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Characterization of the Pyrenean lithosphere using new long period magnetotelluric data

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New magnetotelluric (MT) data has been acquired along a N-S profile of 180 km length that cross the Pyrenean range. The new MT data are complemented with old MT data registered at the same profile 15 years ago. In this work we have 15 old MT data with periods ranging from 0.0128 s to 2000 s and 8 new MT data with periods ranging from 0.001 s to 20000 s. The new data allows us to arrive deeper and determine the lithosphere resistivity structure with more precision up to 150 km depth. Moreover, the final geoelectric model has been obtained using 2D inversion procedures. The previous model was obtained by direct modelling, following a trial and error approach. Analyses of the MT data using the Groom and Bailey decomposition method, as well as the use of the tensor invariants corroborate the validity of assuming regional 2D structures. The strike direction of the electrical structures is E-W, parallel to the Pyrenean range. The final model obtained shows a deep large structure with low electrical resistivity values between Iberian and European plates that can be associated to the subduction of the Iberian plate. We suggest, that the cause of this low resistivity values is the existence of partial melting of the Iberian lower crust below the European one. Sensitivity tests prove that resistivity in this structure is not homogeneous. A vertical gradient is observed between the top and the bottom of the structure, having the top low electrical resistivity values, around 3 Ohm•m, than the bottom that present values between 10 Ohm•m and 56 Ohm•m. At the base of the model appears another low resistivity zone associated with the asthenosphere. The lithosphere asthenosphere boundary depth is different for the two plates studied. The sensitivity tests show that the depth for Iberian plate is 80 ± 20 km and 120 ± 15 km for the European plate. The different depths of these limits show that European plate is thicker. The geoelectric model is compared with several geophysical datasets, such as seismic tomography models, previous magnetotelluric profile, seismic reflection profiles, gravity and geoid anomaly models and with the geological interpretation realized by Muñoz (1992). Finally, a discussion about the possible causes and origin of the low electrical resistivity observed between Iberian and European plate is presented in terms of partial melting and/or amphipole-ecoglite transformation as suggested by other authors.