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Inter-,co and post-seismic ground deformation of the 2012 Emilia seismic sequenceby means of InSAR (COSMO-SkyMed-ERS-ENVISAT) and GPStime series

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In this work we present the results of a comprehensive geodetic analysis of the 2012 Emilia (Po Plain, Italy) seismic sequence, which represents an interesting case for the study of the seismic cycle in slowly converging tectonic settings.The 2012 Emilia sequence occurred in the Apennine thrust front,buried beneath the Po Plain sediments. The seismic sequence was characterized by two mainshocks occurred on May 20, 2012, (ML 5.9) and on May 29, (ML5.8) 2012. The first mainshock occurred in an area where seismicity of comparable magnitude has neither been recorded nor reported in the historical record over the last 1,000 years. The second earthquake occurred 12 km WSW of the first one, starting a new seismic sequence in the western area likely interesting another fault plane. A total of seven earthquakes with ML>5 occurred in the area between May 20 and June 3, 2012. After the first mainshock, a COSMO-SkyMed acquisition plan was going to provide data over a wide area of the Emilia Region covering both the epicentral region and the adjacent areas. The acquisition was later extended up to December 31st, 2013 in order to monitor the post-seismic deformation.We measured the evolution of co- and post-seismic deformation by using the multitemporal SBAS InSAR technique applied to COSMO-SkyMed acquired from both ascending and descending orbits between 2012 and 2013. Moreover, we studied the pre-seismic (inter-seismic) phase by means of ERS1/2 and ENVISAT-ASAR data covering the 1992-2010 temporal interval.We linkedthe ERS and ENVISAT measurements to obtain a 1992-2010 long pre-event time series, which is compared and validated with available GPS data. Similarly ,InSAR and GPS post-seismic signals are also compared and validated.GPS time series have been obtained from the analysis of raw data from continuous GPS networks installed for both scientific and cadastral applications. Although GPS providescoarse details of the co- and post-seismic deformation, because of the few sites available in the near source area, it precisely measures the small post-seismic deformation ($\sim$1 cm cumulated in one year), whose detection has been enhanced by filtering the displacement time-series for the spatially-correlatedcommon mode error. The evolution of the post-seismic deformation has been studied applying an Independent Component Analysis (ICA)method (Gualandi et al. this meeting) to both InSAR and GPS time series. The spatial and temporal patterns of the detected inter-seismic and post-seismic deformation signals will provide the opportunity to assess the modes of the crustal stress accumulation and release in this convergent margin.