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Marcas Project: study of the Mesozoic extension and alpine compression in the central part of the Cantabrian platform (North-Iberian Margin)

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The North Iberian Margin occupies the southern part of the Bay of Biscay (BB) and is the conjugate of the Armorican Margin. The geological history of the area started by the Permo-Jurassic rifting of the Iberian and Eurasian plates that was followed by Cretaceous seafloor spreading in the centre of the Bay. The extensional episode led to the separation of both margins and the opening of the Bay of Biscay, which is a V shaped deep basin opened to the west. This event lasted until late Cretaceous when the whole area, including the nearby Pyrenean Orogen, underwent a compression episode during the Alpine cycle due to the convergence between Iberia and Eurasia. The Alpine compression which affected all crustal levels, included the development of a crustal root beneath the Cantabrian Mountains, resulted in the partial closure of the Bay of Biscay, and produced the deformation and shortening of the North Iberian Margin.

Onshore data in the Cantabrian Mountains to the south and Vasco-Cantabrian Basin in the east, show that both the Mesozoic extension and the Alpine compression decrease westwards. The Mesozoic Vasco Cantabrian Basin and its continuation offshore attains more than 12.000 meters thickness, whereas in the Cantabrian Mountains the maximum thickness of the Mesozoic deposits barely reach 3.000 meters. Moreover, no Mesozoic basins developed in the westernmost part. The Alpine compression resulted in the inversion of previous Mesozoic extensional structures and the development of new Alpine ones recorded in the Cenozoic deposits.

A new set of high quality seismic reflection data has been interpreted integrated with previous studies in the area under the frame of the MARCAS project (which stands for the Spanish translation of “3D Modelization of the ASturian Continental MARgin”). We present in this study some of the interpretations along the central part of the North Iberian margin, where a denser dataset was available. These will permit future ties to the eastern and western side of the margin to produce a more complete description of the geological history of this margin, where drastic lateral variations have been observed along strike in the previous more sparse seismic lines obtained.

There are detailed studies of the offshore structure in the eastern apex of the Bay of Biscay but there is a lack of them in the central and western part of the Cantabrian Platform. The MARCAS project aims to study the Mesozoic structure and Alpine inversion of structures in the central part of the platform as well as their lateral changes and evolution. The objective is to compare them with those onshore. The detailed cross section of the Meso-Tertiary basin that occupies the Iberian continental shelf, shows structures from all three tectonic events undergone by the margin: a) normal faults and asymmetric basins from the Permian to lower Cretaceous extensional stage. b) upper Cretaceous sediments deposited under stable conditions during the passive margin period. c) Inverted faults, thrusts and folds related to the Alpine compression.