Pre-1.8 Ga Crustal Evolution of the Mount Isa Fault Region, Northeastern Australia – Insights from SHRIMP U-Pb and *In-situ* Lu-Hf Analysis of Zircons

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SHRIMP U-Pb age dating and laser ablation Hf-isotope analysis of zircons from pre-1.8 Ga basement rocks on either side of the metallogenically important Mount Isa Fault indicate that the entire region was part of the same lithospheric block, and that the Mount Isa Fault cannot represent the surface expression of a Barramundi-aged transcrustal suture. Magmatic ages of ca. 1.85 Ga in samples from the Yaringa Metamorphics and from enclaves in the Kalkadoon Granite constrain the thermo-tectonic history of the proto-Mount Isa Fault region, with ca. 2.4 – 3.6 Ga inherited zircons suggesting that Archaean crust contributed to the source of the Palaeoproterozoic sequence.

The Lu-Hf composition of zircons analysed by SHRIMP, and the absence of evidence for large-scale tectonism support the notion that there is no lithospheric break across the Mount Isa Fault. Furthermore, the $^{176}Hf/^{177}Hf$ isotope data confirm that Archaean – Palaeoproterozoic magmatic zircons on both sides of the Mount Isa Fault were sourced from the same parental lithospheric reservoir which evolved over time from more primitive mantle to more supracrustal compositions. The results of this study impact on crustal-scale models for the development of shale-hosted massive sulphide Pb-Zn-Cu mineralisation and whether trans-lithospheric faults are an important ingredient for the development of this deposit type.