Low-temperature thermochronologic insights into the exhumation of the northern Gawler Craton (South Australia)

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LOW-TEMPERATURE THERMOCRONOLOGIC INSIGHT INTO THE EXHUMATION OF THE NORTHERN GAWLER CRATON (SOUTH AUSTRALIA)

EXHUMATION OF THE NORTHERN GAWLER CRATON

ABSTRACT

The Gawler Craton (South Australia) records a complex thermal history during the Phanerozoic. Previous work has indicated that the central Gawler Craton was largely exhumed during the Carboniferous as a far-field effect of the Alice Springs Orogeny. Besides this widespread exhumation event, localised Mesozoic and Tertiary thermal events have been documented for the central Gawler Craton as well. The extent of these events into the northern Gawler Craton is not well understood as low-temperature thermochronological data is lacking for this region. For this study, granitoid samples along a roughly north-south transect through the northern and central Gawler Craton were analysed using the apatite fission track (AFT) and apatite (AHe) and zircon (ZHe) U-Th-Sm/He methods. Results from these low-temperature methods yield Neoproterozoic through to Cretaceous AFT, AHe and ZHe ages. Cumulative AFT age plots reveal a multi-phase Phanerozoic cooling history for the central and northern Gawler Craton. Significant AFT age peaks were found at ~480-450 Ma and ~350-300 Ma. The Ordovician age peak is thought to be related with the final stages of the Delamerian Orogeny, while the Carboniferous age peak is interpreted as being a far field response to the Alice Springs Orogeny. This is consistent with previous interpretations throughout South Australia. Additionally, localised Jurassic and Cretaceous AFT and ZHe ages were obtained which are thought to be related with rifting at the southern Australian margin and river incision respectively.

KEYWORDS

South Australia, northern Gawler Craton, Low-temperature Thermochronology, Apatite Fission Track, exhumation.
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