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Architecture of Colliding Tectonic Plates in Tibet by Passive Source Seismology

ZHAO Junmeng¹, YUAN Xiaohui², LIU Hongbing¹, Prakash KUMAR³, PEI Shunping¹, Rainer KIND^{2,4}, ZHANG Zhongjie⁵, TENG Jiwen⁵, CHENG Honggang¹, HUANG Ying¹, XU Qiang¹, WANG Wei¹, TANG Wei¹, ZHANG Heng¹ and LIU Qimin¹

1 Key Laboratory of Continental Collision and Plateau Uplift, Institute of Tibetan Plateau Research, Chinese Academy of Sciences, Beijing 100101, China

2 Deutsches GeoForschungsZentrum (GFZ), Potsdam 14473, Germany

3 National Geophysical Research Institute, Hyderabad 500007, India

4 Freie Universität, Berlin 12249, Germany

5 Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing 100029, China

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 velocity (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 Yun-Gui-Chuan plateau, northeastern ward to Erdos) and two vertical (upward forming Longmen Shan and down ward entering deep mantle).

Key Words: Tibetan lithosphere, receiver functions, anisotropy

* Corresponding author. E-mail: zhaojm@itpcas.ac.cn