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TI Mapping of the Transition Zone Discontinuities Beneath the Southwest Pacific Ocean

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AB We modeled mantle discontinuity depths and impedance contrasts beneath the Tasman and Coral Seas using the ScS reverberation method of Revenaugh and Jordan (1989, 1991). Data from over 600 intermediate and deep-focus earthquakes captured at nearly 80 stations were compiled from the ASRO, DWWSSN, GEOFON, GEOSCOPE, GSN, IDA, and SRO networks. The study area is finely divided into many source-receiver corridors based on the tectonics and geology of the region. Discontinuity properties beneath corridors running along, across, and away from subducting plates are examined. The 410- and 520-km discontinuities are variable in depth (±25 km, ±40 km, respectively) and are generally correlated with one another. The depth of the 660-km discontinuity is much less variable, on the order of (±5 km). In addition to the structure of the major transition zone discontinuities, a low-velocity layer above the 410-km discontinuity and two mid-mantle discontinuities below the 660-km discontinuities are detected. The geographic extents of these features are being constrained through analysis of multiple source-receiver corridors crossing through regions where they were initially detected. The low-velocity layer is an average of 70 km thick and could be an indication of volatile-induced melting in the region, though the depths and impedance contrasts of the transition zone discontinuities do not indicate that the transition zone itself is rich in water. Alternatively, the low-velocity layer could be a layer of dense, silicate melt that has settled atop the transition zone following volatile-induced melting in the upper mantle (e.g. Revenaugh and Sipkin, 1994) rather than melting induced by flow from the transition zone below. In the mid-mantle, discontinuities are seen at approximately 835 and 1070 km depth in the majority of corridors crossing the study area. The two features are often seen in the same corridor, indicating that the two observations are distinct reflectors rather than the result of topography along one

discontinuity. Revenaugh, J. and T.H. Jordan, A study of mantle layering beneath the western Pacific, Journal of Geophysical Research, 94, 5787-5813, 1989. Revenaugh, J. and T.H. Jordan, Mantle layering from ScS reverberations, 2, The transition zone, Journal of Geophysical Research, 96, 19763-19780, 1991. Revenaugh, J. and S.A. Sipkin, Seismic evidence for silicate melt atop the 410-km mantle discontinuity, Nature, 369, 474-476, 1994.
DE: 7208 Mantle (1212, 1213, 8124)
DE: 8170 Subduction zone processes (1031, 3060, 3613, 8413)
DE: 9355 Pacific Ocean
SC: Study of Earth's Deep Interior [DI]
MN: Fall Meeting 2005

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