

Post-Rift Exhumation, Subsidence and Sandstone Deposition along the Mauritania-Senegal Continental Margin

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Abstract

The Mauritania-Senegal segment of the NW Africa rifted continental margin (MSGBC) has emerged as a global hydrocarbon hotspot. Shelfal discoveries are associated with terrigenous Albian deltaic sands deposited on a drowned carbonate platform, where sediment bypasses the escarpment margin through canyon systems basin floor reservoirs are prospective. The occurrence of Cretaceous sands in what was an otherwise a fairly starved margin is unexpected and requires an episode of exhumation/erosion during the post-rift stage of the margin. To address these topics and quantify the source-to-sink system we have produced the first regional-scale set of low-thermochronology data from basement rocks of Mauritania and Senegal and the first systematic analysis of subsidence patterns along an onshore to offshore transects. We integrate the two approaches with provenance analysis (heavy minerals, bulk mineralogy, geochronological dating) of sands from outcrops and well cores. Finally, we perform paleotopography modelling to predict amounts of eroded material as well as the distributary system which delivered the sands to the offshore. The most relevant result of our work is the discovery that the area of the presently outcropping Mauritanides in Senegal and Mauritania experienced km-scale exhumation at 140-90Ma, overlapping with the production of Albian sands. At the same time, larger-than-predicted subsidence took place in the western part of the onshore and adjacent offshore MSGBC basin suggesting a regional tectonic coupling between domains with different vertical movements. Provenance studies record a shift in the heavy mineral assemblages that can be traced across the length of the depositional system. Paleotopography models predict the development of rivers with substantial discharge towards the offshore and the continental domains East of the Mauritanides. The overall results obtained for the Senegal-Mauritania segment confirm similar patterns of episodes exhumation and subsidence defined in Morocco, the timing and amplitude of which cannot be explained by conventional rift models. Interestingly, areas experiencing exhumation are rarely fault-bounded and rather recall a whale-back shape strengthening the idea that they are controlled by lithospheric folding processes.