Coseismic and Postseismic motion of the 2008 Mw 7.9 Wenchuan Earthquake from InSAR

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On 12 May 2008, a Mw 7.9 earthquake occurred on the Longmen Shan fault system at the eastern margin of the Qinghai-Tibet Plateau near Wenchuan City. In this paper, we generated a precise coseismic displacement map covering the epicenter of this large event from L-band ALOS PALSAR imagery by identifying and excluding ALOS interferograms with obvious ionospheric perturbations. Combined with GPS-derived coseismic displacements, a joint model taking into account both coseismic and postseismc motion was constructed to investigate the cosesimic slip distribution of the Wenchuan earthquake and the viscous structure in the Longmenshan region. Our best model suggests this large earthquake was associated with a very complex fault rupture. The slips of Hongkou, Yuejiashan, Beichuan and Hanwang segments were dominated by thrust movements and the Qingchuan segment experienced a dominant right-lateral strike slip. Major slip occurred mainly at the depth of less than 10 km, with a maximum slip of 10.6 m on the northeastern part of the Hongkou segment. Our estimated geodetic moment was approximately 9.30×10^{20} N m (Mw 7.92), which is consistent with previous seismological results. The midcrust to lower crustal viscosity derived from the joint model in a Maxwell half-space was 3×10^{17} Pa s, which places a strong low bound on the viscosity in the Longmenshan region. It is believed that postseismic motion time series results covering a longer time span might have the potential to improve this constraint.