

Turkey-Syria Earthquake doublet: coseismic deformation, slip model and seismic hazards assessment for surrounding faults

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Abstract: On February 6, 2023, two large earthquakes, the Mw 7.8 Pazarcik and Mw 7.5 Elbistan earthquakes, struck south-central Turkey and northwestern Syria, causing significant damage and loss of life. Using eight SAR images acquired by Sentinel-1 and ALOS-2 satellites, we mapped the coseismic deformation utilizing DInSAR and pixel offset tracking methods. Our results reveal that these earthquakes produced ~320 and ~150 km-long ruptures, respectively. We then used the InSAR and GPS data to invert the fault geometry and slip distribution associated with the two earthquakes. Our inferred faulting models show that the first and second main shocks are ruptured on a southeast-dipping, high dip fault and a north-dipping, moderate-to-high dip fault, respectively. Both events are dominated by sinistral strike-slip motion, most of the slips are concentrated at 0-15 km depths, with a peak slip of more than 9 m. Finally, we calculated the Coulomb failure stress change to assess the seismic risk for surrounding faults.

Keywords: Turkey-Syria Earthquake doublet, Coseismic slip model, Regional seismic risk assessment