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Space-time Distribution of Afterslip following the 2008 Wenchuan 8.0 Earthquake

Duxin Cui
Second Crust Monitoring and Application Center, China Earthquake Administration,Xi'an, China (cuiduxin@163.com)

The postseismic horizontal and vertical deformations following the 2008 Ms 8.0 Wenchuan earthquake are inferred from GPS and precise leveling data. Using more than 60 campaign GPS stations observed between 2008 and 2012 in the vicinity of Longmen Shan fault, the postseismic displacement fields and time series are revealed. The results show that the displacement near the rupture is very significant. The maximum of accumulative postseismic displacement is 0.234 m during five years. Displacements of most sites are proportional to these coseismic displacements respectively. The deformation across the rupture is extremely uneven. The postseismic displacements at the west region of the faults are larger than that at the east region, and the displacements near the southwest segment of the rupture are larger than that near the northeast segment. The postseismic relaxation process is demonstrated by the GPS time serials observed during 2008-2012. The time series shows that the movement rates decrease fast. The postseismic displacements of the first year after the main shock are significant, which are almost half of the total postseismic displacements. The crustal movement rate after 2012 has almost been equal to its velocity before the main shock. The best-fit relaxation constant of the logarithmic displacement function is attained in 15 days (between 3 and 35 days at 70% confidence). The result shows that the relaxation time in hanging wall is longer than that in the footwall. Meanwhile, the evolution characteristics of the postseismic vertical deformation are obtained from the precise leveling measurement near the surface rupture. The results demonstrate the hanging wall uplift while the footwall down. The amplitude of the postseismic deformation is lower than that when the earthquake happened. The largest displacement appears the leveling route between Maoxian and Beichuan on the hanging wall. It is special that the deformation close the rupture at the hanging wall decreases dramatically, which is the main feature by the movement of the seismogenic high-angle thrust fault. The deformation characteristics after Wenchuan earthquake derived from GPS and precise leveling data can be used to study the rupture mechanism and the physical mechanisms well.