

Discontinuity image of the upper mantle transition zone beneath eastern and southeastern Tibet

*Ruiqing Zhang¹, Yan Wu¹, Lian Sun¹, Qingju Wu¹, Zhifeng Ding¹

1. Institute of Geophysics, China Earthquake Administration

We present new constraints on the upper mantle transition zone structure beneath eastern and southeastern Tibet based on P-wave receiver functions for a large broadband data set from two very dense seismic arrays. The northern array, installed during 2007 to 2009, consisted of 288 broadband stations spaced at 10–30 km intervals, mainly across the Qiangtang and Songpan-Ganzi blocks and the Sichuan Basin. The southern array consisted of 350 broadband stations with an average spacing of ~35 km, and was deployed mainly in SE Tibet by the ChinArray project from 2011 to 2014. To apply the receiver function technique, we collected events with body wave magnitudes > 5.0 and at epicentral distances of 30–90°. We computed a dataset of 195,000 high-quality receiver functions from 1,360 teleseismic events. Our results show a clear depression of both the 410-km and 660-km discontinuities west of the Red River fault relative to the east. The same amount depression of the two discontinuities results in a normal transition zone beneath the Tengchong volcano. Moreover, a significant depression of the 660-km discontinuity is detected beneath the western Yangtze Craton. In contrast, that the transition zone thickness beneath much of the Sichuan Basin is similar to the global average. These result not only provide new constraints on the mechanism of the Tengchong volcano but also shed light into the depth extent of the Red River fault and the possible presence of detached lithosphere below the western Yangtze Craton, which are key to understanding the tectonic evolution of eastern and SE Tibet.

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