Assessment of the continuity of the orogenic root beneath the Cantabrian-Pyrenean orogen

Gabriela Fernández-Viejo¹, Patricia Cadenas¹², Jorge Acevedo¹, and Sergio Llana-Funez¹

¹University of Oviedo, Dept. of Geology, Oviedo, Spain (gaby@geol.uniovi.es)
²CNRS-IPGS-EOST-University of Strasbourg

Crustal roots are a consequence of the contraction of continental masses during orogenesis identified in collisional chains worldwide. Frequently mirroring the summits of mountain systems, they portray the fundamental topic of isostasy. The northern Iberian Peninsula presents a rugged topography resulting of the collision with the European plate and the partial closure of the Bay of Biscay during the Cenozoic. Three differentiated systems formed along, from east to west: a continental collisional chain, the Pyrenees, occupying the isthmus between Iberia and Europe; facing the Bay of Biscay, a deep Mesozoic basin inverted during contraction, the Basque-Cantabrian region, and in the west a crustal pop-up of Palaeozoic basement, the Cantabrian Mountains. The last two extend underwater in the form of a shortened platform, and an accretionary wedge fossilized by post orogenic sediments. The identification of a crustal root beneath the Pyrenees in the 80’s and the observation of a similar morphology beneath the Cantabrian range in the 90’s gave place to the interpretation of the thickening as a continuous feature of the Iberian crust.

However, a reappraisal of vintage refraction profiles and new data from autocorrelations of ambient noise recordings, challenge the alleged continuity. The Pyrenean-Cantabrian orogeny is a three-plate interaction. Beyond the three types of convergent boundaries we may need to introduce the hyperextended-continent destructive boundary, where this is a well-studied example but not the only one.