



## **An application of advanced RTK DGPS technique at Campi Flegrei unrest caldera**

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The Campi Flegrei District (Naples - Italy) includes the volcanic areas of the Campi Flegrei and the islands of Ischia and Procida. The Campi Flegrei are characterized from a caldera 35,000 years old (eruption Campanian Ignimbrite) by which numerous volcanic monogenic apparatus developed inside. The last eruption of this caldera rose again in 1538 and carried to the origin of Mount Nuovo. From the geological point of view, the caldera is mainly formed by volcanic rocks and subordinately by clastic sea sediments; from the structural point of view, the configuration of Campi Flegrei is the result of deformations related to the regional and volcano-tectonic events. The regional tectonic is the cause of direct faults with NE-SW and NW-SE direction and subordinately with NS direction. The magmatic chamber is located at low depth (about 4-5 Km). The dynamics of this volcanic field was characterized by slow and continuous vertical movements as well known as Bradyseism. During 1969-72 (maximum uplift 170 cm) and 1982-84 (maximum uplift 184 cm) this area has been interested by two intense episodes with strong uplift of the ground and moderate seismic energy activity. Both the episodes were followed from a phase of subsidence interrupted by modest phenomena of uplifts, the last of which pointed out during the period March-September 2000 (maximum uplift about 4 cm). Even though the two main uplift crises are not culminated into an eruption, it is fundamental considering that these events caused significant damages to the buildings and to the economy of the Campi Flegrei, which has 250,000 inhabitants. The OV-INGV ground deformations studies are also carried out by the application of GPS and precise levelling techniques: in Campi Flegrei area were installed a CGPS network, consisting of 8 permanent stations, and a precise levelling network, consisting of about 300 benchmarks distributed along a distance of 120 km, with a mean distance of about 400 m, on twelve loops. Several

methods based on the use of GPS reference networks for real-time kinematic positioning have been proposed and tested in recent years. The use of such methods is advantageous to overcome some of the limitations of the standard single reference station differential carrier phase positioning method. Accuracies at the centimetre level are possible under ideal conditions. Thanks to a greater rapidity, the real-time kinematic (RTK) positioning can be useful for periodic survey and for quickly solving field problems in period of crisis compared to the time for carried out a levelling survey. In particular, as regards the Campi Flegrei volcanic district, considering the high density of permanent stations of the Osservatorio Vesuviano-INGV GPS surveillance network, it is of great interest to focus the analysis on the possibility to take advantage of using these stations as reference in order to operate with a single receiver. This paper presents the results of a test based on the use of an advanced post-mission RTK DGPS positioning method with a good agreement with levelling data.