The geothermal state of the Potiguar basin - a preliminary study.

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This research shows a preliminary study on the thermal state of the Potiguar basin, an important exploratory play in Brazil. Altogether we investigated about 69 wells where heat flow values were calculated in the onshore region of 160 - 43 mW/m² while in the offshore region 95 - 58 mW/m². Being the highest values found in the basin's COB.

The Potiguar sedimentary basin is one of the Brazilian basins of great geological and economic importance. Located in the Northeast region, it covers part of the states of Rio Grande do Norte and Ceará, also extending to maritime areas. This basin is recognized for its significant oil and natural gas production located at the eastern end of the Brazilian Equatorial Margin. Over the years, hydrocarbon exploration and production has played an important role in the region's economy, boosting the energy sector and contributing to local development. With the advancement of technology and results coming from studies in related basins on the African coast, investigations still need to be carried out. In the case of this research, an investigation into the thermal state of the basin is being carried out, both for the demarcation of isotherms in order to map and understand the distribution of temperatures along the basin, which will facilitate the identification of new exploratory targets for hydrocarbons, as well as the potential of geothermal energy resources in it.

Geologically, the basin is limited to the south, east and west by the crystalline basement, extending the marine basin northwards to the 2,000m isobath. The height of Fortaleza defines its west limit with the Ceará basin, while the height of Touros defines its east limit. The structural framework of the Potiguar basin was defined, according to Françolin and Szatmari (1987) and Almeida et al. (1996) in its rift phase, during the Neocomian (145 − 130 Ma.), when the formation of the grabens began. The onshore Potiguar basin rift has an internal geometry of hemigrabens, which are bounded by NE trending normal faults and NW trending transfer faults, dipping to NW and N, respectively (Castro and Bezerra, 2015).

To carry out this research, geothermal data from 69 wells obtained in the region were used, 60 from the onshore portion and 9 from the offshore portion. The preliminary results of this study indicate that in the onshore region of the basin, the maximum geothermal gradient value was 73ºC/Km and the minimum 15ºC/Km. In the offshore portion of the basin, the gradient values were between 38ºC/Km and 23ºC/Km, maximum and minimum respectively. The results of the distribution of the geothermal flow of the basin reveal that in the onshore region there is a variation of 160 - 43 mW/m² and in the offshore region 95 - 58 mW/m², as maximum and minimum values respectively.
In general, the surface heat flow distribution obtained by mapping shows that the highest heat flow distribution is located in the offshore region of the basin, which differs from the punctual analyses. A large positive geothermal anomaly can be observed in the SE region of the basin, exactly at the Continental-Ocean boundary. New data integration is expected to confirm this anomalous area.