Petrochronologic insight into episodic crustal recycling along the paleo-Pacific margin of Gondwana

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Scarce exposure of Archean rocks from the Nimrod Complex in the central Transantarctic Mountains provide a glimpse into the largely inaccessible geology of the East Antarctic craton currently buried under the East Antarctic Ice Sheet. Nimrod strata record a complex tectonic history spanning 2.5 billion years of Earth history [1], and thus potentially record a long term record of tectonic processes affecting East Antarctica as well as provide insight into the mechanisms by which this cratonic body developed. In order to unravel the metamorphic and magmatic history of these rocks, we performed Laser Ablation Split Stream (LASS) depth profiling on zircon from a suite of 50 high grade metamorphic and igneous rocks. LASS depth profiling allows for the simultaneous recovery of multiple ages, trace elements, and Lu-Hf-Yb isotope data at sub-micron depth resolution. Thus enabling us to extract high resolution petrochronologic information from zircon domains not resolvable using conventional static spot measurements.

Geochemical and geochronological data indicates four distinct episodes of melt extraction at ca. 3.1 Ga, 2.7 Ga, 1.7 Ga, and 0.5 Ga. Zircon trace element and zircon εHf data provide strong evidence for melt extraction directly from the mantle during the Mesoarchean (ca. 3.1 Ga) with no clear evidence for the addition of juvenile crust since that time. Instead, younger rocks record progressive and episodic re-melting of older crust under moderate to high temperature anatectic conditions. We infer based on these data that crustal recycling was the primary long-term mechanism for crustal growth in this portion of the East Antarctic craton since the Archean.

REFERENCES

[1] Goodge & Fanning (1999) *Geology* **27**, 1007-1010.