Co-and Postseismic Deformation of the 2014 Mw 6.9 Yutian Earthquake, NW Tibet Studied by High Resolution Optical and Radar Data



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Abstract: The ~2000 km long, ENE-striking Altyn-Tagh fault (ATF) is the most prominent active strike-slip fault system in northern Tibet. Between 2008 and 2014, three M_w> 6 earthquakes occurred on the branching faults of southwestern ATF system. Historically, two M>7 earthquakes occurred in 1924 along this segment of the ATF, ~150km to the NE of the 2014 earthquake. We present the first co- and postseismic ground deformation fields related to the largest strike-slip earthquake of these events, 2014 M_w 6.9 Yutian earthquake, generated from both TanDEM-X radar (1.3 m) and SPOT-6 optical satellite images (1.5 m) that fully cover the ruptured fault. These data show that the seismogenic fault consists of two main fault branches with a 4.5 km step over in between them, close to the Xor Kol Lake. The lake is almost in the middle of the surface rupture where the largest coseismic offset is found near the shoreline. We delineate the surface trace of the seismogenic fault from the computed image offset measurements and use the result to constraint the surface location of the modeled fault. We invert the coseismic data for optimal fault dip and spatially variable slip. We find that the majority of fault slip occurred in the upper 10 km with peak slip of about 2.5 m at 4 km depth. The estimated shallow slip of the slip model is consistent with the field observations. Studying Sentinel-1 postseismic time-series data acquired between 2014 and 2016, we find a clear evidence for aseismic shallow fault slip occurring at the southwestern end of the fault activated in the Yutian earthquake. Finally, we explore the influence the Yutian earthquake may have had on the ATF and on neighboring faults using the Coulomb stress change calculations. We find that the earthquake brought the fault segment between the 1924 event and the 2014 event closer to failure.

Key words: 2014 Yutian earthquake, Altyn-Tagh fault, InSAR

Biography

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