



Where Has the Shortened Lithosphere Gone —Mantle Flow below the Tibet

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The fate of the colliding Indian and Asian tectonic plates below the Tibetan high plateau may be visualized by, in addition to seismic tomography, mapping the deep seismic discontinuities, like the crust-mantle boundary (Moho), the lithosphere-asthenosphere boundary (LAB), or the discontinuities at 410 and 660 km depth. We herein present observations of seismic discontinuities with the P and S receiver function techniques beneath central and western Tibet along two new profiles. The LAB of the Indian and Asian plates is well-imaged by several profiles and suggests a changing mode of India-Asia collision in the east-west direction. From eastern Himalayan syntaxis to the western edge of the Tarim Basin, the Indian lithosphere is underthrusting Tibet at an increasingly shallower angle and reaching progressively further to the north. A particular lithospheric region called Tibetan Plate was found in northern and eastern Tibet between the two colliding plates, the existence of which is marked by high temperature, low mantle seismic wavespeed (correlating with late arriving signals from the 410 discontinuity), poor Sn propagation, east and southeast oriented global positioning system displacements, and strikingly larger seismic (SKS) anisotropy. The crustal shortening in the southern Tibet is accommodated by underthrusting of the Indian crust below the Asian crust that may reach further north than the YZS. In northern Tibet, crustal shortening is accommodated by homogeneous crustal thickening. The more rugged and higher topography in west Tibet can be supported by the rigid mantle lithosphere there, whereas to the east the lithosphere is weaker due to the existence of the crush zone. Under pressure by Indian and Asian plates, the subducted Indian lithospheric materials moved eastward and divided into four directions when meeting the Sichuan basin, two horizontal (southeastern ward forming Yunguichuan plateau, northeastern ward to Erdos) and two vertical(upward forming Longmen Shan and down ward entering deep mantle).