Central and South Atlantic conjugate margin pre- and post-salt successions: implications for rift models and petroleum systems

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Data from offshore basins along the Nova Scotian–Moroccan (considered non-volcanic and transitional) and Brazilian–West Africa (volcanic) conjugate margins reveal the presence of stratigraphic sequences below the late synrift salt lying above the unconformities that define the onset of rifting, and the elusive breakup unconformity corresponding to oceanic crust inception. These sequences are observed in proximity to basin margin hinge lines in shallow water, and in deep water at the distal basin margins extending towards the abyssal plain.

Recent industry-acquired deep crustal and regional seismic lines have improved resolution of these pre-salt features as well as post-salt troughs controlled by basement-involved faults. In shallow water, they are manifested as isolated salt evacuation synclines and half-grabens composed of fluvial and playa redbed sediments. Unusual deep-water structures, appearing as highly rotated fault blocks with growth geometries, have alternative interpretations of continental or oceanic, synrift or post-rift features. Originally interpreted as structural relief on magnetically quiet oceanic crust, the features' internal geometries and occurrence below the assumed breakup unconformity suggest that the basement may not be oceanic. Some evidence supports the presence of attenuated, serpentinized mantle in these areas.

The extremely thick pre-salt sedimentary sequences seen in the Atlantic margins are probably related to rift shoulder uplift at the continental border, and at the future rift spreading axis immediately prior to rifting. A rapidly deposited sedimentary succession was thus directed towards the main salt (rift) depocentres on both the South and Central Atlantic conjugate margins. The successions underlying the salt in deep waters are not rotated by synrift faults, and in the South Atlantic the depocentre lies above a deep seismic reflector which may correspond to the Moho or to lower crust detachments.

Recognition of these features, identification of basement type, definition and age of breakup events, and their interpreted temporal and tectonic association, has significant implications for different styles of rifting, salt tectonics, and basin petroleum systems (source facies, heat flow and maturation, trap formation, and migration pathways).

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