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Alpine deformation mechanisms along central and north Iberia Peninsula: a wide-angle seismic cross-section

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Orogen formation in tectonic plates boundaries and deformation transfer to the plate's interior to build intraplate mountain belts are processes that contribute to define topography and delineate continent/ocean transitions. The crustal deformation mechanisms that govern these processes vary deeply according to different tectonic settings and on superimposed tectonic phases. The central and northern Iberian Peninsula comprises from north to south: 1) the partially inverted passive continental North Iberian Margin (NIM), 2) the Cantabrian Mountains (CM) formed in the norther boundary of the Iberian subplate during the Alpine orogeny, and 3) an intraplate mountain range, the Spanish-Portuguese Central System (SPCS), located at *ca.* 200 km to the south of the CM. Additionally, the CM and SPCS are separated by the Duero Cenozoic basin which represents an elevated *plateau* (~800 m), whereas to the south of the SPCS, the Madrid Cenozoic basin is located at ~ 400 m altitude. Here, we present a 650-km long crustal-scale cross-section from the NIM to the south of the Madrid Cenozoic basin based on hyperbolic moveout processing of wide-angle seismic reflection/refraction data and on the reinterpretation of previous P-wave velocity models. Our data show an asymmetry of the Moho reflections at both sides of the SPCS and deep subvertical reflectors to the south of the SPCS that we interpret as the image of south-vergent crustal-scale thick-skinned thrusts. This contrasts with the deformation pattern of the CM, where deformation is decoupled between the upper and lower crust and only the Iberian lower crust subducts to the north down at least 40 km depth. This crustal architecture results from the inversion during the Alpine compression of inherited structures and weakness zones: mid-Cretaceous extensional detachments in the NIM and CM; and late- to post-Variscan granitoid intrusion that prompted crustal-scale fault nucleation in the contact with the country rocks in the SPCS. The Conrad discontinuity, separating the upper and lower crust, was assimilated during granitoid intrusion in the late-Variscan extension and played a major role in the different patterns used to accommodate deformation from the Iberian subplate's boundary towards the interior and partly resulting in the different altitude of the SPCS foreland basins.

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