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Tracing the opening and connectivity of the South Atlantic with Sr and Os isotopes

Rafaela Cardoso Dantas^{1,2,4}, Rachel Flecker³, Ian Parkinson⁴, Maurice Tucker⁴, Dan Palcu⁵, Paul Meijer⁵, André Pires Negrão¹, and Luigi Jovane²

¹Institute of Geosciences, University of São Paulo, São Paulo, Brazil (rcdantas@usp.br)

²Oceanographic Institute, University of São Paulo, São Paulo, Brazil

³School of Geographical Sciences, University of Bristol, Bristol, United Kingdom

⁴School of Earth Sciences, University of Bristol, Bristol, United Kingdom

⁵Earth Sciences, Utrecht University, Utrecht, Netherlands

The temporal and geological characteristics surrounding the initiation of the Proto-South Atlantic in the Early Cretaceous are presently unclear, marked by potential marine incursions from both the northern Tethys- and the southern-ocean, ultimately culminating in the generation of immense salt deposits. The Araripe Basin in Northeast Brazil contains crucial outcropping records of these phenomena with its origin and development intricately linked to the tectonic forces orchestrating the disintegration of the Gondwana Supercontinent. The basin underwent distinct tectonic phases, transitioning from a pre-rift continental environment to a syn-rift lacustrine setting, and finally to evaporitic systems in the post-rift/sag phase.

The post-rift stage is notably represented by the Santana Group, which chronicles significant environmental shifts, including the potential existence of a seaway linking the waters of the Tethys to the Proto-South Atlantic, intermittent marine incursions, and the presence of substantial evaporite layers. Despite extensive study, the paleoenvironment of this unit remains contentious, with hypotheses ranging from epicontinental sea to a basin with non-marine and transitional environments under marine influence.

To address this ambiguity, we employ geochemical, paleomagnetic, and isotopic records (strontium ⁸⁷Sr/⁸⁶Sr and osmium ¹⁸⁷Os/¹⁸⁸Os) as indicators of hydrological connectivity. These tools serve as invaluable aids in reconstructing the paleoenvironment during the deposition of both pre- and post-salt phases in the basin.

Keywords: Salt giant, South Atlantic opening, marine gateways, strontium isotopes, osmium isotopes