Geophysical Research Abstracts
Vol. 14, EGU2012-7790, 2012
EGU General Assembly 2012

Time-resolved velocity tomography at Mount Etna (Italy) volcano during 2000-2008

G. Barberi (1), O. Cocina (1), C. Chiarabba (2), P. De Gori (2), and D. Patane' (1)

(1) Istituto Nazionale di Geofisica e Vulcanologia, Osservatorio Etneo, Sezione di Catania, Catania, Italy, (2) Istituto Nazionale di Geofisica e Vulcanologia, CNT, Roma, Italy

The continuous volcanic and seismic activity at Mount Etna makes this volcano an important laboratory for seismological and geophysical studies. We used repeated three-dimensional tomography (4D tomography) to detect variations in elastic parameters during different volcanic cycles in the period November 2000–May 2008, that includes several flank eruptions.

The use of a large number of permanent seismic stations and the abundance of local earthquakes, occurring both before and during the eruptions, guarantee consistent and high-resolution velocity models. First, we performed a tomographic inversion of the whole data set to define the 3D P-wave velocity (VP) and the structure of the P- to S-wave velocity ratio (VP/VS). A total of ca. 3,000 well constrained earthquakes (root mean square time residuals $\leq$ 0.4 s; horizontal and vertical hypocentral location errors $\leq$ 1.5 km; azimuthal gap of the stations $\leq$ 180°), ca. 40,000 P-wave arrivals, and ca. 9,000 S-wave arrivals were inverted to model a grid, 2 km by 2 km by 1 km spaced, with the use of SIMULPS-14 software. Then, on the basis of geophysical and geochemical observations indicating some cyclic recharging and discharging (eruptions) phases, we inverted different sub-periods to investigate time variations in the elastic parameters.

The observed time changes of velocity-oriented anomalies suggest that four-dimensional tomography could provide a basis for more efficient volcano monitoring and short- and midterm eruption forecasting.