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# ERS-ENVISAT InSAR deformation time-series: a powerful tool to investigate long term surface deformation of large areas

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Satellite time series have already provided key measurements to retrieve information on the dynamic nature of Earth surface processes. We exploit in this work the availability of the large archives of spaceborne Synthetic Aperture Radar (SAR) data acquired by the ERS-1/2 and ENVISAT sensors of the European Space Agency (ESA) during the 1992-2009 time period, in order to investigate long term surface deformation of large areas. To achieve this result we take advantage of the Differential SAR Interferometry (InSAR) algorithm referred to as Small BAseline Subset (SBAS) technique (Berardino et al., 2002), which allows us to generate mean deformation velocity maps and corresponding time-series by exploiting temporally overlapping SAR dataset collected by the ERS and ENVISAT sensors (Pepe et al., 2005).
In particular, we focus on the results obtained by retrieving ERS-ENVISAT deformation time-series from 1992 till today in selected case studies relevant to different scenarios. We start from the analysis of the Mt. Etna volcano (Italy) and the Napoli Bay area (Italy), the latter including three volcanic systems (the Campi Flegrei caldera, the Somma-Vesuvio volcanic complex and the Ischia island) and the city of Napoli. In addition, we present the results relevant to the cities of Istanbul (Turkey) and Roma (Italy).
The overall analyses are carried out by using averaged (multilook) InSAR interferograms with a spatial resolution of about 100 x 100 m. Moreover, in selected zones we further investigate localized phenomena by zooming in the areas of interest and carrying out a InSAR analysis at full spatial resolution scale (Lanari et al., 2004). In these cases we also exploit the doppler centroid variations of the post-2000 acquisitions of the ERS-2 sensor and the carrier frequency difference between the ERS-1/2 and the ENVISAT systems in order to maximize the number of investigated SAR pixels and to improve their geocoding.
The presented results demonstrate the unique opportunity provided by the available 18 years of ERS and ENVISAT acquisitions for the comprehension of long term deformation phenomena and the development of effective monitoring scenarios.

References

Berardino, P., G. Fornaro, R. Lanari and E. Sansosti (2002). A new Algorithm for Surface Deformation Monitoring based on Small Baseline Differential SAR Interferograms, IEEE Trans.Geosci. Remote Sens., Vol. 40, No 11, pp. 2375-2383.

Pepe, A., E. Sansosti, P. Berardino and R. Lanari (2005). On the Generation of ERS/ENVISAT DInSAR Time-Series Via the SBAS Technique, IEEE Geoscience and Remote Sensing Letters, Vol. 2, No 3, pp. 265-269.

Lanari, R., Mora, O., Manunta, M., Mallorqui, J.J., Berardino, P., Sansosti, E. (2004). A Small-Baseline Approach for Investigating Deformations on Full-Resolution Differential SAR Interferograms, IEEE Trans. Geosci. Remote Sens., Vol. 42, No 7, pp. 1377 -1386.