Crustal anisotropy and deformation of the Tibetan Plateau based on the Pms of the receiver functions

*Yan Cai[1], Jianping Wu[1,2], Weilai Wang[1], Lihua Fang[1,2]

1. IGP Institute of Geophysics, China Earthquake Administration, 2. Key Laboratory of Seismic Observation and Geophysical Imaging, Institute of Geophysics, China Earthquake Administration, Beijing 100081, China

As the frontier of the plateau uplift and extension, the northeastern margin of the Tibetan Plateau (NE Tibetan Plateau) is an ideal place to study the crustal and upper mantle deformation characteristics and coupling relationship of the Tibetan Plateau. However, the resolution and reliability of previous studies in this region are suffered from insufficient observations. In this paper, with an array of 675 dense seismic stations in the NE Tibetan Plateau, we obtained the crustal anisotropy parameters by using the Pms phase in receiver functions. The results show that the average splitting time of Pms wave is approximately 0.5 s, which is mainly caused by the middle and lower crust. In the Tibetan Plateau, the fast polarization directions of Pms are mainly NW-SE, which are parallel to the directions of SKS and the maximum shear strain directions. In the outside of the plateau, such as Alxa block and western Ordos block, the fast polarization directions of Pms are NE-SW, which have large intersection angles with the directions of SKS. We infer that the deformation of the crust and upper mantle in the Tibetan Plateau is coupled and is controlled by simple shear deformation with the direction of NW-SE, while the crust-mantle deformation in the outside of the plateau is decoupled, and the crustal deformation is mainly caused by the differential movement of the middle and lower crust with the direction of NE-SW. The observations show an interesting finding that the Alxa block and Ordos block, which are always considered to be the stable blocks, may be experiencing crustal deformations at this stage.

Keywords: Tibetan Plateau, crustal deformation, anisotropy, receiver functions

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