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Contrasting rifting styles of Ceara and Potiguar basins of the Brazil Equatorial Margin

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Introduction

Rifting of the Brazil Equatorial Margin (BEM) involved long-lived lithospheric-scale strike-slip fault systems that compartmentalised the margin into sectors that evolved with apparently distinct kinematics and opening history -albeit still strongly debated. Although the signature of the transcurrent (also named transform) fault systems is evident in the large-scale BEM geological structure, their role in the tectonic evolution of the sectors they bound is less understood. Likewise, the variability of the tectonic structure and associated synrift stratigraphy of those sectors is imperfectly described in the literature.

Method

We have studied crustal-scale 2D seismic images of a regional grid across the Potiguar and Ceara basins located along a rifted margin sector bounded by large strike-slip lithospheric shear zones. The seismic data image fault-block structure and the base (Moho) and top of the crystalline basement, which is covered in most places by synrift strata.

The synrift stratigraphy, sampled by wells in multiple locations, together with the tectonic structure provide a detailed record of the time and space evolution of rifting processes. The integration of tectonic structure and syn-tectonic strata deposited during the creation of accommodation space provides the necessary information for a comparative basin analysis.

Results and Conclusions

The spatial and temporal pattern of extension, and the distribution of extensional structures and synrift deposits support that Ceara and Potiguar basins evolved with different opening kinematics and different extension rates, arriving to continental break-up at different times.

Synrift sediment was dominantly deposited in continental depositional environments, which were restricted by regionally variable thinning patterns of the basement. The spatial and temporal variation in the distribution and thickness of syntectonic deposits attests significant along-strike changes in the rates of deformation and crustal thinning that require explanation beyond gradual changes in opening kinematics.

Similarly, differences in fault pattern distribution and in the timing of tectonic subsidence in the basins, imply basin-scale fault systems responding to variable crustal rheological evolutions or the works of a poorly understood hierarchy of master faults controlling the timing and evolution of the extensional fault systems.

We will present the differences in the formation processes of the rifted margin, from inception to break up, for Potiaguar and Ceara basins, and discuss the main regional tectonic processes that may have controlled their distinct spatial and temporal tectonic evolution.