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Three-dimensional seismic tomography of the Campania-Lucania Apennines region (Southern Italy)

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The aim of this work is to determine a 3D velocity model of the Campania-Lucania Apennines region (Southern Italy) which shows a very complex tectonic-structural setting. The Campania-Lucania Apennines region is one of the most seismic active areas in Italy. The most recent destructive earthquake was the 1980 Irpinia earthquake (M6.9) that caused about 3000 deaths. In this region is being installed an advanced seismic network mainly devoted to early-warning seismic purpose and the knowledge of a reliable velocity model is a basic tool for seismological studies.

Earthquakes with magnitude ranging 1.7-5 collected by the Istituto Nazionale di Geofisica e Vulcanologia network between 1980 and 2003 as well as aftershocks from the 1980 Irpinia earthquakes were used for the 3D seismic tomography. The picking of the first P- and S-wave arrival times was performed and only the earthquakes which were recorded at least eight stations were considered. The final database consists of 1196 earthquakes, $\sim$15500 P and $\sim$7000 S arrival time readings.

Selected data were inverted by using the linearized, iterative tomographic method proposed by Benz et al. that simultaneously inverts first arrival times for both velocity model parameters and hypocenter locations. The distribution of stations and events allowed to investigate a volume of 144x162x30 km^3. The medium was discretized with uniform cell size of 9x9x3 km^3. In order to avoid falling into local minima, several inversions were performed using 225 initial 1D velocity models that were chosen randomly inside reasonable range. The final 3D velocity model was constructed using the average of the 225 tomographic models. The spatial resolution of this model was

investigated using a standard checkerboard test, and the uncertainty associated to the velocity value for each cell has been analyzed.

The new 3D velocity model is used to obtain more reliable earthquake locations and focal mechanisms, which could contribute to better understand the structure of the Campania-Lucania Apennines region.