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Is the Campi Flegrei (Italy) deformation pattern constant with time? Comparing the 1982-1984 unrest, 1994-1999 subsidence, 2000-2001 and 2005-2007 miniuplifts.

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The Campi Flegrei (CF) caldera is a high-risk volcanic area located North-West of Naples, Italy. CF volcanic history dates from about 50000 years and its magmatic system is still active, as testified by the 1538 Monte Nuovo eruption and the bradyseismic episodes (3.5 m of net uplift) occurred in 1969-1972 and 1982-1984. The secular subsidence is still continuing since then, and mini-uplifts with a few cm amplitude occurred during 1989, 1994, 2000, and 2005.
The usual approach when analysing deformation data is inverting them for different source models and comparing misfits and source parameters. We do not know of any attempt of investigating the model-independent information contained in the data.
Here we refer to three different phases, namely the (i) 1994-1999 subsidence, (ii) 2000-2001 miniuplift, and (iii) 2005-2007 miniuplift, our main goal being cross-comparison of the three deformation patterns with one another and with the 1982-1984 one. We use pixel-wise displacements relative to every acquisition date from 165 ERS and 62 ENVISAT SAR images acquired on ascending (track 129, frame 809) and descending (track 36, frame 2781) orbits (courtesy of IREA/CNR, Naples, Italy) for most recent phases, and levelling and EDM data (June 1980 and 1983) for the 1982-1984 unrest.
The analysis of SAR data is carried out using different techniques, like differences between smoothed stacked images and comparison among single-pixel trends, in order to obtain robust results.
Deformation patterns of 1982-1984 and 1994-1999 are very similar to each other, for both vertical and horizontal displacements. On the contrary, both mini-uplifts exhibit peculiar features. This is particularly evident for the 2005-2007 miniuplift, when the deformation centre appears shifted Westward up to 1000 m and the maximum uplift area does not coincide with the null Eastward displacement one. Even if the interpretation of our results is not straightforward, nevertheless they put constraints on the source(s) of the different phases and the possible role of ring-faults in controlling the deformation pattern.