Geophysical Research Abstracts
Vol. 21, EGU2019-2202, 2019
EGU General Assembly 2019

Structural fingerprints of polyphase extension: formation and spatial overlap of hyperextended rift basins at the southern Bay of Biscay

Patricia Cadenas Martínez (1), Gianreto Manatschal (1), and Gabriela Fernández-Viejo (2)

(1) UMR7516, IPGS-CNRS, Université de Strasbourg/EOST,Strasbourg, France, *p.cadenas@unistra.fr, (2) Department of Geology, University of Oviedo, Oviedo, Spain

Nowadays, it is widely agreed that rifting is a polyphase and strain localisation process which implies the stacking of successive deformation events [e.g., Bulk, 1990; Lavier & Manatschal, 2006; Péron-Pinvidic & Manatschal, 2009]. At distal parts in magma-poor rifted margins, crustal thinning and exhumation of lower crustal and mantle rocks give place to the creation of major amounts of accommodation space resulting in the formation of hyperextended basins. Hyperextended rift basins include disconnected and localised basins overlying highly thinned crust and deep and wide sag-type basins developed on top of extremely thinned crust and/or exhumed mantle [e.g., Péron-Pinvidic et al., 2013]. Despite extensive research focused on the study of its structure, the spatial and temporal evolution and overlap between hyperextended basins resulting from polyphase rifting is still poorly understood. The magma-poor Bay of Biscay rift represents a valuable setting to study the architecture of a segmented rift system evolving to lithospheric breakup.

In this work we focus on the study of hyperextended rift basins formed within the southern Biscay margin. The Late Jurassic to Barremian Asturian Basin and the wide hyperextended Late Early Cretaceous basin identified within the abyssal plain, which can be tentatively ascribed from Aptian to Albian, developed during two rift events. These basins are separated by the Le Danois High forming a remnant topographic high. We present a detail description of the crustal structure and architecture of these basins based on the interpretation of the CS01 dense set of borehole-constrained, high quality 2D seismic reflection profiles. The Asturian Basin includes a deep and narrow depocenter, 13 km depth, which developed on top of highly thinned crust that has been slightly inverted during the partial closure of the Bay of Biscay due to Alpine convergence. Within the abyssal plain, the extensional sequences have been completely reactivated, resulting in an accretionary wedge that overlies an extremely thinned crust and is covered by post-orogenic sediments. The identification of major depocenters, the interpretation and spatial correlation of major structures responsible for crustal thinning and exhumation enabled us to characterise the evolution of polyphase extension and resulting structural segmentation. The Le Danois represents an acoustic basement block 20 km thick at the central part of the margin. Towards the east, the Le Danois High includes several tilted blocks overlain by thick sedimentary wedges, with the highest point corresponding to breakaway points of low angle detachment faults. These structures were responsible for the progressive thinning of the Le Danois High toward the east, the exhumation of granulites at its top [Fügenschuh et al., 2003] and the widening of the hyperextended basin developed within the abyssal plain during the Late Early Cretaceous rift event.

A better understanding of polyphase rifting in the southern Biscay margin can provide new insights to comprehend the evolution of extension in the north Iberian rift systems and to constrain the tectonic setting for the development of rift basins and the strongly debated kinematic scenarios for the Iberian plate during the Mesozoic.