Influences of the Avalonia-Gondwana collision structures in the evolution of North Atlantic Basins – the example of the West Iberian Basin

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The early Mesozoic fragmentation initiation of the Pangea supercontinent gave origin to the North Atlantic Ocean through a complex and multistoried process, involving old and new structures and terranes. As frequently seems to occur in similar contexts, the late Paleozoic closure suture of the Rheic ocean controlled, at least in part, the orientation of the later continental crust fragmentation, originating the Iberian margin to separate from the Newfoundland conjugate margin, along it. This event took place as early as late Triassic, recorded by red beds in both the western Iberian margin and the Newfoundland margin.

The Rheic suture was also responsible for putting together a pattern of different basement terranes from both the Avalonia and Gondwana, influencing the geometry of the Paleozoic sub-basins and also the distribution of their potential source-rocks. As a consequence, the predictability of the occurrence of some integrated elements of petroleum systems, such as the Silurian shales and Carboniferous turbidites source rocks, together with a proper understanding of migration pathways of the generated hydrocarbons, are strongly dependent on the detailed knowledge of the rock structural orientations and surfaces resulting from the geometry of the collision model of the Rheic closure.

This heterogeneous and structured basement underlies different Mesozoic basins such as the Lusitanian Basin, the Peniche Basin and the Alentejo Basin, this one more to the south. Therefore, it controlled the structural orientation and evolution of these Mesozoic basins, namely its regional dips and depocenters, up-lifted and subsident blocks, lithology of provenance areas, etc. Also the presence of potential source-rocks beneath the Mesozoic infill is crucial to explain possible occurrences of gas in some Mesozoic reservoirs.

In order to achieve a better understanding of the complex basement structure, geological and geophysical data must be integrated - both rock data and indirect evidences, namely through gravimetric and magnetic responses, must be addressed. However, apropriate answers to questions such as the cinematics of the Porto-Tomar Shear Zone, the position of the westwards underling boundaries between the Central Iberian Zone, the Ossa Morena Zone and the South Portuguese Zone, or the detailed Avalonia-Gondwana frontier, need to be searched, to fully understand the regional framework.

The exploration activities that are going on in the deep offshore basins of the western Iberian margin should provide relevant data and new perspectives about the composition of the basement, the control on the Mesozoic crustal fragmentation and the resulting present-day geometry of the Paleozoic elements of the oil systems.

References

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Fig. 1 – Sketch of the Avalonia – Iberia collision structures within the present day orientation of the Western Iberian Margin; based in Alves *et al*., 2012 and FrOG Tech, 2012 . Insert D is taken from Simancas *et al.*, 2009.