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# Ground deformation at Campi Flegrei and Vesuvius volcanoes (Southern Italy) by GPS, tide gauge and levelling networks

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The volcanic unrest precursory phenomena in the Neapolitan volcanic area are not yet completely clear. This is also caused by the still poor information about instrumental data and knowledge related to the past eruptions (with the exception of the last ground uplift occurred in 1982-1984 at Campi Flegrei, that however has not terminated in an eruptive phase). The risk volcanic management starts from the knowledge of some observables, that we think to be related to the evolution of the volcanic processes, and of their space-time evolution. The ground deformation is connected to pressure increase and migration of magmatic masses. Therefore, their monitoring is fundamental in the short-time forecast of the eruptive activity. 3D geodetic networks have been installed since several years in the Neapolitan area, where three volcanic structures are located (Campi Flegrei, Mt Vesuvius and Ischia Island) each marked by a specific deformation activity. In the last years the INGV-Osservatorio Vesuviano has brought many important improvements in the geodetic monitoring system, both in the number and quality of the used instrumentation and in the acquisition procedure, storage and elaboration of the data. Here, we describe the surveillance system constituted by GPS, tide-gauges and levelling networks and the main results obtained in the definition and evaluation of the geodetic parameters necessary for a satisfactory surveillance of the monitored volcanoes in order to asses the related volcanic risk.