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Oblique Rifting in the Southern Tibetan Plateau Revealed From 3□D High□Resolution Seismic Travel□Time Tomography Around the India–Eurasia Continental Collision Zone

Shunping Pei[1,2] and Jiawei Li[2]
[1]Department of Geophysics, School of Earth Sciences, Yunnan University, Kunming 650500, China (peisp@itpcas.ac.cn)
[2]Key Laboratory of Tibetan Plateau Earth System, Environment and Resources, Institute of Tibetan Plateau Research, Chinese Academy of Sciences (CAS), Beijing 100101, China

As the front edge of the continental collision zone, the Indo-Eurasian continental collision belt has great significance for studying the plate collision process, plateau uplifting mechanism and orogenic activities within the plateau. Several models have been proposed to explain north-south compression collision and east-west extension based on geological and geophysical observations. Among them, the distance and shape of subducted India's lower crust and its geometry under the southern Tibet rift are still controversial. To address these issues, we analyze arrival times of P- and S-wave from 35,193 local and regional earthquakes recorded by 575 permanent and temporary stations, and apply an improved double-difference tomography method to obtain high-resolution 3-D P- and S-wave velocity structures of the crust and upper mantle and the locations of the relocated events in the Indo-Eurasian continental collision zone. The east-west velocity profiles reveal that there exists a discrete high-velocity layer dipping eastward at depths of 40-60 km beneath the Longgar rift (LGR), Tingri-Nyima rift (TNR), Xianza-Dinggye rift (XDR), and Yadong-Gulu rift (YGR), which suggests that the subducted Indian lower crust had experienced tearing. On the basis of comprehensive analysis about seismicity, source mechanism of large earthquake in the mantle, and tomographic images, we propose a new dynamic model to present India-Eurasia collision and North-South rifts formation. The significant character of this model is that, the rifts do not cut through the crust vertically but obliquely.