Heterogeneous coupling, aseismic slip, and seismic potential along the Xianshuihe fault from Sentinel-1 InSAR velocities, 2014–2022

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Abstract: As one of the most active strike-slip faults in China, the detailed aseismic and seismic slip distribution along the entire Xianshuihe fault (XSHF) in the present day is still not well understood. To address the problem, we obtained the high-resolution interseismic InSAR velocities during the period of 2014–2022 from ascending and descending Sentinel-1 images. Based on the back-slip theory, we inverted the long-term slip rate, coupling ratio, and slip deficit rate. The long-term slip rate of ~12–13 mm/yr along the XSHF is higher to the southeast and lower to the northwest. Five asperities and two creeping zones are also identified. The northwestern and southeastern ends of XSHF locked down to ~15 km, which is deeper than the Daofu, Bamei, and Kangding segments in the middle of XSHF with locking depths of ~6–8 km. Two aseismic slip zones are related by the postseismic of the 1981 Daofu and 2014 Kangding earthquakes. We comprehensively analyzed the characteristic earthquakes, microseismicity, slip distribution of large earthquakes, and locking distribution suggesting that the heterogeneity of the present-day XSHF locking distribution model is mainly controlled by previous large earthquakes and their postseismic re-locking. Finally, the seismic potential assessment shows the cumulative seismic moment on the Bamei segment since 1893 could generate a Mw 6.72 earthquake, and a Mw > 7.0 earthquake is still capable of generating in the Moxi segment after the 2022 Mw 6.7 Ludng earthquake.

Keywords: Interseismic, Aseismic Slip, Seismic Potential