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Palaeogeographic evolution of the central segment of the South Atlantic during Early Cretaceous times: palaeotopographic and geodynamic implications

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The tectonic and sedimentary evolution of the Early Cretaceous rift of the central segment of the South Atlantic Ocean is debated. Our objective is to better constraint the timing of its evolution by drawing palaeogeographic and deformation maps. Eight palaeogeographic and deformations maps were drawn from the Berriasian to the Middle-Late Aptian, based on a biostratigraphic (ostracodes and pollens) chart recalibrated on absolute ages (chemostratigraphy, interstratified volcanics, Re-Os dating of the organic matter).

The central segment of the South Atlantic is composed of two domains that have a different history in terms of deformation and palaeogeography. The southern domain includes Namibe, Santos and Campos Basins. The northern domain extends from Espirito Santo and North Kwanza Basins, in the South, to Sergipe-Alagoas and North Gabon Basins to the North.

Extension started in the northern domain during Late Berriasian (Congo-Camamu Basin to Sergipe-Alagoas-North Gabon Basins) and migrated southward. At that time, the southern domain was not a subsiding domain. This is time of emplacement of the Parana-Etendeka Trapp (Late Hauterivian-Early Barremian). Extension started in this southern domain during Early Barremian. The brittle extensional period is shorter in the South (5-6 Ma, Barremian to base Aptian) than in the North (19 to 20 Myr, Upper Berriasian to Base Aptian). From Late Berriasian to base Aptian, the northern domain evolves from a deep lake with lateral highs to a shallower one, organic-rich with no more highs. The lake migrates southward in two steps, until Valanginian at the border between the northern and southern domains, until Early Barremian, North of Walvis Ridge.

The Sag phase is of Middle to Late Aptian age. In the southern domain, the transition between the brittle rift and the sag phase is continuous. In the northern domain, this transition corresponds to a hiatus of Early to Middle Aptian age, possible period of mantle exhumation.

Marine influences were clearly occurring since the Early Aptian in the Northern domain and the Campos Basin. They seem sharp, brief flooding coming from the North, i.e. from the Tethys-Central Atlantic, trough a seaway crossing South America from Sao Luis, Parnaiba, Araripe and Almada basins (Arai, 1989). In the absence of data, the importance of those marine flooding during the Middle Aptian in the Santos Basin is still discussed.

Keywords: South Atlantic Ocean, Early Cretaceous, Rift, Palaeogeography, Geodynamic