



A lithospheric cross-section across the NE Iberian Peninsula and the western Mediterranean Basin

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Abstract

Results from the TRANSMED-II geotransect and all available geophysical and geological data have been implemented in a 1000 km 2-D lithospheric profile that runs from the Aquitanian basin to the Tell mountains, crossing the Pyrenees, the Ebro basin (NE of the Iberian Peninsula), and the Valencia Trough and Algerian basins (western Mediterranean). The modeling approach integrates elevation, gravity, geoid, surface heat flow, and seismic and petrological data. Unlike previous models proposed for the region where the density of the lithospheric mantle was considered to be only temperature-dependent, the applied methodology allows inferring seismic velocities and density from its mineralogical composition through self-consistent thermodynamic calculations. To fit the geophysical observables and the geological setting in each region, we have considered two different lithospheric mantle compositions corresponding to Phanerozoic or Tecton in the collision/subduction zones (Pyrenees and the Kabyles-Tell area) and a more fertile mantle in the neogene back-arc extended basins of the W Mediterranean (Valencia and Algerian basins). Particular attention has been taken underneath the W Mediterranean part of the profile where variable low Pn velocities are recorded at the uppermost lithospheric mantle, which could be attributed either to anisotropy, transient thermal effects, the presence of a serpentized mantle or the combination of all those effects. The obtained lithospheric thickness shows noticeable differences with previous studies. Maximum depths of the lithosphere–asthenosphere boundary (LAB) are found beneath the Pyrenees (with values exceeding 150 km). The lithosphere is thinned in the W Mediterranean region, especially in the Algerian basin and the Valencia basin (~60 km), showing a slight thickening (~75 km) below the Balearic promontory.