Basement inheritance affecting initiation and evolution of intracontinental rifts: Araripe Basin, northeast Brazil

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The structural inheritance of the basement plays an important role controlling rift formation and evolution. Here we investigate tectonic and rheological inheritance on brittle reactivation of the Precambrian basement and shear zones in the formation and evolution of the Cretaceous Araripe Basin. The basin is a part of the Northeast Brazilian Rift System, associated with the junction of the Southern and Equatorial branches of the Atlantic Rift. Its basement is part of Neoproterozoic Transversal Zone (Borborema Province), a crustal scale transpressional duplex system, related to the Brasiliano escape tectonic events.

We present here a synthesis of field observations from the Araripe Basin and its adjacent basement, combined with topographic, aeromagnetic and seismic data to propose a general overview on the tectonic framework and evaluate how it influenced the basin initiation and evolution. Our integrated analysis shows that there are three main structural trends for the basin and its surroundings: NE-SW, E-W and NW-SE. The NE-SW and E-W trends are the most expressive sets of lineaments in the topographic and aeromagnetic data, directly related to the basement framework. Integration of seismic data and filtered aeromagnetic maps confirms that NE-SW and E-W trends represent oblique fault systems.

Archean, Paleoproterozoic, Mesoproterozoic and Neoproterozoic terranes are arranged side by side in NE-SW mega sigmoid, bounded by the E-W Pernambuco (to the south) and Patos (to the north) dextral shear zones. The Araripe basin units are distributed mostly in two sub-basins, Cariri and Feira Nova, separated by a structural high, controlled by NE-SW and ESE-WNW faults. Analyzing these terranes and their link to the distribution of the depocenters and structures, we find that the NE trending Archean terrane coincides partially with the Feira Nova NE-SW single graben. On the eastern portion of the basin, the graben system is much wider and controlled by NE-SW and ESE-WNW trending fault systems. This wide graben overlies a Neoproterozoic basement terrane constituted by a supracrustal unit (Cachoeirinha Group) of phyllites, metasandstones, metavolcanics with low to medium metamorphic grade.

This evidence corroborates with the hypothesis that the rheology of the upper crust might be partially influenced by distinct lithotectonic terranes. The older Archean block sustained the narrow sub-basin, indicating a more localizing behavior, while the younger Neoproterozoic terrane, controlled a less localizing graben system with a wider sub-basin in the eastern Araripe basin.
The authors gratefully acknowledge support from Shell Brasil Petroleo Ltda. and the strategic importance of the support given by ANP (Brazil's National Oil, Natural Gas and Biofuels Agency) through the R&D levy regulation (Technical Cooperation #20.219-2).