

The upper mantle Vp/Vs image beneath Central Tibet from Receiver Function tomography

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Although numerous research has already provided basic information on the deeper lithospheric structure beneath Tibet, the northern foremost edge and geometry of the northward underthrusting Indian lithosphere have yet to be understood. Vp/Vs could provide more insight into the mantle physical state than either Vp and Vs alone, owing to the different sensitivities to partial melting, temperature, and composition.

By means of the strong dependence of the travel-time of the converted wave at the 410-km discontinuity on the Vp/Vs in the upper mantle, we developed a new mapping method to constrain the Vp/Vs in the upper mantle. Using the teleseismic records of 158 broadband stations deployed in Central Tibet, we obtained a high-resolution velocity ratio image of the upper mantle. A striking difference is shown between western and eastern Tibet. A distinct high-velocity ratio zone exists at a relatively shallow depth in western Tibet, whereas in eastern Tibet there is an east-west trending non-continuous high-velocity ratios at greater depth. We propose that this difference reflects different geometries of the underthrusting Indian lithosphere from west to east. Slab tearing beneath eastern Tibet and lithospheric delamination beneath western Tibet are likely a good candidates to explain the observations.