Petrogenesis of the Niagara Icefalls Ultramafic-mafic complex, Northern Victoria Land, Antarctica

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The Niagara Icefalls ultramafic-mafic complex is located within the Wilson terrane, near to the tectonic border between the Bowers and Wilson terranes, within Northern Victoria Land, Antarctica. Previous studies indicate this complex was emplaced ~514 Ma during a period of extension within Northern Victoria Land, [1, 2] based on U-Pb zircon ages and the complex's boninite-like affinity [1].

In this study, we revisited the petrogenetic model of the Niagara Icefalls ultramafic-mafic complex using whole-rock and mineral major and trace elements from a more extensive sample set. Also, new zircon U-Pb SHRIMP analyses reveal a more complex petrogenetic model than previously described. The mineral and whole-rock data exhibit boninitic characteristics with very low whole-rock TiO_2 content (<0.07%) and depleted HREEs and HFSEs while showing a relative enrichment in LREEs and fluid-mobile elements. However, differences in mineral chemistry between wehrlites in the North, and a sequence of dunite, orthopyroxenite, and gabbronorite in the South, suggest these rocks were produced from different parental melts. Furthermore, zircons associated with pegmatitic gabbronorites, which cross-cut wehrlites, have a mean age of 513.7 +/- 2.6 Ma, whereas the mean age of zircons in gabbronorite associated with dunite and orthopyroxenite is 500.3 +/- 4.2 Ma. These temporal and chemical disparities among similar boninite-like plutonic rocks suggest they were formed at two stages. Firstly, ~514 Ma an extensional event led to the melting of the refractory mantle wedge, forming a boninite-like melt. Subsequently, ~500 Ma the second instant of boninitic magmatism occurred, likely associated with the subduction of the Bowers back-arc. The higher degree of depletion in rocks associated with the ~500 Ma gabbronorite compared to those of the ~514 Ma pegmatitic gabbronorite may suggest the progressive depletion of the mantle wedge beneath the Wilson Terrane during the Ross Orogeny.

[1] Tribuzio *et al.* (2008) *Contrib. Mineral. Petrol.* **155**, 619-633. [2] Rocchi *et al.* (2011) *Gondwana Res.* **19**, 594-607.