2008 M_w 7.9 四川大地震の断層構造模式：復活した龍門山逆断層帯

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Structural model of 2008 M_w 7.9 Wenchuan earthquake in the rejuvenated Longmen Shan thrust belt, China

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The Longmen Shan range exhibits a great steep relief between the eastern Tibetan plateau and the Sichuan basin. The structural configuration of the Longmen Shan may be schematically described as a southeastward-verging fold-and-thrust belt system, which experienced at least two major periods of contractional deformation in the Late Triassic and Cenozoic (Burchfiel *et al.*, 1995; Jia *et al*, 2006). However, GPS data of the last decade indicated that there is no large-scale shortening (shortening rates < 3mm/yr.) of the upper crust across the Longmen Shan. Thereby the rise of the Longmen Shan range was interpreted by lateral eastward flow of ductile deep crust causing thickening by crustal inflation. Whereas the 12 May, 2008 (*Mw=7.9*) Wenchuan earthquake occurred in the rejuvenated Longmen Shan thrust belt and displayed an ongoing uplift process of the eastern margin of Tibetan plateau. The hypothesis of deep crust flow model seems to be dramatically challenged by this thrusting event. Our field investigation discovered that the Wenchuan earthquake ruptures often inherit the pre-existing thrust faults and the destruction of the buildings and most landslides are limited to the hanging wall of the reactivated thrust faults. Some available focal mechanisms and GPS measurement of coseismic displacement show prevailing reverse and reverse-oblique kinematics, compatible with a nearly average NW–SE shortening and with field evidence of active thrusting and oblique thrusting deformation (Lin *et al.*, 2008, 2009).

The 12 May 2008 Wenchuan earthquake of China occurred in the rejuvenated Longmen Shan thrust belt and displayed an ongoing uplift process of the eastern margin of Tibetan plateau. The coseismic surface ruptures exactly follow the pre-existing thrust fault trace and the destruction of the buildings and most landslides are limited to the hanging wall of the reactivated thrust faults. In this paper, in order to detect any indication of coseismic deformation linked to subsurface structures, we construct the subsurface fault and fold geometries using petroleum seismic reflection profiles, as well as constrained by coseismic surface ruptures and seismicity. Our data suggest that the deformation can be divided into two different structural segments related to the regional coseismic deformation during the Wenchuan earthquake. In the southern segment, two coseismic surface rupture zones accord with two pre-existing thrust faults (the Yingxiu-Beichuan and Pengguan faults) in the seismic profiles and both coseismic active thrusts become incorporated into the deep main detachment. This through-going thrust fault connecting directly from the hypocenter to the surface break, but cannot be easily extended to the northern segment along the Yingxiu-Beichuan thrust fault zone. In contrast, only one shallow coseismic active thrust fault with oblique-slip occurs as the active passive roof of imbricate thrust sheets in the northern segment. Our results provide an actual structural model which shows nearly classic ramp-flat geometry and the wedge structures at the blind front of the rejuvenated thrust belt. We emphasize that there is a potential 15~17 km-deep main detachment associated with this large earthquake in the Longmen Shan belt, and infer that some active displacements along the 6~9 km-depth shallow detachment have been propagating into the Sichuan basin since late Cenozoic.