

# Modeling surface deformation observed with SAR interferometry at Campi Flegrei caldera

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**Abstract:** Satellite radar interferometry of Campi Flegrei caldera, Italy, reveals a pattern of subsidence during the period 1993-1998. Interferograms spanning the first half of the observation period (1993-1995) have a lower amplitude and average rate of subsidence than those spanning either the second half (1995-1998), or the entire period (1993-1998), consistent with observations of a slowing down or reversal of subsidence during the first half of the observation period. We calculate a time series of deformation images relative to a reference image based on a least squares inversion. During the observation period, the maximum subsidence progresses at a rate of roughly  $38 \pm 2$  mm/yr, with periods of no apparent subsidence in late 1996 to early 1997. To understand the characteristics of the source, we jointly invert pairs of ascending and descending differential interferograms spanning similar time intervals (first half, second half, or entire) of the period 1993-1998. In each case the joint inversion fits the two unwrapped interferograms with a similar subhorizontal rectangular contracting tensile dislocation striking roughly N98E with dimensions approximately 4 x 2 km and located beneath the city of Pozzuoli at a depth of 2.5-3 km. Inversion for a spheroidal or Mogi point source also produced reasonable fits but with progressively poorer overall fits to the data, respectively. Our inversion assuming a simple source in an elastic half space does not include the possible effects of local structure on the surface deformation, a factor that may also reduce the need for an asymmetric source. The solution we find is consistent with other studies that suggest subsidence due to hydrothermal diffusion as the primary deformation mechanism during this phase of caldera deflation.