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Aseismic strain episodes at Campi Flegrei, Italy

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Since spring 2004 a research project has been developed in Italy to install borehole Sacks-Evertson strainmeters (dilatometers) aimed to improve monitoring systems of the Italian volcanoes. 6 borehole dilatometers have been installed around Campi Flegrei and Vesuvius during 2004-2005 (Scarpa et al., 2007). This small network has been implemented by two arrays of long-baseline water tube tiltmeters installed in underground tunnels since 2008.
Relevant strainmeter and tiltmeter data have been collected and analyzed at the instruments installed at Campi Flegrei during the recent unrest episodes. Renewed activity started since 2004-2005, characterized by a quite low rate of vertical vertical displacement, amounting initially to a few cm/year. A long term strain episode occurred during summer 2006, in correspondence to an increase of CO_2 emission and displacements measured also by tiltmeters and GPS transducers. This strain episode preceded the seismic activity by few months, as also observed during the 1982 most significant unrest. Other aseismic slip episodes have been recorded in 2009, in correspondence of the renewal of gas emission activity at Solfatara, in 2010, one day before a seismic swarm, and in September 2012, few days before the most significant seismic swarm occurred after the 1982-1984 uplift. The time scale of these phenomena is ranging from some hours to several days, putting further constraints on the origin of ground uplifts at Campi Flegrei. Their location is compatible with the source inferred from long term deformation signals, at about 4 km depth beneath Pozzuoli.