Deliniating the deep crustal fluid link between the Paralana Enhanced Geothermal System and the Beverley Uranium Mine using Magnetotellurics

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ABSTRACT

The global demand for clean energy alternatives is constantly increasing, creating significant interest for more sustainable energy resources such as uranium and geothermal. Australia is host to over 25% of the world's known uranium resources as well as having significant geothermal potential.

The Mount Painter Domain, in the Northern Flinders Ranges in South Australia, is in a region of anomalously high heat flow generated by radiogenic decay of uranium and thorium rich granites. Two distinct uranium deposits have formed from dissolved uranium carried from the ranges by fluids, being deposited where reduction in sediment pH precipitates uranium.

In May 2012 a magnetotelluric profile was collected, extending from the Northern Flinders Ranges to the Lake Frome embayment to help constrain existing resistivity models. Precipitation of uranium at the Beverley Mine site is anomalous as no surface water flow is present, suggesting the presence of subsurface processes. This pathway is linked to a $50\,\Omega\,\mathrm{m}$ conductive body at the brittle-ductile boundary of the mid-crust, directly under the Paralana geothermal prospect. 3D modelling of the Paralana geothermal prospect suggest deep conductive features connecting with features at the surface.

KEYWORDS

magnetotellurics, uranium exploration, fluids, three-dimensional inversion, geothermal, electromagnetic induction, graphite

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