



## **The real-time multiparametric network of Campi Flegrei and Vesuvius**

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Volcanic processes operate over a wide range of time scale that requires different instruments and techniques to be monitored. The best approach to survey a volcanic unrest is to jointly monitor all the geophysical quantities that could vary before an eruption.

The monitoring techniques are sometimes peculiar for each volcano, which has its own behavior. The simultaneous investigation of all the geophysical and geochemical parameters improves the sensibility and the understanding of any variation in the volcanic system.

The Osservatorio Vesuviano is the INGV division charged of the Campi Flegrei and Vesuvius monitoring, two of the highest risk volcanic complexes in the world due to the large number of people living on or close to them. Each of them have peculiarities that increase the monitoring challenge: Campi Flegrei has high anthropic noise due to people living within its numerous craters; Vesuvius has a sharp topography that complicates the data transmission and analysis.

The real time monitoring of the two areas involves several geophysical fields and the data are transmitted by a wide data-communication wired or radio infrastructure to the Monitoring Centre of Osservatorio Vesuviano:

- The seismic network counts of 20 station sites in Campi Flegrei and 23 in Vesuvius equipped with velocimetric, accelerometric and infrasonic sensors. Some of them are borehole stations.
- The GPS network counts of 25 stations operating at Campi Flegrei caldera and 9 stations at Vesuvius volcano. All the procedures for remote stations managing (raw data downloading, data quality control and data processing) take place automatically and the computed data are shown in the Monitoring Centre.
- The mareographic network counts of 4 stations in the Campi Flegrei caldera coast and 3 close to the Vesuvius that transmit to the Monitoring Centre where the data are elaborated.
- The tiltmetric network consist of 10 stations distributed around Pozzuoli harbor, the area of maximum ground uplift of Campi Flegrei, evidenced since 2005, and 7 stations distributed around the Vesuvius crater. Each tiltmetric station is also equipped with a temperature and magnetic sensor. The signals recorded are sent to the Monitoring Centre.
- The 4 marine multiparametric stations installed in the Pozzuoli gulf send accelerometric, broad band, hydrophonic and GPS data to the Monitoring Centre.
- The geochemical network counts of 4 multiparametric stations in the fumarolic areas of Campi Flegrei and 2 stations in the Vesuvius crater (rim and bottom) with data transmission to the Monitoring Centre. They collect soil CO<sub>2</sub> flux, temperature gradient and environmental and meteorological parameters and transmit them directly to the Monitoring Centre.
- The permanent thermal infrared surveillance network (TIRNet) is composed of 6 stations distributed among Campi Flegrei and Vesuvius. The stations acquire IR scenes at night-time of highly diffuse degassing areas. IR data are processed by an automated system of IR analysis and the temperatures values are sent to the Monitoring Centre.