



Geometries of hyperextended continental crust in northeastern continental brazilian margin: insights from potential field and seismic interpretation

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The study region encompasses a set of three basins located at Northeast Brazilian continental margin: Pernambuco (south sector), Paraíba and Natal platform (north sector). These basins were formed during the last stage of separation between South America and African plates during Cretaceous. The continental breakup in these regions occurred probably during the Middle-Upper Albian (~102 m.y). The adjacent basement rocks belong to Borborema Province (BP), which was formed due a complex superposition between Pre-Cambrian orogenic cycles. The structural framework of BP is dominated by large shear zones that divided this province in three main tectonic domains: South, Central and North. The Pernambuco Basin is located in the South Domain and the Paraíba and Natal platform basins are related to the Central Domain. The tectonic and magmatic evolution of the Pernambuco Basin was influenced by oblique rifting (~ 35° to rift axis) and a thermal anomaly probably caused by the Santa Helena hotspot. The north sector represents a continental shelf characterized by basement high with a narrow platform and an abrupt shelf break on transition to the abyssal plain. The continental platform break of this sector was parallel to the rift axis. In this way, we present a regional structural interpretation of these sectors of Brazilian rifted margin based on interpretation and 2D forward modeling of potential field and 2D seismic data. The magnetic maps (Reduction to magnetic pole and Analytic signal) revealed the influence of an alternating pattern of large narrow magnetic and non-magnetic lineaments, oriented NE-SW, E-W and NW-SE. In the Pernambuco Basin these lineaments (NE-SW and E-W) are related to shear zones in the hyperextended basement which is interpreted as a continuation of the granitic-gneissic and metasedimentary rocks of the South Domain of BP. The Paraíba and Natal platform basins show a slight change in the orientation of structures trending E-W (shear zones in continental crust) to NE-SW (fracture zones in oceanic crust). In the gravimetric maps (Residual isostatic and Free-Air) and in 2D forward modeling the negative and positive gravity anomalies are related to grabens and horsts, respectively. The Pernambuco Basin shows depocentres oriented on NW-SE and structural-marginal highs with circular and elongated shape trending NNE-SSW. The basins in the north sector present elongated positive and negative gravimetric anomalies trending NNW-SSE that are confirmed by the seismic interpretation as basement highs and small grabens, respectively. From integration of results, the oblique rifting process promoted by thinning and exhumation deformation phases and the magmatic activity in the hyperextended domain of the Pernambuco Plateau, produced an anastomosing pattern between the two sets of shear zones (NE-SW and NW-SE) and a series of rhomb-shaped structures (lozenges). The northern Paraíba and Natal Platform basins, the orthogonal arrangement between Pre-Cambrian shear zones (NE-SW and E-W) and the rift axis favored these structures to initiate strait transforming faults from thinned continental crust to oceanic crust.