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# Contribution of 2009-2014 COSMO-SkyMed SAR data to the interpretation of the Campi Flegrei caldera, Italy, activity.

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The Campi Flegrei (CF) caldera is located in a densely populated volcanic region in the northern suburbs of Naples (Southern Italy). The coast near CF is famous for its significant vertical motions since Roman times, which are documented by drowned and elevated harbor works that have recorded slow variations in local sea level. After the last eruption in 1538, the caldera subsided and it has been doing so more-or-less steadily since 1969 when minor uplift occurred. In the early 1970s this uplift became significant ($\sim$1.5 m max). A further large uplift episode occurred from 1982 to 1984 ($\sim$1.8 m max), and subsequently smaller uplift episodes have occurred later on. From 2006 to spring 2013, CF was mostly uplifting at an increasing rate. Uplifting started again during summer 2014.
Amoruso et al. (2014a,b) have recently shown that the CF ground deformation field from 1980 to 2013 can be decomposed into two stationary parts. Large-scale deformation can be explained by a quasi-horizontal source, oriented NW to SE and mathematically represented by a pressurized finite triaxial ellipsoid (PTE) $\sim$4 km deep, possibly related to the injection of magma and/or magmatic fluids from a deeper magma chamber into a sill. Residual deformation not accounted for by PTE is confined to the Solfatara fumarolic area and can be mathematically explained by a small (point) pressurized oblate spheroid (PS) $\sim$2 km below the Solfatara fumarolic field, that has been equated with a poroelastic response of the substratum to pore pressure increases near the injection point of hot magmatic fluids into the hydrothermal system.
A satisfying feature of this double source model is that the geometric source parameters of each are constant over the period 1980–2013 with the exception of volume changes (potencies); potency time histories for PTE and PS, to which the time evolutions of the two components of the ground displacement field are related, are somewhat similar but not identical.
Amoruso et al. (2014a,b) used leveling data from 1980 to 1994, geodetic precise-traversing data for June 1980 and June 1983, ERS/ENVISAT SAR data from 1993 to 2010, and cGPS data from 2000 to 2013.
Here we take advantage of the SAR images acquired by COSMO-SkyMed ASI constellation to analyze CF ground deformation via the SBAS-InSAR algorithm from 2009 to spring 2014, at high spatial (3x3 m2) and temporal resolution (8 days revisit time on average). Firstly, we have compared InSAR LOS and cGPS displacements, then we have generated the InSAR LOS residual time series after subtracting predictions for PTE and PS, using the best-fit source potency time histories.
We show that residuals are always very small, apart from few sporadic (in time and place) local (<1 km2) short-duration (few weeks) displacement anomalies of about 1 cm, which are in any case on the order of the InSAR technique accuracy.
The source potency time histories confirm the negligible role of PS during the 2011-2013 unrest.

Amoruso et al. (2014a), J. Geophys. Res., 119 (2), 858-879
Amoruso et al. (2014b), Geophys. Res. Lett., 41 (9), 3081-3088