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The crustal structure of the Cantabrian Mountains revealed by magnetotelluric soundings

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SUMMARY

The central Cantabrian Mountains represent a block of Variscan basement uplifted over the Duero foreland basin as a consequence of a southward displacement along a basement-involved thrust during the convergence between Europe and Iberia in the Eocene-Oligocene. We present a new long period magnetotelluric profile across this part of the Cantabrian Mountain and the Duero Basin. The MT profile consists of thirteen magnetotelluric sites over a 100 km long, N-S oriented profile. Dimensionality analyses indicate a dominant E-W direction but with a strong influence of 3D structures mainly at long periods. Accordingly, a 3D joint inversion of the full impedance tensor and the geomagnetic transfer function was carried out.

In the southern part of the area, the resistivity model shows the conductive sediments of the Duero basin over a high resistive and homogeneous Iberian lithosphere. Towards the north, beneath the Cantabrian Mountains, the model reveals a heterogeneous and conductive lithosphere, in which various elongated and dipping conductors in the upper and middle crust are associated with the major Alpine thrusts, one being the frontal thrust of the Cantabrian Mountains over the Duero basin. At deeper depths (between 20 and 35 km depth), the model shows the Iberian crust subducting to the north beneath a high conductivity zone interpreted as the hydrated mantle wedge of the north-Iberian continental margin.

Keywords: Magnetotellurics, Cantabrian Mountains, 3-D inversion