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Strain partitioning and seismotectonics in the east margin of the Tibetan Plateau constrained by river landforms

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Longmen Shan fold-and-thrust belt (LSFTB) borders the east margin of the Tibetan Plateau, which is composed of basement-involved imbricate thrusts and thin-skinned structures in the foreland [1]. Two strong earthquakes of thrust-type occurred along the imbricate thrusts in the century, the one with magnitude 8.0 teared the thrust front and formed a 240-km-long surface rupture zone in 2008 [2], the other with magnitude 7.0 slipped along the range front blind fault in 2013 [3,4]. Quantitative studies of Quaternary deformations of the LSFTB are mainly limited to the thrust front. Little is known about the kinematic features of the total LSFTB.

The Mingjiang River runs from northwest to southeast across the east margin of the Tibetan Plateau, whose surface processes should have been affected by activities of the LSFTB. Therefore the tectonic deformations were quantitatively studied based on the geometry and datings of the river terraces. The Wenchuan-Maowen fault (WMF) is found to be principally right-laterally slipping, and other faults are mainly thrust slipping (Figure 1). Thrusting is mostly accommodated by the thrust front, i.e. the Yingxiu-Beichuan (YBF) and Guanxian-Jiangyou (GJF) faults. Since ～100kyr B.P., average strike slip rate of the WMF is 1.0 to 1.9mm/yr. The total crust shortening rate of the Longmen Shan and its foreland is 1.4 to 2.0 mm/yr, three quarters of which belongs to the thrust front, and one quarter of which belongs to the foreland.

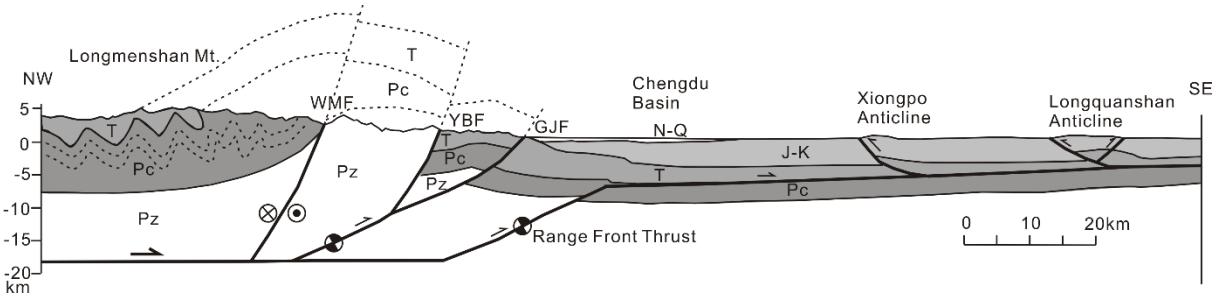

Figure 1: Tectonic model across the east margin of Tibet Plateau

There seems to be three separate seismogenic structures in the LSFTB (Figure 1), which are the strike-slip posterior marginal fault (WMF), the thrust front (YBF and GJF), and the range front blind fault. The three fault systems jointly accommodated the tectonic deformations caused by eastward sliding of the Longmen Shan block along the middle crust detachment about 20 kilometers deep. The 2008 Wenchuan Ms 8.0 earthquake occurred along the splaying thrust front. The 2013 Lushan Ms 7.0 earthquake occurred along the range front blind fault which is a ramp soling westward to the detachment in the middle crust and topping eastward to the upper detachment in the lower Tertiary strata. The ramp is a locking structure in the stepped detachment. The strike-slipping earthquakes along the WMF may be

～7.5 in magnitude. According to the coseismic slips and the mean slip rates of these faults, the recurrent intervals of these earthquakes are ～2 kyr to 3 kyr.

References:

[1]Burchfiel B et al.(2008) GSA Today 18(7): 4-11
[2]Xu X et al.(2009) Geology 37(6): 515–518
[3]Wang M et al. (2014) Geology 42(10): 915-918
[4]Liu S et al. (2015) Tectonophysics 639: 99–108