

# Margin segmentation during polyphase rifting in the southern Bay of Biscay

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There is broad agreement that the structure of rifted margins results from the evolution of successive deformation modes linked to tectonic activity. However, the progressive spatial and temporal evolution of rifting leading to strain localization and structural segmentation are still poorly understood. The strongly segmented Bay of Biscay rift system represents a valuable setting in which to study and characterize the evolution of extensional processes and the architecture of a polyphase rift system that evolved to lithospheric breakup. This system developed during the Mesozoic as part of the southern North Atlantic rift. Its central V-shaped oceanic basin was formed during a short-lived spreading period preceded by Triassic to late Early Cretaceous polyphase rift events. The system was subsequently inverted to various extent during the Alpine orogeny due to the convergence between Iberia and European plates.

In this work, we present the structural framework and the tectonic evolution of the North Iberian margin/southern Biscay margin. To build this framework, we relied on the interpretation of a dense set of high quality 2D seismic reflection profiles, together with boreholes and published wide-angle models, and lithospheric density constraints derived from 3D gravity inversions. The margin shows a distinctive structural variability and a strong segmentation resulting from three extensional events. Remnants of an early Permian–Triassic rift have been identified along the continental platform. A rift basin related to a Permian– Triassic rift is suggested in the western platform. During a second Late Jurassic to Early Cretaceous rift event, localized hyperextension resulted in narrow and deep basins such as the Asturian and the Parentis basins, located in the central and eastern North Iberian margin. During a last late Early Cretaceous rift event, extreme crustal thinning and exhumation gave way to the onset of seafloor spreading and the formation of an oceanic basin.

The results of our study suggest that the Bay of Biscay rift system formed as a result of a complex and polyphase evolution. The observed segmentation arose from a strong partitioning of deformation and a progressive strain localization during rifting that conditioned the subsequent compressional reactivation of the margin.