Lithospheric structures beneath Chinese Mainland: Insights from S receiver functions

*Xuzhang Shen[1], Xiuping Mei[1], Mian Liu[2], Xiaohui Yuan[3], Rainer Kind[3]

1. Lanzhou Insititute of Seismology, China Earthquake Administration, 2. Department of Geological Sciences, University of Missouri, 3. Deutsches GeoForschungsZentrum

A rigid lithosphere floating over the viscous asthenosphere is the basic model of continental drift. The displacement of lithosphere-asthenosphere boundary (LAB) provides important clues of lithospheric deformation. However, because the LAB is not a sharp discontinuity but marked in many places by a smooth velocity gradient, it is difficult to determine the precise depth of LAB with body waves. It can be also complicated by another relatively sharp discontinuity, named as mid-lithosphere discontinuity (MLD), which may result from deformation at mineral grain boundaries (Karato et al., 2015).
The Chinese Mainland is tectonically shaped in the Cenozoic by the collision with the Indian plate on its southwestern side and the subduction of the Pacific and Philippines oceanic plates on the eastern side. Investigation of the LAB under mainland China can help us understand its geodynamic evolution and the mechanism controlling intraplate seismicity and volcanism in China.
We have integrated the dataset from ~1000 permanent seismic stations of the Chinese seismic network and dataset from ~700 stations of IRIS in west China to obtain more than 300 thousands S receiver functions. We use these results to investigate the lithospheric structures beneath the Chinese mainland. The preliminary results indicate a low velocity layer between 60~150 km, which represents the LAB or MLD. The results show clear differences of the crustal and lithospheric structures between east and west China, the deformation of LAB between different blocks, the subduction of India Plate, the depth variations of LAB and the relationship between LAB and the seismicity of strong earthquakes. We will discuss the implications of these results on the Cenozoic tectonic evolution in mainland China. This work is supported by National Natural Science Foundation of China (Grant 41274093 and 41574077) and the Basic Research Project of Institute of Earthquake Science of CEA (Grant 2014IESLZ03).

Keywords: lithosphere-asthenosphere boundary, S receiver functions, Chinese mainland, mid-lithosphere discontinuity

