

Slow anomalies oceanward of subducting slabs at the 410-km discontinuity

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P-wave whole mantle tomography studies revealed a low velocity region oceanward of the Northern Honshu slab of the Pacific plate at depths around the 410-km seismic discontinuity. Resolution tests and scrutiny of the traveltimes residuals for the ray paths passing through the low velocity region indicate that this anomaly is a resolvable feature and not an artifact due to the strong slab anomalies. The existence of the slow anomalies is also supported by the analysis of the P-wave records from the J-array (a large aperture seismic array in Japan) for a Bonin earthquake. The P arrivals to Northern Honshu (at epicentral distances of 13 - 20 degree) are strongly triplicated because of the 410-km discontinuity. The later arrivals along the retrograde branch, where ray paths pass through the low velocity region, are anomalously slow. Comparison of the observed and synthetic waveforms indicates not only slow anomalies but also depression of the 410-km discontinuity. This depression represents the direct evidence for the low velocity zone of primarily thermal origin. An excess temperature of 200 K and the associated fractional melt of less than 1% can explain both the results of the tomographic and waveform analyses. In the presentation, the slow anomalies will be shown based on our new tomography model.