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Testing coda methods in high resolution seismic imaging of active volcanoes: application to Campi Flegrei and Mt. Vesuvius.

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The three-dimensional S waves attenuation tomography at Mt. Vesuvius and Campi Flegrei has been obtained by multiple measurements of coda-normalized S-wave spectra. We used 2595 waveforms, relative to 880 volcano-tectonic earthquakes, located close to the crater axis in a depth range between 1 and 4 km (below the sea level), recorded at 7 3-component digital seismic stations. We adopt a two-point approximate ray tracing (Thurber modified) traced in the high resolution 3-D velocity model which was previously obtained. The coda-normalization method was already applied with a limited data set to image the S-wave seismic attenuation structure in the same area; the new database is now able to image a bigger part of the area, with a resolution comparable with that of the velocity tomography.

We also applied the ordinary spectral-slope method to both P- and S-waves. This method is based on the assumption that the differences between the theoretical and the experimental high frequency spectral-slope are due only to attenuation effects. The total attenuation factor has been estimated assuming that the theoretical high frequency spectral source decay equals the experimentally evaluated average spectral decay. We applied this method to test the goodness of the coda-normalization method as well as to complement the S attenuation image with the P attenuation image.

The images with this methods were obtained applying multiple least square inversions of the spectral data in order to increase the space resolution. The minimum resolution cell side results to be of 300 m. Results show the coincidence of an high-Q zone located below the crater between 2.5 and 3 km depth, with the high velocity zone at

the same depth, inferred by the velocity tomography. A low-Q zone is located at the N-W side of the high Q zone, and may be associated with the low rigidity volcanic materials constituting the aquifer.