

25 years of GPS measurements at Mt. Etna

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GPS (Global Positioning System) monitoring has been performed on Etna volcano since 1988, making this volcano one of those with the longest records of GPS data. The first order network, measured at least once every year in accurate static mode, was progressively augmented from 9 benchmarks in 1988 to about 80 benchmarks nowadays. Through the quarter of a century, improvements concerned also technological aspects. The most important was the evolution towards a network of permanent stations, which now collect GPS data continuously on 25 selected sites, at very high rate (up to 10 Hz), spurred the development of specific approaches for data processing. However, Etna has also proved an optimum testing ground of new surveying approaches in order to optimize geodetic fieldwork. Several methodological developments related to kinematic surveys and to the correction of tropospheric delays were made.

The use of GPS for monitoring ground deformations at Mt. Etna considerably improved our knowledge of the dynamics of the volcano, its main structural features and plumbing system, producing more than 30 papers on international journals and specific books. The analysis of GPS data allowed, for instance, to infer the location of magma reservoirs acting during the last two decades, identifying a pressure zone beneath the western flank at a depth ranging from 2 to 9 km, studying several shallow intrusions related to the recent eruptions, quantifying the flank dynamic of Mt. Etna and modeling detachment surfaces beneath the eastern and southern flanks. At a local scale (e.g. in the summit areas and across the Pernicana fault), displacements have been also identified and modeled.

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