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Evidence for an elevated 410 km discontinuity and transition zone properties below the western margin of the Philippine Sea Plate

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P waves from earthquakes south of Taiwan, recorded by broad-band and short-period seismic stations in Taiwan, were used to define the P-wavespeed structure between depths of 100 and 800 km below the western margin of the Philippine Sea Plate, close to the collision zone with the Eurasian Plate. The presence of a low wavespeed zone in the upper mantle is inferred, although the details are unclear due to the extreme complexity of the seismic records. Wavespeeds in the upper mantle are lower than those of the reference model IAPS91, as expected for signal propagation within an oceanic plate. The estimated depths of the 410- and 660-kilometre discontinuities are 325 and 676 km respectively. The unusually shallow depth of the upper discontinuity is inferred by clearly resolving the travel-time branch produced by refraction through the transition zone; it is attributed to P waves reaching their maximum depths within or close to the subducted oceanic South China Sea Plate where subduction has been slow and relatively recent, and where temperatures are relatively low. The 660-kilometre discontinuity is slightly deeper than usual, probably because of lower temperatures at the base of the transition zone than in most other regions. The wavespeed gradients within the transition zone between depths of 460 and 610 km are higher than in most other P wave models of the transition zone, suggesting anomalously low wavespeed jumps across the upper and lower discontinuities of 1.0-2.0% and 1.3-2.4% respectively. There was no evidence for a discontinuity near 520 km depth.