Sharp Lateral Boundaries in the D'' Region

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We report that a sharp lateral boundary exists at the southern edge of the Pacific superplume. The set of SHdiff waveforms, which graze the South Pacific superplume, have similar features to those observed previously at the southeastern edge of the African superplume. The similarity of the two observed SHdiff waveform sets at relatively high frequencies indicates that the low velocity regions in the lower mantle under Pacific and Africa, observed as the strong degree-2 pattern in shear velocity tomographic models, have a similar nature also at finer scales. We used the coupled mode/spectral element method (CSEM) (Capdeville et al, 2003), which can handle strong lateral variations of the velocity in the D'', to construct synthetic waveforms. The middle figure shows that the postcursors are refraction from the lateral boundary in D'' region. The existence of these pulses suggests that modeling heterogeneity outside of the great circle path can help constrain the 3D structure, especially the shape and velocity contrast at the boundary at the base of the mantle.


NSF award number EAR-0106000