

Active thrusting beneath an alluvial terrace in the southern Longmen Shan range front, Sichuan basin, China
Active thrusting beneath an alluvial terrace in the southern Longmen Shan range front, Sichuan basin, China

WANG, Maomao^{1*} ; LIN, Aiming¹ ; JIA, Dong² ; SHAW, John³
WANG, Maomao^{1*} ; LIN, Aiming¹ ; JIA, Dong² ; SHAW, John³

¹Department of Geophysics, Kyoto University, ²Nanjing University, ³Harvard University

¹Department of Geophysics, Kyoto University, ²Nanjing University, ³Harvard University

The devastating 2008 Mw7.9 Wenchuan earthquake, China, demonstrates that the central and northern parts of the Longmen Shan are currently active. However, evidence for active faulting and folding in the southern Longmen Shan remains poorly documented. In this paper, we define the structural geometry, fault kinematics, and seismic hazard of the Qiongxian thrust fault system (QTF) along the southern Longmen Shan range front by integrating deep and shallow seismic reflection data and geomorphic observations. The QTF is a 50-km-long, N-S-trending set of faults and associated folds that exhibit geomorphic evidence of Quaternary surface deformation. Geomorphic observations and seismic reflection data reveal that these faults dip steeply to the east and merge at depth with a blind, west-dipping thrust ramp. The trend and reverse sense of slip along the QTF indicates that the structure accommodates east-west crustal shortening. Based on uplift of stratigraphic horizons across the fault zone, we define a late Pliocene to early Pleistocene fault slip rate of 0.2-0.3mm/yr, and a middle Pleistocene to present rate of 0.4-1.2 mm/yr on the west-dipping thrust ramp. This ramp soles to a basal detachment in the Triassic section at a depth of 4.5-5.5 km. To the west, this detachment steps down onto a blind, northwest-dipping thrust termed the Range Front Thrust. A rupture of the QTF in combination with the Range Front Thrust could generate a Mw7.8 earthquake with average displacement of 5.7m. This type of earthquake source poses significant hazards to the adjacent, highly populated Sichuan basin.