A stratigraphic record of enhanced subsidence during continental breakup: do breakup sequences rule over unconformities?

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Late Jurassic–Cretaceous rifting and continental breakup of the North Atlantic Ocean was complex, and present-day paleogeographic reconstructions have yet to address the position of micro-plates such as Iberia. As an alternative method to predict source and reservoir potential in North Atlantic rift basins, the focus has changed in recent years towards understanding the topography of paleo-rift axes, continental slopes, marginal highs, and shelves, using seismic and stratigraphic data from multiple sources. In such a setting, West Iberia differs from the North Sea, proximal Newfoundland basins, and Ireland, by presenting excess accommodation space for sediment sourced from hinterland areas. Such a character was accompanied by important bypass of sediment towards the North Atlantic rift axis, with excess accommodation space resulting in enhanced conditions for the generation of 'black shales' in these regions. This presentation uses seismic profiles, borehole data, and tectonic-subsidence models to stress the following three characteristics: (1) the important migration of slope facies towards the west and southwest recorded in West Iberia during Late Jurassic–Early Cretaceous; (2) the predominance of a slope-fed depositional system through the latter stages of rifting and continental breakup; and (3) the near-permanence of topographically sheltered, 'sediment starved' conditions in the future region of continental breakup during the Late Jurassic and Early Cretaceous.

The maintenance of these characteristics until continental breakup was achieved in the whole of the Iberian plate, from which point slope progradation ceased, subsidence increased dramatically in offshore basins, and bypass of sediment predominated on the continental slope. Such a character indicates a Cenomanian/early Turonian age for the end of the synrift process along the whole of the Iberian Plate into the Bay of Biscay, with discrete breakup sequences marking diachronous continental breakup events on successive segments of the margin. Field areas demonstrate sediment bypass during diachronous continental breakup along West Iberia. Most published literature misrepresents the importance of such forced-regressive events on the 'outer proximal margin' of West Iberia. We also compare stratigraphic successions at outcrop with borehole and seismic data, extending our analysis from the shallow offshore to more 'distal' basins.

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