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Selected case studies in advanced DInSAR analysis of seismogenic areas

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Deformation monitoring of seismogenic areas is a key application of Differential Interferometric Synthetic Aperture Radar (DInSAR) techniques, including both secular and transient deformation. DInSAR allows long-term measurements of tectonic processes at steadily improving spatial and temporal resolution, providing information on the characteristics of the observed deformation phenomena with an unprecedented level of detail.
In this work, we investigate the capability of the advanced DInSAR techniques to analyze long-term surface deformation occurring in extended, seismogenic areas. In particular, we focus on the Small BAseline Subset (SBAS) (Berardino et al., 2002) approach and benefit of its capability to work in multi-frame (Casu et al., 2008) and multi-sensor (Pepe et al., 2005) DInSAR scenarios, by using the first generation SAR system data (ERS-1/2, ENVISAT and RADARSAT-1). Moreover, we also show the SBAS capability to employ new generation sensors to increase the temporal sampling of the retrieved time series (Lanari et al., 2010).
We apply the SBAS algorithm to analyze the temporal evolution of the detected displacements affecting three selected case studies relevant to different seismogenic scenarios, by means of velocity maps and corresponding deformation time series retrieved through data acquired by European (ERS-1/2, ENVISAT) and Italian (COSMO-SkyMed) satellites. More specifically, we focus on the analysis of the deformation patterns associated with the activity of the San Andreas (Southern California, USA), the North Anatolian (Turkey) and the Paganica (Abruzzo, Central Italy) Faults.
The achieved results provide a clear idea of the surface deformation retrieval performance in active seismogenic areas of the advanced DInSAR algorithms; in particular, we highlight the key role played by the DInSAR techniques for carrying out the analysis of already occurred seismic events as well as for the comprehension of ongoing geophysical phenomena. Finally, the performed analysis shows the significant impact that the new generation SAR sensors may have for understanding the deformation processes in seismogenic areas.

References:

Berardino, P., Fornaro, G., Lanari, R., and Sansosti, E. (2002), A new algorithm for surface deformation monitorino based on small baseline differential SAR interferograms, IEEE Trans. Geosci. Remote Sens., 40, 2375–2383.

Casu, F., Manzo, M., Pepe, A., and Lanari, R. (2008), SBAS-DInSAR Analysis of Very Extended Areas: First Results on a 60,000 km2 Test Site, IEEE Geosci. Remote Sens. Letters, 5, 3, doi:10.1109/LGRS.2008.916199.

Lanari, R., Berardino, P., Bonano, M., Casu, F., Manconi, A., Manunta, M., Manzo, M., Pepe, A., Pepe, S., Sansosti, E.. Solaro, G., Tizzani, P., and Zeni, G. (2010), Surface displacements associated with the L'Aquila 2009 Mw 6.3 earthquake (central Italy): New evidence from SBAS-DInSAR time series analysis, Geophys. Res. Lett., 37, L20309, doi:10.1029/2010GL044780.

Pepe, A., Sansosti, E., Berardino, P., and Lanari, R. (2005), On the Generation of ERS/ENVISAT DInSAR Time-Series via the SBAS technique, IEEE Geosci. Remote Sens. Letters, vol. 2(3), pp. 265-269.