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Deformation along the western Indian plate boundary: new constraints from differential and multi-aperture InSAR data inversion for the 2008, Baluchistan (Western Pakistan) seismic sequence.

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We use Synthetic Aperture Radar Differential Interferometry (DInSAR) and Multi-Aperture Interferometry (MAI) to constrain the sources of the three largest events of the 2008 Baluchistan (western Pakistan) seismic sequence, namely two Mw 6.4 events only 12 hours apart and an Mw 5.7event occurred 40 days later. The sequence took place in the Quetta Syntaxis, the most seismically active region of Baluchistan, tectonically located between the colliding Indian Plate and the Afghan block of the Eurasian Plate. Elastic dislocation modelling of the surface displacements, derived from ascending and descending ENVISAT ASAR acquisitions, yields slip distributions with peak values of 80 cm and 70 cm for the two main events on a pair of strike-slip near-vertical faults, and values up to 50 cm for the largest aftershock on a NE-SW strike-slip fault. The MAI measurements, with their high sensitivity to the north-south motion component, are crucial in this area to resolve the fault plane ambiguity of moment tensors. We also studied the relationships between the largest earthquakes of the sequence by means of the Coulomb Failure Function to verify the agreement of our source modelling with the stress variations induced by the October 28 earthquake on the October 29 fault plane, and the stress variations induced by the two mainshocks on the December 09 fault plane.
Our results provide insight into the deformation style of the Quetta Syntaxis, suggesting that right-lateral slip released at intermediate depths on large NW fault planes is compatible with contemporaneous left-lateral activation on NE-SW minor faults at shallower depths, in agreement with a bookshelf deformation mechanism.