

Jurassic seaways offshore Portugal: subsidence history and early-rift evolution of the North-Central Atlantic

OLIVIA A. WALKER¹, TIAGO M. ALVES¹, STEPHEN HESSELBO², TIM PARAOH³, AND MARIANNE NUZZO³

1. *3D Seismic Lab, School of Earth and Ocean Sciences, Cardiff University, Main Building, Park Place, Cardiff CF10 3AT, United Kingdom*

2. *University of Exeter – Penryn Campus, Penryn, Cornwall TR10 9FE, United Kingdom*

3. *British Geological Survey, Science Centre, Keyworth, Nottingham, Nottinghamshire NG12 5GG, United Kingdom*

4. *IGI Limited, 2 Hallsannery Farm Cottages, Bideford, Exeter EX39 5HE, United Kingdom*

The development of Early Jurassic seaways has been recorded along the margins of Northwest Europe, particularly between Iberia and Newfoundland in the form of continental, evaporite, and marine strata spanning the Late Triassic–Early Jurassic. The development of this seaway linked the Central and North Atlantic regions for the first time, but its true size and palaeo-position is still to be determined. Understanding the establishment and characteristics of these proto-oceanic gateways are key to develop an accurate palaeogeographic setting during the early-rift phase of the North Atlantic.

We will present a series of high-quality regional 2D seismic reflection profiles from offshore Portugal, tied to academic and industry borehole data, to address the development of rift-related units in different Atlantic basins, ultimately leading to the delineation of the Jurassic seaway. Subsidence curves for the Early Jurassic basins show an important synrift period at this stage in the evolution of the seaway, with likely depths of more than 1000 m being recorded during the Hettangian and Sinemurian. In addition, subsidence curves show that the Lusitanian and Peniche basins were likely part of the same seaway during the early stages of rifting, with important rift-shoulder exhumation occurring between the seaway and the distal margin from Late Jurassic onwards.

The inner Lusitanian Basin and outer Peniche Basin have similar Late Triassic to Early Jurassic characteristics suggesting a co-genetic evolution. Such a character calls for comparisons between other ‘similar’ basins along the Atlantic margin to be made in order to investigate other active seaways in the Early Jurassic. A similar Early Jurassic seaway existed in the North Sea area, a result of the northward propagation of the rift and multiple transgressive pulses. Differential subsidence between grabens allowed for seawater to inundate basins forming a seaway over sites of previous continental continuity.

In conclusion, the West Iberian and North Sea seaways provided a connection between the Boreal and Tethyan realms, with oxygen isotopes confirming the establishment of seawater exchange by the Pliensbachian. Temporary cessation in water exchanges is nonetheless, expected to induce provincialism of fauna and modification of sediment supply to the depositional basins surrounding the small landmasses present at the time. Future investigation of the ‘North Sea’ seaway will draw more comparisons with the ‘Iberian’ one.