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Crustal structure of the Iberian Chain inferred from magnetotelluric data

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The Iberian Chain developed as an intraplate thrust-belt within the Iberia during the Paleogene, coeval with the Pyrenean deformation and the early phases of the Betic orogen. Geophysical (Bouguer anomaly map) and geological studies suggest a thickened crust beneath the chain. This was produced by a thrust-system involving the Hercinian basement and the Mesozoic and Cenozoic cover. The scarce geophysical data does not permit to accurately constrain the structure at crustal scale.

In the framework of the TOPO-IBERIA project we acquired recently 28 broad-band magnetotelluric soundings along a NE-SW profile crossing the tectonic structures and main geological units. The profile is 180 km long with approximately 5 to 7 km space between MT sites. Robust and remote reference processing was performed to obtain high quality data in the period range from 0,001s to 1000s. The strike analysis revealed a 2D behavior for the MT data with a dominant direction of N130º. 2D inversion of tipper, TM and TE modes was carried out.

The resistivity model shows a deep conductor that is interpreted as a crustal-scale thrust formed during the Alpine orogeny and responsible for a crustal thickening. This lower crust conductor can also be interpreted as an intrusion of basic or ultrabasic rocks containing metallic mineral occurrences emplaced during the opening of the Bay of Biscay in Albian times as proposed in the Basque country (north Iberia). At shallow depths, the resistivity model shows several upper crustal layer conductors interpreted as thrusts with a flat and ramp geometry consistent with geological observations. Other conductors are related to tectonic structures in the upper crust.