Geochemical and isotopic investigation into the source of U and Th enrichment in the Proterozoic, high heat producing granites of the Anmatjira Range

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GEOCHEMICAL AND ISOTOPIC INVESTIGATION INTO THE SOURCE OF U AND TH ENRICHMENT IN THE PROTEROZOIC HIGH HEAT PRODUCING GRANITES OF THE ANMATJIRA RANGES

HIGH HEAT PRODUCING GRANITES OF ANMATJIRA RANGES

ABSTRACT

The Anmatjira Range of the North Australian Craton contains extraordinarily high heat producing Paleoproterozoic granites, with heat production being as high as 6.7μWm^{-3} as compared to the average upper crust of 1.69 μWm^{-3}. Little previous research has been conducted as to the source of this enrichment of heat producing elements. This study investigates the degree of enrichment in these granites as well as their likely source.

Magmatic ages for the granitic suites were obtained by LA-ICP-MS, U-Pb geochronology along with inherited zircon ages of the suites which were compared with detrital ages of the Lander Rock Formation which is thought to have strong similarities with the source. The magmatic ages for the granites ranged from 1784 ± 6.6 to 1779 ± 9.9 Ma.

Whole rock geochemistry was used to compare heat production between the granites, as well as their dominant trends. All samples were peraluminous indicating a metasedimentary source.

A strong crustal influence on the granites is indicated by negative εNd values, however, as they are less negative than surrounding metasedimentary units there is a mantle influence on these granites.

The inherited zircons from the granites present a very similar (slightly younger) U-Pb age population to the oldest metasedimentary package in the area, the Lander Rock Formation.

These results support the initial hypothesis that an enriched crustal source with a mantle contribution formed these high heat producing granites. The inherited zircons strongly advocate that the already enriched source, with similarities to the Lander Rock Formation, is the most likely source rock.

KEYWORDS

Geochemistry, Uranium, Thorium, Anmatjira Range, Heat Production

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