

# Modeling of InSAR interferograms in the Brawley Seismic Zone during the Calipatria, California earthquake swarm of June 2021

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The Salton Sea area of California, in the Brawley Seismic Zone near the southern end of the San Andreas Fault, is characterized by the occurrence of frequent earthquake swarms on transform faults. Since 1981, there have been at least three well-observed swarms on the same fault structures near the town of Calipatria, California. The largest recorded event on this system was a Mw5.7 during a swarm in 1981. Between August and September 2005, another seismic swarm occurred where the largest magnitude earthquake was Mw5.1. In June 2021, a third seismic swarm occurred with a maximum magnitude of 5.3. Based on geodetic observations, the 2005 swarm released about 80% of its moment as aseismic slip (Lohman & McGuire, 2007).

This study focuses on quantifying the degree of aseismic slip in the June 2021 Calipatria swarm by calculating the geodetic moment and comparing it with the seismic moment. Sentinel-1 InSAR interferograms were formed to obtain the deformation associated with the swarm. We improved the quality of the interferograms by applying custom phase masks (polygons) in ArcGIS Desktop. The interferograms show a deformation signal of up to ~2cm within 5km from the Mw5.25 earthquake. We constrain the geodetic moment by minimizing the root-mean-square misfit between the geodetic data and elastic dislocation models. The best-fitting value for the 2021 swarm suggests that the deformation is equivalent to Mw 5.6, indicating a significant aseismic contribution to the ground deformation. From the available geodetic and seismic data, the 2005 and 2021 swarms appear to be very similar, both consisting of shallow slip and significant aseismic deformation.

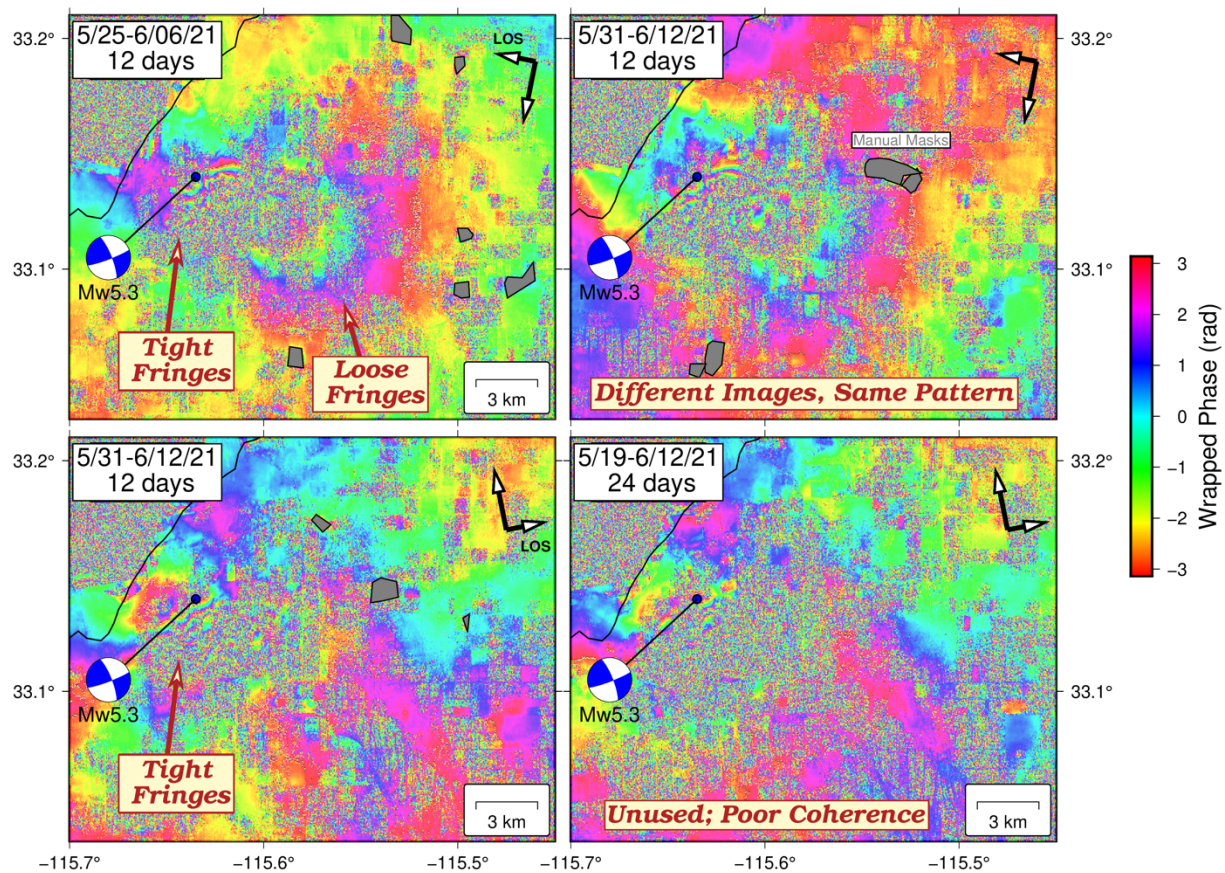


Figure 1: Four Sentinel-1 interferograms from both ascending and descending geometries over the Calipatria earthquake swarm in the Salton Sea. The largest-magnitude earthquake took place on June 5, 2021.