Geophysical Research Abstracts
Vol. 19, EGU2017-4208-1, 2017
EGU General Assembly 2017

Anatomy of a caldera: seismic velocity and attenuation models of the Campi Flegrei (Italy).

Marco Calò (1) and Anna Tramelli (2)

(1) UNAM, National Autonomous University of Mexico, Institute of Geophysics, Vocanology, Mexico (calo@igeofisica.unam.mx)), (2) INGV, Istituto Nazionale di Geofisica e Vulcanologia sez. Napoli - Osservatorio Vesuviano

Campi Flegrei is an active Caldera marked by strong vertical deformations of the soil called bradyseisms. The mechanisms proposed to explain this phenomenon are essentially three i) the presence of a shallow magmatic chamber that pushes the lid and consequently producing periodic variation of the soil level, ii) a thermic expansion of the geothermal aquifer due to the periodic increase of heat flux coming from a near magmatic chamber or deep fluids or iii) a combination of both phenomena.
To solve the paradox, several models have been proposed to describe the nature and the geometry of the bodies responsible of the bradyseisms. Seismological tools allowed a rough description of the main features in terms of seismic velocities and attenuation parameters and till now were not able to resolve the smallest structures (<1.5-2km) located at shallow depth (0-4 km) and believed to be responsible of the soil deformations.

Here we show Vp, Vp/Vs and Qp models carried out by applying an enhanced seismic tomography method combining the double difference approach (Zhang and Thurber, 2003) and the Weighted Average Method (Calò et al., 2009, Calò et al., 2011, 2013). The data used are the earthquakes recorded during the largest bradyseism crisis of the 80's.
Our method allowed to image seismic velocity and attenuation structures with linear dimension of 0.5-1.2km, resulting in an improvement of the resolving power at least two times of the other published models (e.g. Priolo et al., 2012).
The joint interpretation of seismic velocities and attenuation models allowed to discern small anomalous bodies at shallow depth (0.5-2.0 km) marked by relatively low Vp, high Vp/Vs ratio and low Qp values explainable with the presence of shallow geothermal water saturated reservoir from regions with low Vp, low Vp/Vs and low Qp possibly related to the gas saturated part of the reservoir. At deeper depth (2-3.5 km) bodies with high Vp and Vp/Vs and low Qp can be associated with magmatic intrusions.
The results of this project have been obtained in the framework of the PIPIIT program (IA100416).