Magnetotelluric imaging of a Palaeozoic Andean margin subduction zone in western Victoria

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ABSTRACT

The geological setting for the accretion of the Lachlan and Delamerian Orogens in south-eastern Australia is controversial, with two different models proposed. The Lachlan Orogen resulted from either subducting oceanic crust and wedge accretion, or shortening and compression between two continental blocks. Broadband magnetotelluric (MT) data recorded over the transition between the Delamerian and Lachlan Orogens impose new constraints on the formation of southeastern Australia. The east-west MT survey extended for approximately 120 km, recording at 44 stations. A 2D inversion of the data in the bandwidth of 0.05-2000 s yielded a resistivity model to a depth of 150 km, with resistivity ranging from 1-10 000 Ωm. The upper crust was most resistive (>10 000 Ωm), and transitioned to a relatively flat conductor of 50-100 Ωm at ∼20 km. The upper mantle is resistive (>1 000 Ωm) and uniform below this layer. The Escondida, Moyston and Avoca Faults are imaged as low resistivity pathways (100-200 Ωm) extending to the surface. Faults may be anomalously conductive from alteration to serpentinite, and other trace mineralisation such as graphite. The Lachlan Orogen likely formed from west dipping subduction of mafic to ultramafic oceanic crust. This crust was altered to serpentinite, with magnetite coating grain boundaries. Imaged conductive bodies show where shearing caused interconnectivity of the magnetite.

KEYWORDS

Tasmanides, magnetotellurics, western Victoria, subduction

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