



Twenty years of ground deformation monitoring at Campi Flegrei caldera (Southern Italy) via advanced space-based remote sensing techniques

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Campi Flegrei is a densely populated volcanic caldera located to the western edge of Napoli bay (Southern Italy). Starting from the end of the 1960's the caldera has been experiencing rapid, large amplitude, uplift episodes followed by longer term subsidence. In particular, from 1969 to 1984 the caldera uplifted more than 3.5 m, reaching a maximum rate of about 1 m/year in the 1982-1984 time interval.

In this work we investigate ground deformation phenomena occurred at the Campi Flegrei caldera during the last twenty years by exploiting the advanced Differential Synthetic Aperture Radar Interferometry (DInSAR) technique referred to as Small Baseline Subset (SBAS) approach. To this aim, we take advantage of the SBAS multi-platform capability which allows us to generate mean deformation velocity maps and corresponding time series by jointly exploiting SAR images collected by the ERS and ENVISAT SAR sensors of the European Space Agency (ESA).

Our analysis exploits the overall ERS and ENVISAT data archive consisting of about 300 images covering the 1992 – 2010 time interval and acquired over both ascending and descending orbits. This is used to discriminate the vertical and east-west components of the retrieved displacements, thus allowing us to analyze the spatial and temporal characteristics of the caldera deformation pattern with a significant level of detail.

The results show a strong non-linear ground deformation temporal evolution at Campi Flegrei caldera. In particular, from 1992 to 2005 the retrieved surface displacements are characterized by a substantial long-term subsidence component, which followed the 1982-1984 unrest phenomenon. This trend is modulated by (temporal) higher frequency signals related to two mini-uplift events occurred in 2000 and 2005. After 2005, the time series analysis suggests that the long term subsidence (induced by the 1982-1984 unrest) has extinguished and a new phase of background uplift has began.