

**THERMOCHRONOLOGICAL HISTORY OF THE NORTHERN OLYMPIC DOMAIN OF THE GAWLER CRATON; CORRELATIONS BETWEEN COOLING AGES AND MINERALISING SYSTEMS**

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The Olympic Domain of the Gawler Craton is home to the world class Olympic Dam Iron Oxide Copper Gold (IOCG) mineral deposit in addition to numerous other IOCG mineral deposits. The Olympic Domain preserves a complex geological history that began in the Palaeoproterozoic. However, most published work conducted on these IOCG deposits have focused on their initial formation, with only a few studies investigating the post-formation thermal history of the Olympic Domain. This study uses multi-method thermochronology by combining apatite U/Pb, muscovite and potassium feldspar  $^{40}\text{Ar}/^{39}\text{Ar}$ , zircon and apatite (U-Th-Sm)/He, and apatite fission track (AFT) dating to provide insights into the thermal history of the northern Olympic Domain between  $\sim 550^\circ\text{C}$  and surface temperatures. Apatite U/Pb and muscovite  $^{40}\text{Ar}/^{39}\text{Ar}$  record post magmatic cooling of the  $\sim 1850$  Ma Donington Suite, and  $\sim 1590$  Ma Hiltaba Suite. Potassium feldspar  $^{40}\text{Ar}/^{39}\text{Ar}$  analyses record a cooling signal that is likely related to rifting in the Neoproterozoic Adelaide Rift Complex. A combination of AFT, and zircon and apatite (U-Th-Sm)/He dating preserves three thermal periods, at  $\sim 1000$  Ma,  $\sim 430$ - $400$  Ma and  $\sim 200$  Ma. The older two thermal periods are interpreted to be regional cooling. However, the youngest ages are preserved closest to known IOCG deposits suggesting that they reflect cooling of this elevated geothermal-gradient crust in the Mesozoic. These results have been modelled to produce a thermal history map of the northern Olympic Domain.