Geophysical Research Abstracts
Vol. 19, EGU2017-19447, 2017
EGU General Assembly 2017

Fluid–rock interaction and thermochemical evolution of the eastern Alice Springs Orogen, central Australia

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The Harts Range rift and basement complex is located in the eastern Alice Springs Orogen, central Australia. For the period 450–320 Ma, this tectonic domain is characterised by large-scale deformation of the Harts Range Group rift sequence and pervasive reworking of its underlying basement. Fluid–rock interaction is evidenced by extensive pegmatite intrusion and retrogression occurring episodically throughout this 130 Myr period, possibly coeval with prograde upper-amphibolite facies metamorphism. The orthogneiss-dominated Entia Gneiss Complex (EGC) represents basement structurally underlying the Harts Range Group, and has evidence for associated deformation and fluid ingress between 390–320 Ma. The EGC also contains metapelites at various structural levels of the mid- to lower-crust, providing a means to constrain the thermobarometric record during a period of significant rheological weakening. Despite existing studies, the source of fluid that contributed to pervasive deformation and metamorphism is unresolved. Additionally, the role of fluid in the episodic history of crustal melting, and ultimately the generation of large-scale tectonic reworking in the Harts Range Group, remains unclear. In this contribution, we integrate U–Pb monazite geochronology, geochemistry, petrography and phase equilibria forward modelling from various metapelitic rocks at different structural levels of the Entia Gneiss Complex. Preliminary data show that the timing of metamorphism coincides with pegmatite crystallisation ages. These constraints form the basis for understanding the conditions and timing at which fluid flow occurred, and the potential sources of the fluid will be constrained by stable isotope analyses (δ^{18}O and δD). The combination of *in situ* geochronological data with petrographic observations linked to $P-T$ models is vital in providing temporal constraints on the physical and thermal evolution of the reworking event.