

The nature of the lithosphere beneath Australia

B.L.N. KENNETT³

¹Research School of Earth Sciences, The Australian National University, Canberra ACT 0200 Australia;
Brian.Kennett@anu.edu.au

A wide variety of seismological information provides constraints on the crustal and mantle lithosphere beneath Australia. Important tools include receiver function studies, seismic reflection profiles, body wave and surface wave tomography. There is strong evidence for distinct crustal structure in the various terranes of the Archaean Yilgarn Craton, and these may link into distinct mantle lithospheric domains.

The mantle lithosphere beneath the PreCambrian regions of Australia is generally characterised by elevated seismic wavespeeds down to 200 km or more. However, the region that was reworked in the Alice Springs Orogeny (300-350 Ma) shows curiously low velocities in the uppermost mantle underlain by much higher wavespeeds. To the east beneath the Phanerozoic belt the lithosphere is much thinner. The transition from west to east appears to occur in three distinct steps of reducing lithospheric thickness that may be associated with changes in the age of the continental lithosphere.

A further class of important information comes from the anisotropy of seismic wavespeeds through shear wave splitting studies, the azimuthal anisotropy of Rayleigh waves and polarisation anisotropy between SV and SH waves from independent inversions of Love and Rayleigh surface waves. The assemblage of information is consistent with a generally two layered structure, with the lower layer influenced by the northward motion of the Australian Plate.