



Structure and thickness of the lithosphere in Italy from tomographic and moment tensor non-linear inversion studies

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The study of the structure and thickness of the lithosphere in Italy and its surroundings is important for the understanding of the geodynamic setting of the region; furthermore, the structural models for the crust and uppermost mantle (lithosphere-asthenosphere system) represent a major input for the geodynamic modelling, for the evaluation of seismic hazard using scenario-based deterministic methodologies, and for the reliable retrieval of earthquake source mechanisms.

An important goal is the determination of the structural model for the lithosphere-asthenosphere system, obtained from surface wave tomography and non-linear inversion of dispersion curves, for $1^\circ \times 1^\circ$ cells in the whole Italian region. All the solutions for each cell are processed with an optimized smoothing method with the aim to define a smooth 3D model of the lithosphere-asthenosphere system, in agreement with the concept of Occam razor. In fact, the criteria of optimization will help choose, for each cell, as representative solution the one that minimizes the local lateral velocity gradient. The distribution of seismicity has been used as independent constraint for the definition of the lithospheric thickness.

The inversion for the seismic moment tensor of the major recent earthquakes is performed, in order to obtain a constraint to the geodynamic modelling. The properties of earthquakes sources are studied using an advanced waveform inversion technique (INPAR) that allows the retrieval of the full earthquake moment tensor, thus providing further constraints on the current geometries and stress field of the study region. The methodology uses records with relatively high frequencies and allows a relocation of hypocenters, even for shallow earthquakes, so we analyse their distribution and relate it to the different rheologic-mechanic properties of the upper and lower crust and uppermost mantle.