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The South Atlantic salt basins: insights from the long-term stratigraphic trends of the basins of the African and Brazilian margins

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We study the links between the salt giants and the deformation of the passive margins of the Central segment of the South Atlantic Ocean, its only segment showing salt deposits. We want to determine the relative contribution of the subsidence, the climate and the surface processes in the deposition and, more importantly, the preservation of several kilometers of evaporite deposits.

To do this we synthetized from data of the literature, the long-term evolution of depositional environments throughout the history of each basin of the African and Brazilian conjugate margins. We subdivided the sedimentary wedge into four stages i.e. pre-rift, syn-rift, transition and post-rift phases. Syn-rift phase is classically defined as deposits affected by the crustal deformation (i.e. generally tilted blocks) while the transition phase corresponds to the succeeding deposits, not affected by major faults, and toped by evaporites. We compiled, for each basin, facies and stratigraphic ages of sediments, cross-sections, etc … We also included the uncertainties associated with each of these data. Most of the published data are restricted to the proximal parts of the margins (within 100km of the present-day shoreline).

African and Brazilian margins show common trends in their evolutions. In all basins, the transition phase, whatever its age and duration, records the shift from continental/fluvio-lacustrine (locally coastal marine) facies below the evaporites, to deeper marine facies above. Therefore, in the proximal part of the margins, bathymetries were relatively shallow (continental to coastal) before the onset of evaporites deposition. Evaporites deposition systematically occurred at the end of the transition phase and during usually half of its duration. The rifting timing varies along the Central segment of the South Atlantic Ocean, but the transition phase and the salt deposition end everywhere at the same time (Upper Aptian). Although South Atlantic Ocean kinematics suggests that the onset of the transition phase was coeval to an increase in spreading rates, its end seems to occur during a steady kinematic context at the scale of the central segment.

Nonetheless, African and Brazilian conjugated margins show difference in their evolutions as well. In African basins, the transition phase (during which evaporates deposition occurred) started systematically earlier than in Brazilians basins. Furthermore, although evaporite deposition duration was longer in African basins than in Brazilian basins, the total thicknesses and accumulation rates were lower. These results allow defining first order constraint that can be used in stratigraphic modeling of the long-term evolution of these passive margin basins.