



Spatial slip distribution of the 2008 Wenchuan Mw 7.9 earthquake by joint inversion from GPS and InSAR measurements

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The coseismic deformation of the 12 May 2008 Wenchuan Mw 7.9 earthquake has been achieved by the GPS measurement and the ALOS Pal-SAR interferometry. The two datasets are used separately or jointly to invert the spatial slip distribution of the earthquake. The inversion process includes two main steps. Firstly, a six-segment fault model has been established in consistence with the surface ruptures observed by field survey. Secondly, the slip distribution has been inverted by the constrained least-square method. The results show that a more robust slip distribution could be obtained by the joint inversion with the two geodetic datasets. Our final slip model is in good agreement with the observed surfaces ruptures and fits the deformation data satisfactorily, with the RMS residuals of 0.4 cm and 17.3 cm for the GPS and InSAR measurements, respectively. The slip distribution is confined at the depth range 0-30 km. Two peak-slip areas with maximum slip of about 10 m are found on the Yingxiu and Beichuan segment, respectively, and a moderate slip of 6-8 m on the Qingchuan segment. The inverted rake angle changes along the strike. In the southwest part where the hypocenter is located, the rupture is dominated by the thrust faulting. Then it changes slowly to a dominant right-lateral strike-slip with slight thrusting or even pure right-lateral slip at the northeast end of the fault close to Qingchuan. The geodetic seismic moment is about 8.5×10^{20} Nm, equivalent to a moment magnitude of Mw 7.9.