

Imaging the Lithosphere-Asthenosphere boundary beneath circum-Pacific areas with the precursors of sP

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Lithosphere-asthenosphere boundary (LAB) is the negative upper mantle discontinuity. The lithospheric slabs with different subducting angles and velocities and stagnant slabs induce the different temperature and material anomalies into the deep Earth's interior, and the related dehydration and other volatiles are different in the processes, then affect the topography and characteristics of the LAB. Detecting the LAB in the Pacific subducting zone with seismic data will be helpful for understanding the interaction between the lithosphere and asthenosphere and the geodynamics of subducting slabs, and provides important geophysical parameters for recognizing the Earth's evolution.

The seismic waveform data recorded by the Chinese Digital Seismic Network, USArray, etc, are processed with the N-th root slant stack method to retrieve the seismic triplications or precursors of strong phases related to the LAB. The LAB is imaged and can be used to study the effects of the subducting slabs and related stagnant materials on the LAB. In the work, we found that: (1) The depth of LAB in the northern Lau Ridge is about 63 km with a range of 63 to 64 km, in the northwest is about 77 km with a range of 76 to 78 km and in the south is about 72 km; (2) The depth of LAB beneath Izu-Bonin is around between 58 and 65 km, and the average depth is 62 km; (3) In the western part of the south America, the LAB depths range between 60 and 63 km, with the average depth of 61 km and the topography of 3 km, while in the eastern part, the ones range between 78 and 82 km, with the average depth of 80 km and the topography of 9 km. We infer that the continental lithosphere may be subjected to the stronger erosions in the area near the trench, for the higher degree of partial melting and the more fertile melts in the asthenosphere; the one may be subjected to the weaker erosions in the area far from the trench, for the lower degree of partial melting and the less fertile melts in the asthenosphere.

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