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What is the tectono-sedimentary evolution of sag basins in hyper-extended rift-settings: the example of the Early Cretaceous Bay of Biscay-NW Pyrenean rift basins

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The worldwide discovery of exhumed subcontinental mantle and hyper-extended crust devoid of significant normal faulting at present-day deep-water rifted margins casts doubts on the validity of classical rift models. At present, little is known about the syn- to post rift sediment architecture along these margins. In many of these hyper-extended rifted margins, such as the South Atlantic, high quality reflection and refraction surveys image thick sag basins, however, little is known about their tectono-sedimentary evolution.
The major problem in studying sag basins is the lack of good and public available drill hole and seismic data. In our study, we investigate the Parentis and Mauléon basins at the eastern termination of the Bay of Biscay that we consider as examples of sag basins that formed over hyper-extended crust. These basins formed at the termination of a V-shaped basin during Early Cretaceous rifting. Geophysical surveys in the Parentis basin show evidence of thinned crust and reflection seismic data show a sag geometry of the basin. The Mauléon basin located further to the SE in the NW Pyrenees is likely to have formed in a similar setting and simultaneously to the Parentis basin. The Mauléon basin was, however, reactivated during the Pyrenean compression, with the advantage that the rift structures are relatively well exposed. Field observations show that the architecture of this basin is strongly controlled by a low angle detachment system. In our study we mapped the detachment system and the sedimentary record associated with the rifting phase. Preliminary results show that the 3D geometry of this detachment is complex and associated with a system of lateral ramps oriented N-S. On top of this low angle detachment system, allochthonous blocks oriented E-W delimitates sub-basins within the Mauléon basin. During the functioning of the detachment, the sub-basins are filled with syn-tectonic sediments (mainly marls and tecto-sedimentary breccias). When the detachment stops exhuming, the thermal subsidence is recorded by deposition of a silico-clastic system (turbidites and conglomerates).
As part of a new PhD project, we will map this rift system towards the Bay of Biscay in order to understand how the sag basin and its related sedimentary architecture evolved during continental breakup and early seafloor spreading during the opening of the Bay of Biscay. In our presentation we will show the first results of this preliminary work that aims to better understand the tectono-sedimentary evolution of rift related sag basins in present-day deep-water rifted margins.