



The role of rift inheritance and segmentation in the Bay of Biscay - Pyrenean system: insights from the Santander Transfer Zone

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The Bay of Biscay – Pyrenean system corresponds to a Mesozoic hyperextended rift system that was subsequently reactivated during Late Cretaceous to Cenozoic time leading to the formation of the Pyrenean orogen along the boundary between the Iberian and European plates. The structure of former rift domains and its role on the subsequent compressional reactivation have been extensively studied over the past years. However, few studies have been focused on rift segmentation (transfer zones) and even less on its role during the inversion and the development of mountain belts, leading to an important structural variability resulting from the strong segmentation and strain partitioning along this rift system. Thereby, the Pyrenean –Basque-Cantabrian inverted rift system represents a natural laboratory where a dense dataset is available to study transfer zones.

Thus, the Pyrenees becomes a perfect natural laboratory supported by an important amount of data to study transfer zones. At the scale of the Bay of Biscay – Pyrenean system, the Santander Transfer Zone represents a key area to unravel the evolution and the linkage between the former Bay of Biscay and Pyrenean hyperextended rift systems. Yet, it remains poorly constrained. The aims of this study are: (i) describe and characterize the Santander Transfer Zone as well as the structure and the architecture of the adjacent basins located in the Western Pyrenees and Basque – Cantabrian systems, and (ii) understand its role during rifting and subsequent compressional reactivation during the Pyrenean convergence.

The most recent and extended studies have defined the Santander Transfer Zone as a soft transfer zone poorly constrained and difficult to define accurately from a structural point of view. Offshore, this structure is described at present-day as a N – S trending corridor 60 km wide, whose limits follows the trend of the Santander and the Torrelavega canyons. This soft transfer system accommodates variations in the extensional deformation and links highly thinned domains along the Bay of Biscay and the Pyrenean – Basque-Cantabrian hyperextended rift systems. A first step of this work will include the definition geological (structural, stratigraphic) and geophysical (seismic observations) criteria to define and map this transfer system from onshore to offshore domains. A good knowledge of the architecture and distribution of rift basins on both sides of the transfer zone will add more insights to constraint the structure and the role of the transfer zones. Further work will also focus on unravelling how extensional deformation was partitioned along this soft transfer system and on understanding the along-strike structural variability and the parameters controlling it through time and space. This study is developed as part of the Orogen project.

Keywords: Santander Transfer Zone, Bay of Biscay, Pyrenees, segmentation, rift-inheritance, passive margin, reactivation