

A sporadic low-velocity layer atop the 410-km discontinuity beneath the Pacific Ocean

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The seismic discontinuity at 410 km depth is usually attributed to an isochemical phase transformation from olivine to wadsleyite. In addition to this globally observed feature, a low-velocity layer immediately above it has been observed regionally in many places, mainly under continents and continental margins. This low-velocity layer is thought to represent partial melting due to dehydration of ascending mantle across the 410-km discontinuity. Here we present seismic observations of a sporadic low-velocity layer atop the 410-km discontinuity beneath the Pacific Ocean by stacking and analysing long-period seismic body waves. The lateral variations of this low-velocity layer show no geographical correlation with 410-km discontinuity topography or tomographic models of seismic velocity, suggesting that it is not caused by regional thermal anomalies. If this low-velocity layer indeed indicates dehydration melting across the 410-km discontinuity, its strong lateral heterogeneity needs to be taken into account in future geodynamic models of mantle convection and the deep water cycle.

Keywords: 410-km discontinuity, SS precursor, Partial melting

