

Seismic evidence of tearing of the Indian subducting lithospheric slab and the Tibetan mantle lithosphere beneath the Yadong-Gulu rift in central Tibet

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As a key clue to understand the evolution of the Tibetan Plateau and the process of collision between the Indian and Eurasian plates, the deep structure and deformation of the upper mantle are poorly constrained. In this study, S-wave receiver functions were calculated from teleseismic waveforms recorded by two broadband arrays in central Tibet. S-to-P converted phases in S-wave receiver functions were used to image the lithosphere-asthenosphere boundaries of Tibet and the subducting Indian slab. Our results indicate that the depths of both the lithosphere-asthenosphere boundary beneath Tibet and the subducting Indian slab vary from west to east beneath the central Tibetan Plateau. Across the north-south trending Yadong-Gulu rift, the depth of the Tibetan lithosphere-asthenosphere boundary decreases from ~150 km in the west to ~100 km in the east. Similarly, the depth of the lithosphere-asthenosphere boundary of the subducting Indian slab decreases from ~270 km in the west to ~180 km in the east, indicating a steeper subduction angle to the west. The abrupt changes in depth imply that both the Tibetan mantle lithosphere and the subducting Indian slab are torn beneath the Yadong-Gulu rift; therefore, a channel connecting the asthenosphere with the crust may exist beneath the north-south trending Yadong-Gulu rift.