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Volcano flank dynamics: breakthroughs delivered by space technologies

Giuseppe Puglisi
Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Catania - Osservatorio Etneo

Flank dynamics is an ensemble of phenomena observable in many volcanoes, caused by shallow (e.g. material erosion) or deep sources (e.g. tectonics or magma dynamics). Whatever its origin, the most evident effect of flank dynamics is the continuous/steady movement of the flanks of the volcano. The interaction between gravity, tectonics and magma dynamics produce deep-seated, steady-state movement of large sectors of the volcanoes (sometimes called “persistent flank motion” or “volcanic spreading”), whose effects may be severe, either when it evolves in sudden transient acceleration (producing flank collapses or landslides) or when the steady movement damages essential infrastructures or inhabited areas.

Before space-based observations begun, the knowledge of flank dynamics was limited in terms of areal dimension, magnitude and evolution. Since the 90s, first the GPS, then the SAR interferometry have produced a dramatic shift in the capacity to measure ground deformations at the scale of the volcano. GPS and InSAR now give a complete picture of the persistent flank motion and allow inferring the processes inducing this phenomenon. All this impacts the ability to improve the Hazard Assessment and Risk Reduction related to the persistent flank dynamics. Some worldwide examples are reported in the presentation, among of which from Supersite volcanoes. In particular, Mt. Etna offers the opportunity to make some considerations on the benefit of these improvements in hazard assessment of the flank dynamics.