UNRAVELING A PROTRACTED HISTORY IN THE HOT SEAT: CHARNOCKITIC MAGMATISM IN THE PROTEROZOIC RAYNER OROGEN, EAST ANTARCTICA

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The Mawson Charnockite is an extensive batholith (>3100 km^2) emplaced during the ca. 1000 – 900 Ma Rayner Orogeny that records the convergence of proto-India with proto-Antarctica, probably during the formation of the supercontinent Rodinia. The MacRobertson Land region is divided into three broad areas of comparable Sr-Nd isotopic compositions (Young et al., 1997). Despite being the focus of a recent review (Mikhalsky et al., 2006), the nature, origin and tectonic significance of charnockite in this region is still a matter of debate. We analysed five Mawson Charnockite samples and one gabbroic sample collected from across the Mawson region. Our approach combines several techniques in order to unravel the complex zircon geochronology and isotopic signatures: (1) BSE and CL imaging; (2) U-Pb analysis; (3) Hf isotopic analysis and (4) trace element analysis, via Laser Ablation-Inductively Coupled Mass Spectrometry (LA-ICPMS).

New U-Pb geochronology of one charnockite sample (Mt Horden) gives a concordant age of 954 ± 5 Ma. The other samples show considerable complexity. Data spreads close to concordia and confirms variable isotopic disturbance (Pb-loss) within zircon grains. The oldest concordant oscillatory-zoned grains within the complex samples yield ages of ca. 985, ca. 1050, ca. 1080, ca. 1140 and ca. 1145 Ma, making the estimation of their emplacement ages difficult. However, charnockitic magmatism prior to ca. 1000 Ma has not previously been recorded in the Mawson region and indicates that orogenesis may have commenced ca. 150 Myr earlier than previously thought. The variably disturbed rims of grains return ages that cluster between 960-910 Ma but spread down to 555 Ma indicating a protracted history. Hf isotopic data for zircon grains is the same across the three Sr-Nd zones and indicate model ages of ca. 1950-1710 Ma for all charnockite samples and ca. 1780-1630 Ma for the gabbroic sample. Correlations with similar aged rocks in adjacent regions such as the Prince Charles Mountains, Prydz Bay area, Larsemann Hills and Bunger Hills link the 'Rayner' and 'Wilkes' Provinces of Fitzsimons (2000) with wider implications for the tectonic evolution the East Antarctic Shield.

References

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