Crustal structure of the Capricorn Orogen of Western Australia – the role of a microcontinent during Paleoproterozoic subduction and intra-cratonic crust reworking

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The Capricorn Orogen records the Paleoproterozoic amalgamation of the Western Australian Craton, where regional studies revealed a prolonged tectonic history in craton assembly and subsequent intraplate reworking which significantly re-shaped the orogenic crust. A high-density Earthquake seismic study targeted the Glenburgh Terrane, an exotic late-Archean to Paleoproterozoic crustal block in the core of the orogen. Significant lateral variations in the seismic signal are measured across the terrane, showing a relatively thin crust (<40km) with small Vp/Vs ratios (~1.70) in the centre of the terrane, compared to thickened crust (>40km) with elevated Vp/Vs ratios (>1.76) along the margin. In the Glenburgh Terrane, a unique fast-velocity intraplate is present in the shallow crust, indicating significant modification of the crust during post-cratonization magmatic differentiation processes. Based on existing age, isotopic, chemical and conductivity data, and the absolute shear wave velocity data, the Glenburgh Terrane is interpreted as an Archean microcontinent that was significantly modified during Paleoproterozoic orogenesis. The presence of significant seismic variations across the terrane boundary is attributed to Paleoproterozoic subduction associated with the 2.2Ga Glenburgh Orogeny that initiated the assembly of the Western Australian craton, as well as the post-collisional tectonothermal cratonization processes. These results illustrate that multi-disciplinary datasets provide complementary resolution and texture information allowing for tighter constraints on Proterozoic subduction and cratonization processes.