# The electrical lithosphere of the Iberian Peninsula

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**SUMMARY**

In this work we present a new 3D model of the lithospheric electrical resistivity of the Iberian Peninsula. To obtain it, we have performed a selection among the existing magnetotelluric soundings collected in the last 30 years in the Iberian Peninsula by several individuals and research institutions. In addition, new long period sites have been acquired in the last years to complement the existing data. The electrical lithospheric model of the Iberian Peninsula was derived through a 3D inversion process involving 112 magnetotelluric sites and using the ModEM code. In its initial form, the model incorporated the complex subsurface structure, representing sediments, crust, lithospheric mantle, asthenosphere and surrounding seawater, with resistivity values determined from previous 2D and localized 3D MT models. During the inversion process, only the bathymetry and seawater resistivity were held fixed, allowing the rest of the initial model to evolve freely. Four components of the impedance tensor at 19 logarithmic equispaced periods from 1 s to 30,000 s were inverted. The most significant variation in electrical resistivity relative to the initial model is evident within the lithosphere, specifically at depths shallower than 80 kilometers. This observation aligns with the notion that the electrical resistivity properties of the continental lithosphere exhibit complexity and high heterogeneity. To determine the depth of the electrical lithosphere-asthenosphere boundary (e-LAB), we establish a correlation with the depth of the steepest negative resistivity gradient. The thickness of the lithosphere beneath areas away from the Pyrenees and the Betics Alpine mountain belts varies between 78 and 110 kilometers in depth. The most significant depth is found beneath the central Pyrenees, reaching 138 kilometers, gradually becoming shallower towards the east. This observation is consistent with the results obtained by other authors who employed local 2D and 3D magnetotelluric models. In order to evaluate the sensitivity of the e-LAB depth, we performed two distinct tests wherein we set the e-LAB depth at fixed values of 83 and 103 kilometers across the entire Iberian Peninsula. We selected 83 kilometers as it represents the mean value across the Peninsula, and 103 kilometers was chosen as the midpoint between the minimum and maximum e-LAB depths. The outcomes of both tests unequivocally reveal that these fixed depth values prove inadequate for achieving a global fit of the data, as they appear too shallow for some areas. The final e-LAB showed variations in both depth and resistivity, providing valuable insights into the heterogeneous nature of this boundary beneath the Iberian Peninsula. The observed e-LAB depths is deeper than the seismic LAB and shallower than the ones based on composition and geophysical potential data.

**Keywords:** e-LAB, 3D inversion, Electrical lithosphere