Coseismic and postseismic deformation and source modeling of the May 2012 Emilia (Northern Italy) earthquakes

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We studied two earthquakes occurred in the Emilia region, Northern Italy, respectively on May 20th 2012, Ml 5.9, and May 29th, Ml 5.8, inverting COSMO-SkyMed and Radarsat-1 surface displacements and GPS observations. Both sources were found to be well modelled by ∼E-W, S-dipping thrust faults with a flat-ramp geometry.

We identified a displacement pattern of ∼10 cm towards the satellite sensors, not associated to any of the largest aftershocks. The pattern is temporally co-located or following the first event and preceding the second one. Spatially it is located halfway between the displacement fields of the two main events. We investigate some possible interpretations of our observations, favouring the hypothesis of a slip along the fault plane of the May 29th event, supported by the results of a Coloumb Failure Function analysis, which suggests an increasing load on the May 29th fault plane, following the first mainshock.

The post-seismic deformation was measured for a timespan of about 6 months, using overlapping ascending and descending COSMO-SkyMed acquisitions with a temporal sampling of ∼16 days. The dominant deformation patterns are near-vertical and in the order of 1 to 4 cm/y.