

# The Study of Nowadays 3D Crustal Movement in Fenwei Graban System

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Fenwei rift zone located in the east and south of the Ordos block is still active in China mainland, and it is tectonic boundary separating the Ordos block, Qinling tectonic belt and north China block. Due to the limited observation technique, the current tectonic movement and deformation of Fenwei rift zone are still not very clear and the formation mechanism of the Fenwei rift zone has no consensus. GPS data observed from 2009 to 2014 were collected at 527 campaign-mode and 32 continuously operating GPS stations are processed and get a precise and high spatial resolution horizontal velocity field and strain field. The results reveal that the belt between Shanxi basin and western mountains is under extension with strain rate of 0.01-0.03 ppm/a. Meanwhile the belt between Shanxi basin and eastern mountains is under contraction with strain rate of 0.02-0.03 ppm/a. The western boundary faults of Shanxi basin such as Loyunshan fault, Jiaocheng Fault et al. have 2-3 mm/a of left-lateral slip and 2-3 mm/a of normal-fault extension. But the eastern boundary faults of the basin such as Taigu fault have 1-2 mm/a of right-lateral slip and 1-3 mm/a of normal-fault contraction. There is 2.1 mm/a of shortening motion in southwest of Ordos Block as well as the velocity gradually changes near Lupanshan fault system. It reveals that the fault system is locked in deeper. Weihe fault system show left-lateral slip of 1.0 mm/a and weak extension deformation.

The present crustal vertical velocity field image relative to ITRF2008 is obtained by the precise leveling data from 1970 to 2014 and the vertical velocity of the continuous GPS stations within this region were as a priori constraints. The image reveal that the Ordos block shows overall uplift rates of 3mm/a and Liupanshan-longxi block shows uplift rates of 4-5mm/a. Weihe basin shows subsidence rates of 3-5mm/a relatively Ordos block, while subsidence rates of 2-4mm/a relatively the North Qinling Mountains. Relatively Ordos block and Zhongtiaoshan, the Linfen - Yuncheng Basin demonstrate a subsidence rates of 4-5mm/a. Using the block model and dislocation model, the slip rates and locking depths of the major faults in the Fenwei rift zone were obtained. Our research results provide an important basis for the study on the interaction mechanism between the Qinhai-Tibet block and north China block and long-term risk prediction of regional large earthquakes.

In our study, we suggest a flow model by combining the results of FEA, analysis of Crustal movement profiles with lithospheric mantle deformation from the SKS fast-wave direction. The soft materials beneath the upper crust of Tibet plateau flow towards NE direction, because of the obstruction from the deep root of the Ordos block, the west part flow to Yinchuan along the edge channel, and the south part flow towards the North China across channel under the Fenwei graben.

Keywords: Fenwei graben, Crustal movement, Block model