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Deep crustal structure and continent-ocean boundary along the Galicia continental margin (NW Iberia)

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The Galicia continental margin is a magma-poor rifted margin with an extremely complex structure. Its formation involves several rifting episodes during the Mesozoic in the vicinity of a ridge triple junction, which produces a change in the orientation of the main structures. In addition, there is an overimposed Cenozoic partial tectonic inversion along its northern border. Although this continental margin has been widely studied since the 70's, most studies have focused on its western part in the transition to the Iberia Abyssal Plain, and there is a significant lack of information on the north and northwestern flanks of this margin. This fact, along with its great structural complexity, has resulted in the absence of a previous comprehensive regional geodynamic model integrating all the processes observed.

In the present study we integrate a large volume of new geophysical data (gravity, swath bathymetry and 2D multichannel reflection seismic). Data come from the systematic mapping of the Spanish EEZ project which provides a dense grid of gravity data and full seafloor coverage with swath bathymetry, and from the ERGAP project which provides serially-arranged 2D seismic reflection profiles across the NW Iberia margin. The combined interpretation and modelling of this new information has arisen significant constraints on the origin, the deep crustal structure and the physiographic complexity of the margin, as well as on the characterization of the along- and across-strike variation of the ocean-continent transition along NW Iberia margin.

The analysis of this information leads us to propose a conceptual model for the initiation of the tectonic inversion of a magma-poor rifted margin. Finally, a framework for the geodynamic evolution of the Galicia margin has been constructed, involving three main stages: A) an early stage from the end of rifting and oceanic drift in the Bay of Biscay (Santonian); B) an intermediate stage with the beginning of tectonic inversion in the north and northwestern Iberia margin (Campanian-Paleocene) mainly concentrated along the exhumed mantle zone; and C) a final stage of compressive deformation (Eocene-Oligocene) affecting both the continental and the oceanic crust, evidenced by large dip-slip thrusting.