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Ground displacements (1999-2007) in the Neapolitan volcanic area by means of tide-gauge measurements.

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Osservatorio Vesuviano (OV), department of Istituto Nazionale di Geofisica e Vulcanologia, is in charge of the surveillance monitoring of the Campanian volcanic areas, to promptly recognize any variation of the physical-chemical parameters helpful as precursors of eruption. OV manages an integrated monitoring system at Neapolitan Volcanic area, where three active volcanoes (Somma-Vesuvio, Campi Flegrei caldera and Ischia Island) are located. Due to the vicinity of a coastline, the ground displacements are also monitored by the continuous recording of the sea level, using suitable tide gauge stations. Actually the tide gauge network consist of nine stations: seven in Gulfs of Neaples and Pozzuoli, one at Ischia island and one in Gulf of Salerno, all updated with digital instruments with a real time query.

The tide gauge network, used in this paper, is operating since 1970 and reached, in the eighties, the consistency of 6 stations, Napoli, Nisida, Pozzuoli, Miseno, Castellammare di Stabia and Torre del Greco. The data analysis of the sea level time variations is performed by referring the data measured at tide-stations to the data collected at Naples (Reference Station). The relative stability of the reference station is periodically checked by precision levelling, using a benchmark near to the station and tied to the OV levelling network.

A database spanning from 1999 to 2007, using analog date digitized at 1h sampling rate, have been organized and validate, using were necessary statistical gap filling technique. Data have been analyzed in the frequency domain and the local astronomical components have been defined by harmonic analysis, inferring amplitude and phase for the main diurnal and semi-diurnal components The obtained residual respect to the astronomical tide contains information about meteorological component, eustatic variation, ground deformation and noise.

The residual sea level variation, for each site, can be represented by two terms: sea level background and local sea level variations due to noise, site effects and ground deformation. Removing, by deconvolution, the differential behavior of the sea-level respect to a reference station, provide an estimation of the ground level variation. The vertical ground displacements inferred have been compared with the results of leveling and GPS analysis. The results show no significant level variation at Vesuvius, while in the Campi Flegrei caldera, tide gauge data have been able to detect the so-called mini-uplift episodes occurred in the last years.