

## The Curnamona Cube: 3D lithospheric architecture of a Paleoproterozoic to Mesoproterozoic craton from MT and passive seismics

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### SUMMARY

The Curnamona Province in southern Australia is a 90,000 km<sup>2</sup> Paleoproterozoic to Mesoproterozoic craton that rifted from the Gawler Craton in the Neoproterozoic and is now separated by the Adelaide Rift Complex sediments in the Flinders Ranges. Magnetotelluric (MT) and ambient noise tomography (ANT) passive seismics surveys have been conducted across the Curnamona Province to provide insights on the 3D lithospheric architecture. A long-period (10-10000 s) MT inversion of 136 AusLAMP and legacy long-period MT sites, 134 broadband MT, and 31 geomagnetic depth sounding (GDS) sites over an area 500 km by 500 km yields a lithospheric-scale (depths of 0-400 km) framework for the Province. In addition, a broadband (0.01 to 1000 s) MT inversion of 134 sites with closer spacing yields higher fidelity of crustal heterogeneity. The long-period Curnamona Province model is combined with other models across southern Australia, that span an area 1000 km west-east and 700 km north-south, encompassing the Archean-Mesoproterozoic Gawler Craton in the west to the Phanerozoic Delamerian and Lachlan Orogens in the east. In this wider context, the Curnamona Province is shown to exhibit four distinct regions of low resistivity. (a) In the top 5 km, resistivity is most strongly influenced by porosity of sedimentary cover. (b) The upper crust to a depth of 20 km has low resistivity < 1 Ohm.m along the eastern margin of the Province possibly due to organic carbon in black shales deposited in the Paleoproterozoic. (c) The lower crust to the Moho (~40 km) has low resistivity (< 100 Ohm.m) and is coincident with the extent of the Adelaide Rift Complex suggesting it may have resulted during a period of Neoproterozoic rifting. (d) At sub-continental lithospheric depths of 150-250 km, high electrical conductance in the central to northern part of the Curnamona Province is attributed to metasomatism at the base of the lithosphere in the Mesoproterozoic. Modelling of the 134 site passive seismic survey provide shear-wave velocity constraints to a depth of about 15 km, and are being integrated into the broad-scale lithospheric model.

**Keywords:** Magnetotellurics; passive seismics; Curnamona Province; Adelaide Rift Complex; Gawler Craton.

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