Correlating the Albian magmatic rift across the Sergipe–Alagoas and North Gabon conjugate margin: implications for source rocks above SDRs

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Deepwater exploration over the last few years in Sergipe– Alagoas and North Gabon has renewed our thinking of traditional models of the South Atlantic rift-to-drift transition, magma-poor and magma-rich end-members, and has furthered our knowledge of the role of magmatism on heat flow and subsidence in deepwater areas.

Seismic and well studies across the conjugate margins show the presence of three distinct phases of rifting; the Neocomian–Barremian rift system, episodic rifting in the Aptian corresponding to the linkage of isolated graben and shear zone systems, and the latest Albian magmatic rift that does not follow traditional breakup models for the opening of the South Atlantic. Many models use the Aptian base salt pick as a regional marker for end-rift and onset of thermal subsidence. However, this is not the case in the Sergipe– Alagoas and North Gabon conjugate, where rapid sag subsidence is not observed until the Cenomanian in the distal domain.

Deepwater wells in Gabon have penetrated the distal magmatic rift and found the lower sedimentary section to be composed of marine shales interbedded with sandstone stringers with a shallow marine affinity. The upper Albian section is composed of shale, marl, carbonate rocks, and volcanic rocks. Similar stratigraphy is encountered in the distal Sergipe–Alagoas Basin, and magmatism in the form of pillow basalt has been previously dated by $^{40}Ar/^{39}Ar$ at 104.8 ± 2 Ma. Magmatism in the distal domain of both margins comprises a series of intrusions, SDRs, volcanoes and lava deltas.

Albian organic shales overlie the broad SDR domain and are considered to be the source of large oil discoveries in Sergipe– Alagoas (e.g., Moita Bonita and Barra). Recent deepwater wells in North Gabon have also documented good quality Albian source rocks deposited in a highly restricted shallow marine environment with volcanic input and fluctuating relative baseline changes. Deep penetrating seismic reflection data shows highly attenuated and infiltrated crust with a shallow 'Moho' reflector under the Albian rift system. Volcanic addition to the lower crust, in form of magmatic underplating, and in the upper crust as SDRs and intrusions in the distal domain allow the preservation of shallow water conditions necessary for the restricted source rocks and contrasting deeper water conditions in the proximal domain.

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