**Stress field and kinematic evolution of the Equatorial Margin of Brazil: the interplay between the Romanche Fracture Zone and the Transbrasiliano Lineament in the Ceará Basin**

Aline C. Tavares1,2, David L. de Castro2,3, Francisco H. Bezerra2,3, Helenice Vital²

1 - Instituto Nacional de Ciência e Tecnologia de Geofísica do Petróleo – INCT-GP;

2 – Programa de Pós-graduação em Geodinâmica e Geofísica – PPGG/UFRN;

3 – Instituto Nacional de Ciência e Tecnologia em Estudos Tectônicos – INCT-ET

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# Abstract

The central segment of the Brazilian Equatorial Margin is crossed by two major structures – the Romanche Fracture Zone (RFZ) and the Transbrasiliano Lineament (TBL - a Neoproterozoic collisional boundary) – where the Ceará Basin was formed and which has recently received attention due to its oil and gas potential. However, the spatial and temporal evolution of the stress field in the Ceará Basin is still a matter of debate. There are gaps in the current and paleostress data across the margin that needs investigation. Here, we investigated the interaction between the RFZ and the TBL and their impact on the evolution of the Ceará Basin by integrating magnetic, gravity, seismic and bathymetric data. Based on previous studies and our results, we conclude that when the South American and African plates were united before the breakup of Pangea, the studied area was subjected to a normal (extensional) stress regime with an extension axis aligned NW-SE. The maximal compression changed from vertical to horizontal. It was oriented NW-SE in the Mid-Cretaceous (Barremian), and the stress field inverted from normal to strike-slip with 300 Az-oriented maximum horizontal compression. This period coincided with the dextral shearing of the RFZ (~E-W) and the TBL (strike ~030 onshore and ~060 offshore) when the South American plate became an independent during the transform opening of the Equatorial Atlantic Ocean. The combined dextral shearings of both major structures resulted in squeezing the rift and post-rift sequences West of the TBL and south of the RFZ. It generated a ~30 km long horizontal offset at the top of the rift sequence in the Ceará Basin along the TBL, which led to the folding and uplift of the Ceará Terrace Marginal Ridge. The interpreted seismic data show an ~1.0 s (TWT) vertical offset in the continental shelf. We also point out that the Ceará Basin underwent tectonic inversion in the Cretaceous. Our tectonic model indicates that the TBL splits the Precambrian basement in the margin: a thicker and older lithosphere in the west block (Barreirinhas, Ceará Terrace Marginal Ridge, Pará-Maranhão and Foz do Amazonas basins), which acted as an obstacle to continental rupture, and a thinner and hotter lithosphere in the east (Ceará and Potiguar basins). The potential field data reveal that the NE-SW-oriented shear zone (TBL) arrests at the E-W-striking RFZ. In contrast, the E-W-oriented RFZ presents a sharp, steep boundary between continental and oceanic crusts. Many questions are still open and need further research. For example, the Equatorial Margin east of the TBL exhibits many present-day stress indicators such as borehole breakouts, focal mechanisms and image logs. They indicate that the region is under a present-day strike-slip regime with the maximum compressive stress (sigma 1) roughly following the coastline. There is a lack of these stress indicators and relatively lower seismicity in the western block of the TBL. Although recent studies indicate a strong lithospheric contrast between these two blocks, the reasons for lower seismicity in the West are still debatable.