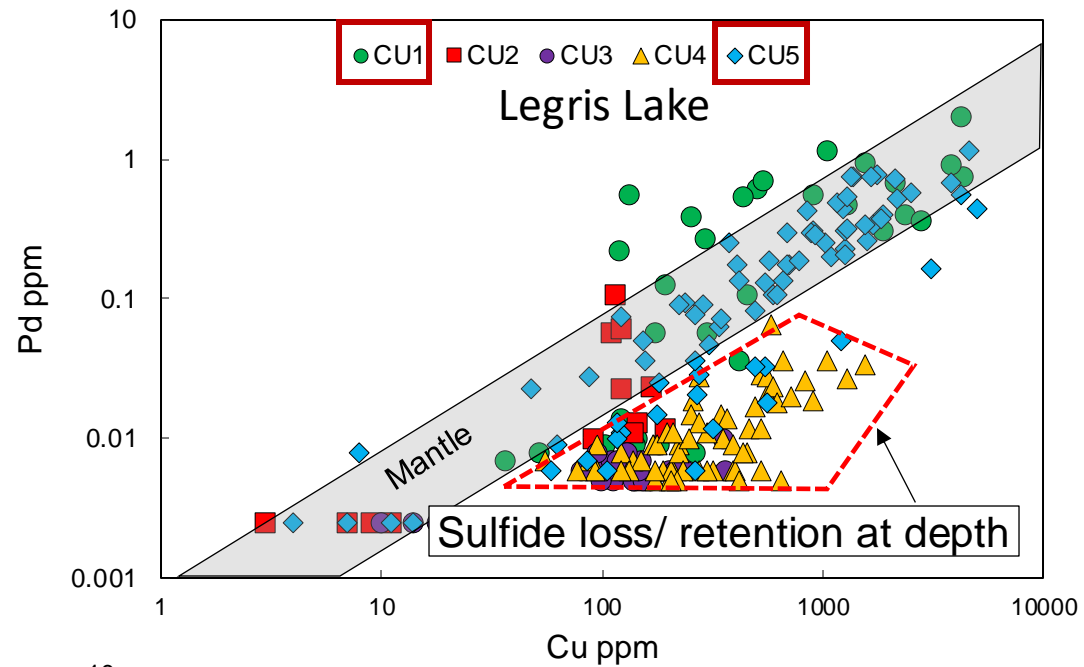


Funnel-shaped, N-dipping, layered mafic intrusions;
orthopyroxenite to leucogabbro

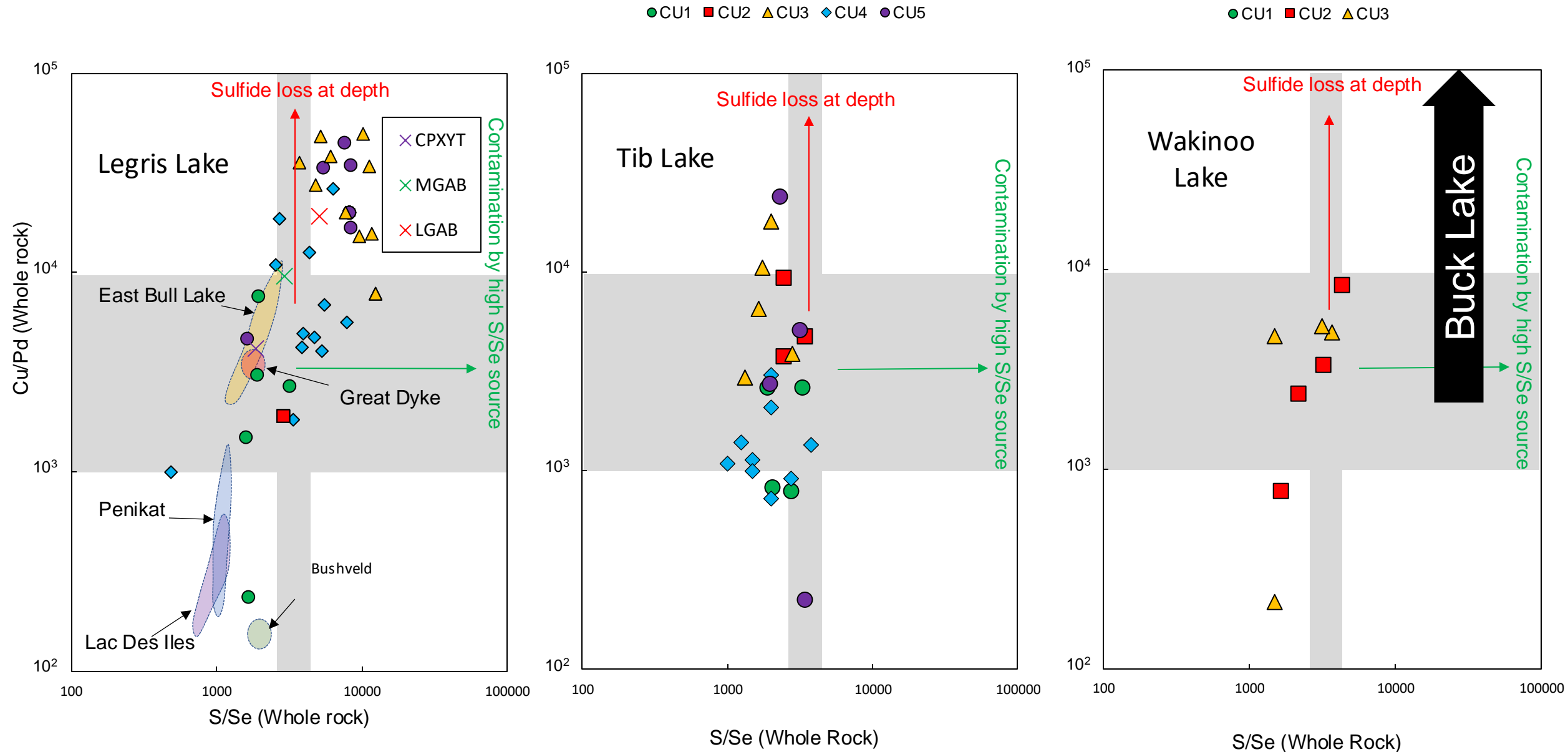
Tib, Wakinoo, Demars, Buck, and Legris Lake: Mineralized cyclic units tend to be OPX-rich.



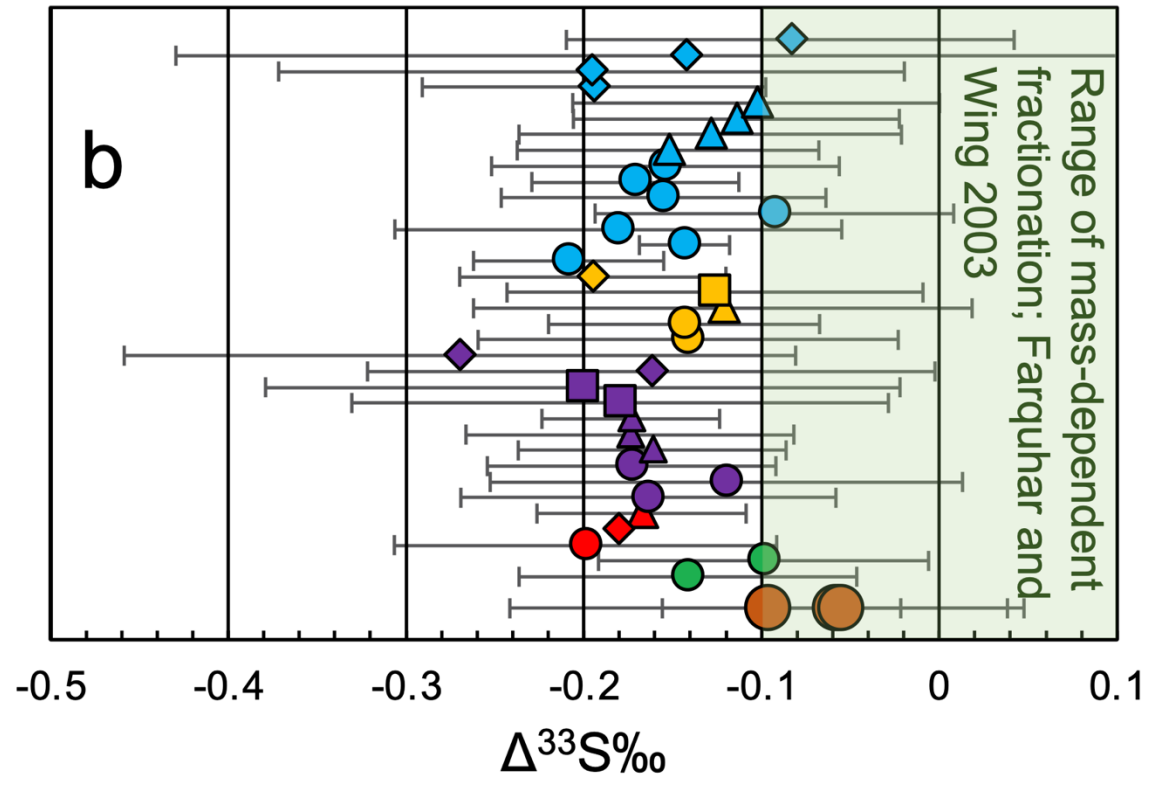
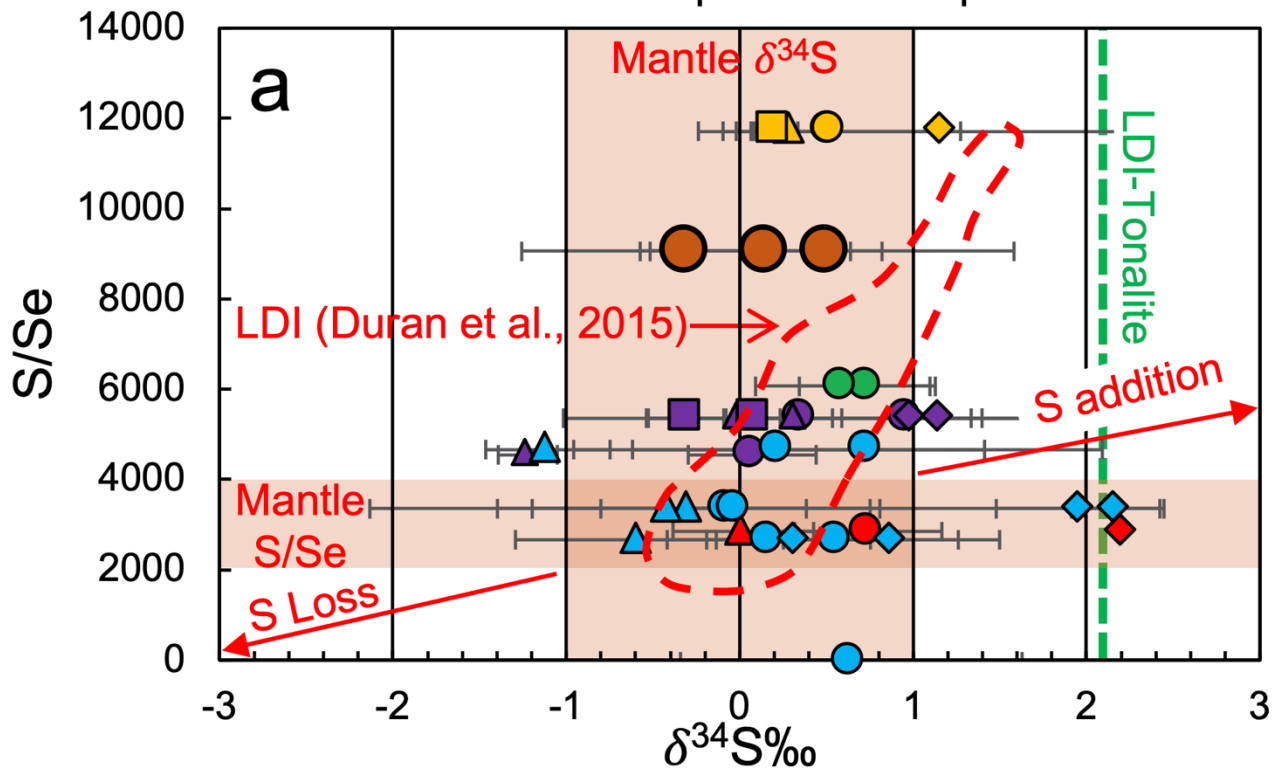
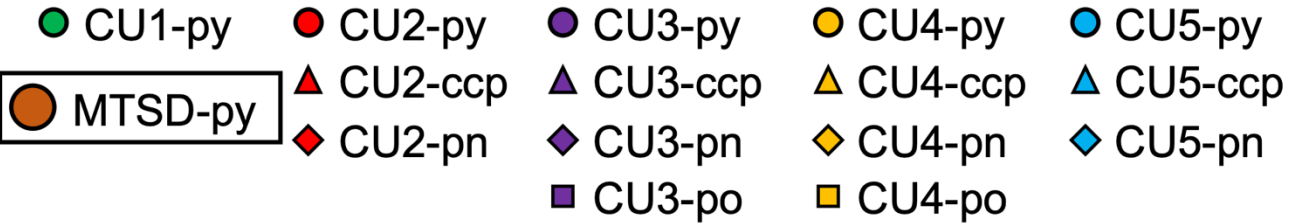
S-melt retention during emplacement: A control on PGE mineralization



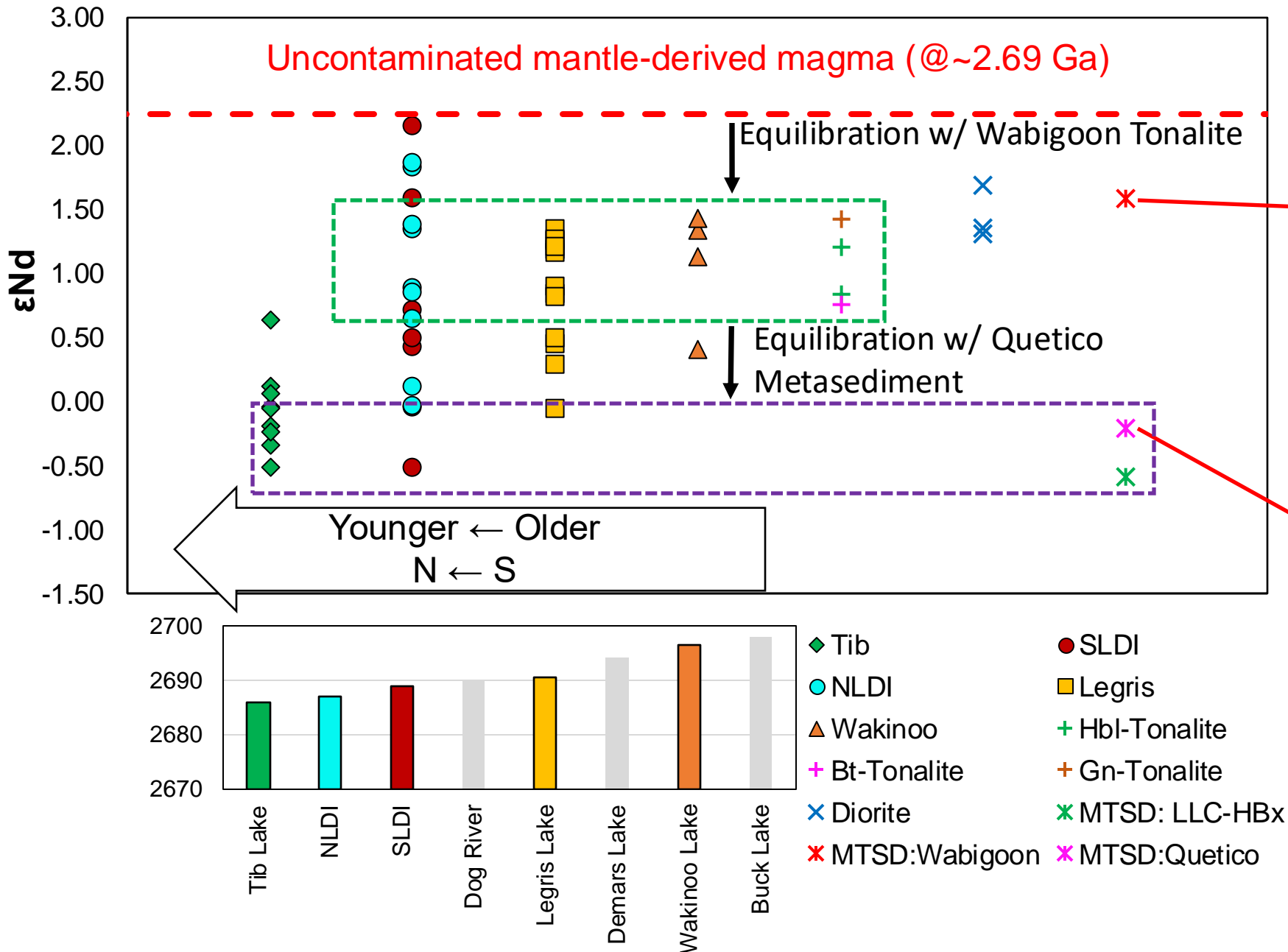
S-melt retention during emplacement: A control on PGE mineralization



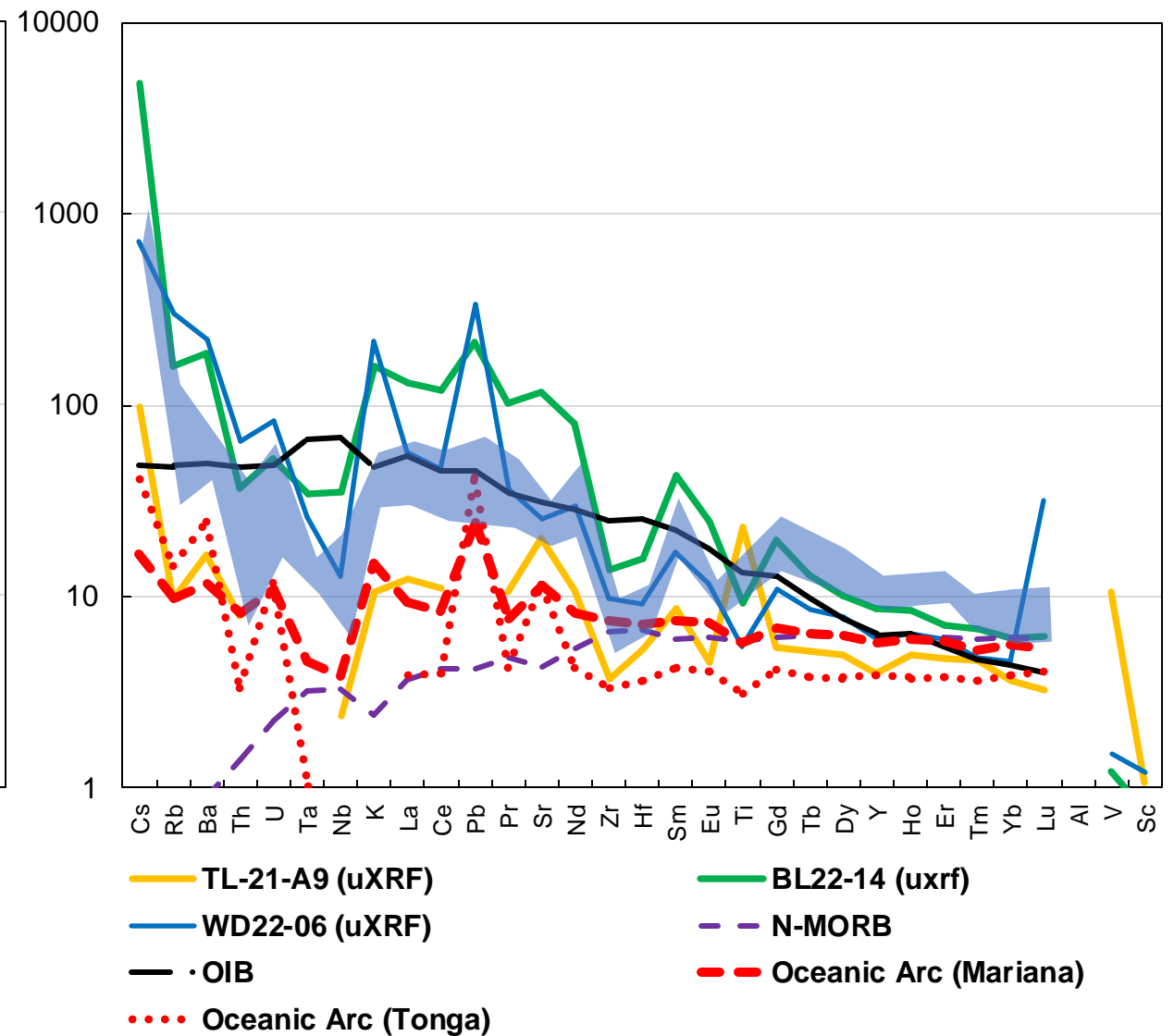
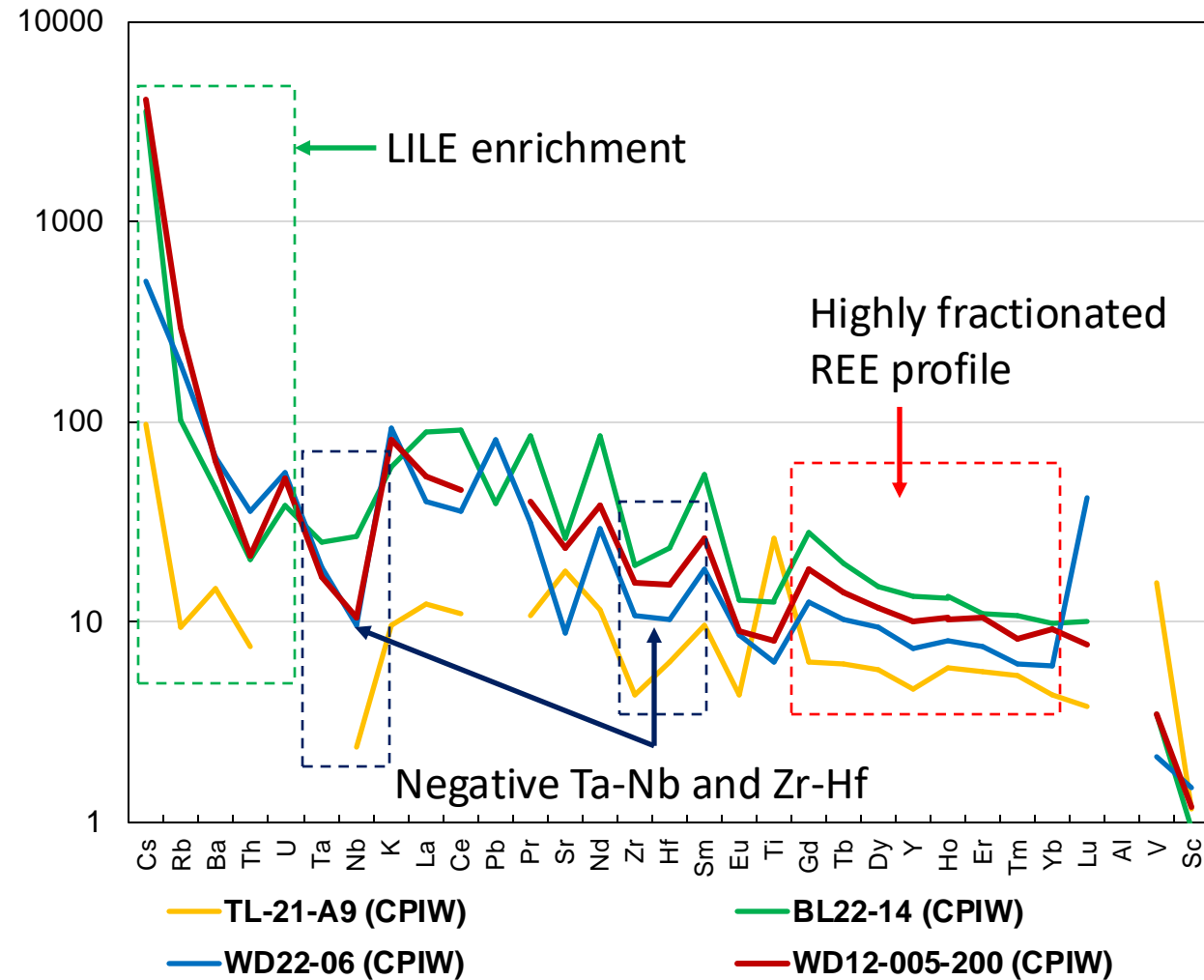
Legris Lake: Mostly mantle **S** but also clear evidence of **some external contribution of S... Tonalite? MTSD?... Stay tuned for more**



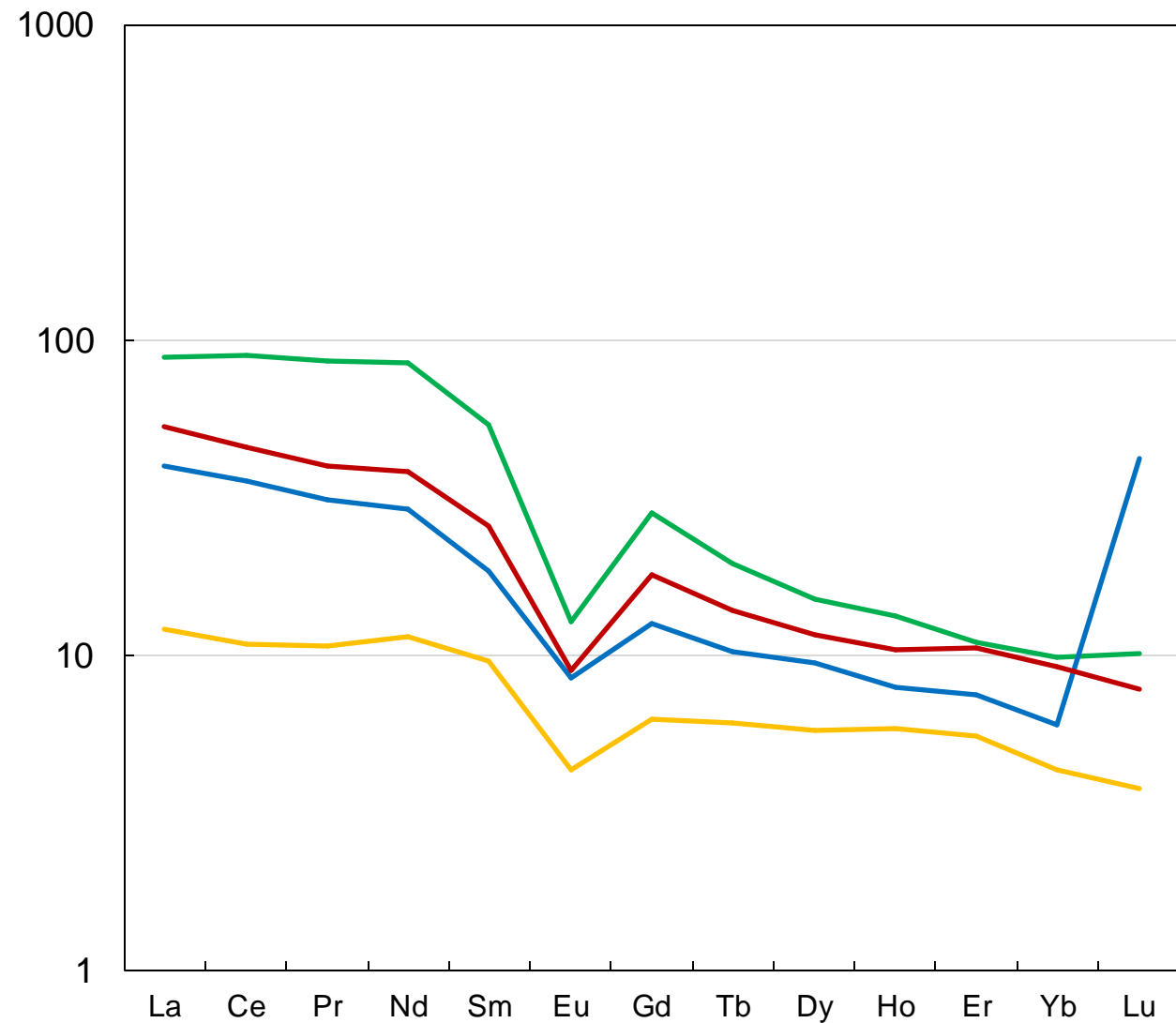
Assimilation of 1) Wabigoon **Tonalite** and 2) Quetico **Metasediment**



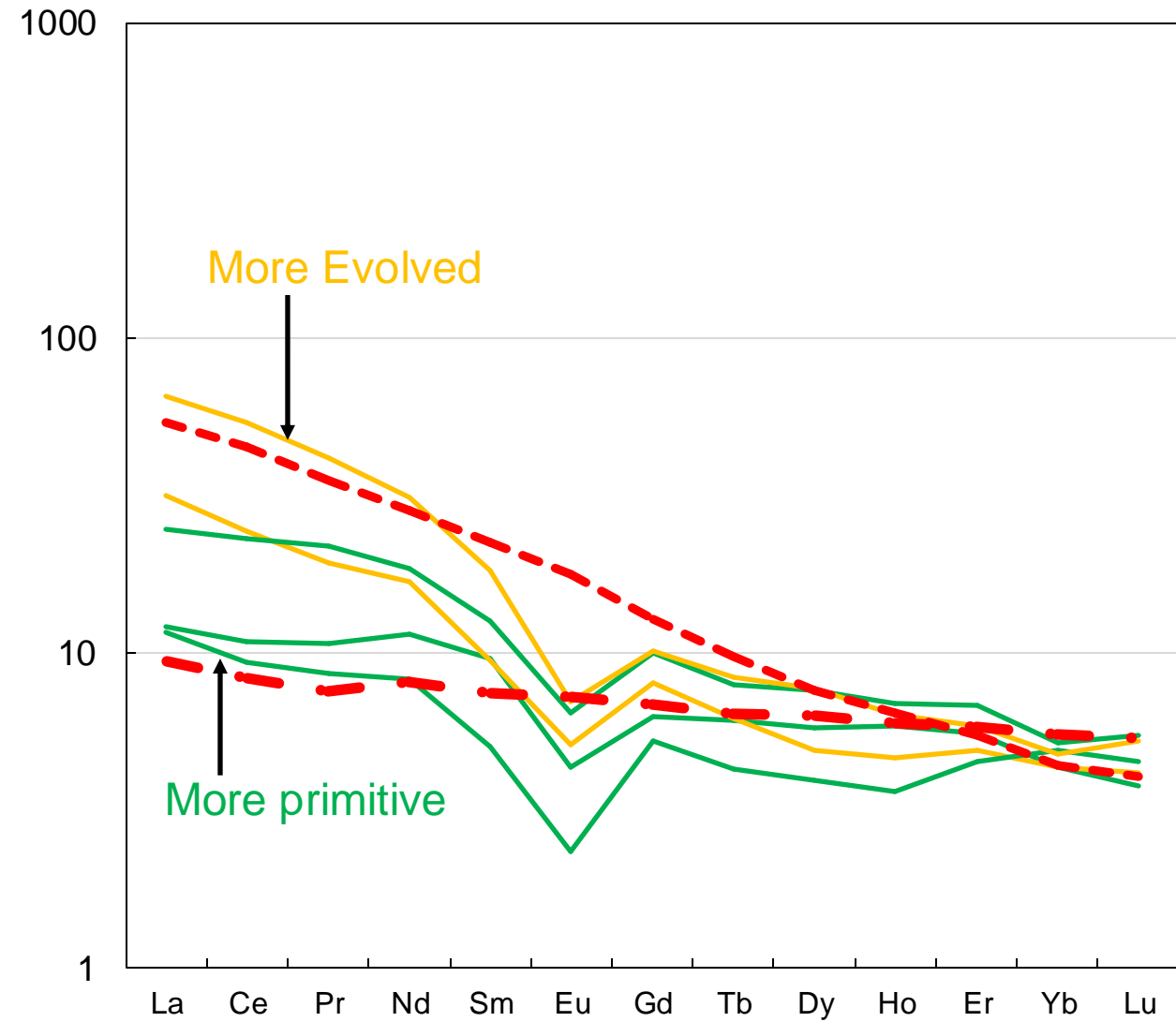
Modeled parental melt compositions are consistent with **an arc setting for the LDI-IS** and suggest a common sources reservoir



Magma mixing in the LDI and Tib Lake complexes...



- TL-21-A9 (CPIW)
- WD22-06 (CPIW)
- BL22-14 (CPIW)
- WD12-005-200 (CPIW)



- TL-21-A9 (CPIW)
- TL12-004-185 (CPIW)
- TL12-004-144 (CPIW)
- - - Oceanic Arc (Mariana)
- TL12-004-295 (CPIW)
- TL12-004-95 (CPIW)
- - - OIB

1. The intrusions of the LDI-IS have a clear temporal association
2. The LDI-IS formed in an arc setting
3. Assimilation of tonalite likely drove S-saturation at depth
4. Sulfide melt retention during emplacement is a key control on the abundance of PGE mineralization
5. Magma mixing likely occurred during the formation of Tib Lake and LDI-MBI



Thank you!

