

Volcano ground deformation : search for magma storage and modeling of the intrusion process with application to recent Mt. Etna eruptions

Alessandro Bonaccorso

Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Catania, Catania, Italy

The pattern and rate of surface deformation reveal the final ascent mechanisms of the magma inside the upper crust. Different sources can characterize the uprising of the magma which can be stored at different depths in pressuring reservoirs and then penetrate into the volcano edifice through fast dike intrusions or violent explosions at main conduits.

In general, ground deformation monitoring techniques (terrestrial geodesy, GPS, tilt, SAR) together with appropriate source modeling can provide the interpretation of the eruptive phenomena. In particular, the study of the ground deformation associated with the numerous and spectacular recent eruptions of Mt. Etna volcano (1981, 1983, 1989, 1991-93, 2001, 2002-03) furnished the opportunity to observe different behaviors relating to the eruptive activity, and suggested different feeding and magma penetration mechanisms.

The results and principal conclusions suggested by modeling the recorded deformation clearly enlighten that different precursors are associated to different styles of eruptions. Implications for both the internal volcano dynamics and its structure are discussed.