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A lithospheric cross-section in the Western Mediterranean: from the Aquitanian/Ebro basins to north Algeria

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We study the lithosphere structure along a 1700 km transect from the Aquitanian Basin to the Sahara Platform in Algeria following the TRANSMED-II geotransect and crossing the Pyrenees, Ebro basin, Valencia Trough, Algerian basin and Tell-Atlas mountains. The objective is to characterize the structure and composition of the lithospheric mantle in the region by combining elevation, gravity, geoid, surface heat flow, seismic and petrological data. Unlikely to previous models proposed for the region, where the lithospheric mantle density was considered to be only temperature-dependent, the new methodology allows for deriving seismic velocities and density from its composition through self-consistent thermodynamic calculations. The results obtained are compared to observed elevation, Bouguer anomaly, geoid height and surface heat flow and also to available Pn velocities and tomography models. To fit these observables we have considered four different lithospheric mantle compositions corresponding to Phanerozoic or Tecton in the European continental region (Pyrenean region), a more fertile mantle in the Neogene Mediterranean Sea, a different Tecton composition for the Kabyles-Tell-Atlas area and finally, a Proterozoic or Proton-type mantle in the Saharan Platform. The resulting lithospheric mantle geometry show noticeable differences with previous studies. Maximum LAB depths are found beneath the Pyrenees with values exceeding 150 km, and beneath the Sahara Platform region (200∼km)The lithosphere is thinned in the Mediterranean area, especially in the Algerian Basin and the Valencia Trough (60 km and 74 km, respectively) showing a slight thickening (100 km) in the Balearic Promontory. This profile shows a lithospheric structure along the western margin Mediterranean controlled by the collision and subduction processes at Eurasia-Iberia boundary.