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SHEAR-WAVE VELOCITY MODELS AND SEISMIC SOURCES IN CAMPANIAN VOLCANIC AREAS: VESUVIUS AND CAMPI FLEGREI

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We present a comparative study for the shear-wave velocity models and seismic sources in the Campanian volcanic areas of Vesuvius and Campi Flegrei.

The structural models for the Vesuvius and Campi Flegrei volcanic areas are obtained through the non-linear inversion of surface-wave tomography data. We obtained local group velocity data in the period range 0.3-2 sec analysing a set of events recorded in 1989-1999 period at OSVE stations for the Vesuvius area, and in 1984, during the last bradyseismic crisis, for the Campi Flegrei area. Group velocity data, in the period range 10-35 sec, and phase velocity data in the period 25-100s, have been obtained in a previous study of regional events located in the Italian peninsula and bordering areas. Both sets of dispersion data have been obtained by means of Frequency-Time Analysis; then, they have been processed using a tomographic technique. We apply a non-linear inversion method, called Hedgehog, to invert local Rayleigh wave group velocity curves, obtained with the tomography. In this way we retrieve average models for the first 30-35km of the lithosphere, the lower part of the upper mantle being kept fixed on the base of existing regional models. A common feature to the two volcanic areas is a low V_s layer, centred at about a depth of 10 km. The only exception is a model corresponding to a path in the northeastern Vesuvian area. This low velocity can be reasonably associated to the presence of partial melting and therefore may represent a quite diffused crustal magma reservoir, which is fed by a deeper one, with regional character, located in the uppermost mantle.

A set of events in the Vesuvius area and in Campi Flegrei have been analysed in the past few years to determine the seismic source moment tensors, by means of waveform inversion. The seismic moment tensor can be decomposed into double-couple (DC), compensated linear vector dipole (CLVD), and volumetric (V) components, and it is very suitable to investigate the physical changes within a volcano, related to magma or fluid movements. The results of the seismic source studies show the presence of a relevant volumetric component for the events of the Vesuvian area. For the Campi Flegrei area the analysis of the moment tensor components highlights an increase of the volumetric component in correspondence to a relatively significant change in the seismicity rate.