



Reinterpretation of the tectonics and formation of the Pernambuco Plateau Basin, NE Brazil.

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The continental margin from Alagoas to Natal represents arguably the most frontier region for exploration on the Brazillian margin. High quality seismic data was not collected in the region for many decades as it was believed that only a few kilometers of sediment existed, and thus there was no exploration potential.

Here we present the results of work done as part of an IODP virtual site survey. The work has resulted in a total reinterpretation of the basin structure and tectonics, including finding sediment filled half grabens holding up to 8km thick stratigraphic sections. The two deepest grabens likely represent rift jumps during breakup, which may imply different age sediments in the different grabens. The basin is also found to contain a sizable salt accumulation, previously uninterpreted due to hard overlying carbonates hampering seismic imaging. This salt can be seen to have been highly mobile in the past, and has developed into kilometer scale diapirs flanked by typical rollover anticlines. For the first time we show the basin has all the elements needed for a working petroleum system, with the exception a source rock – which cannot be speculated on further as the basin is undrilled. However source rock sequences are present in the Alagoas basin to the south, and recent released seep data show evidence for both biogenic and thermogenic seeps over the plateau basin, which could also signal source rock presence.

We present seismic and potential fields data, including forward potential fields models and seismically derived crustal stretching and thinning estimates, to show that the half grabens terminate abruptly at the latitude of the Pernambuco Shear Zone, a major crustal scale Precambrian shear zone. Onshore boreholes, well away from the deep seismically imaged half grabens offshore, find crystalline basement to drop away rapidly across the shearzone, revealing a third graben to terminate at the shear zone. We interpret this as that the preexisting crustal structure has acted as a mechanical barrier to south to north rift propagation, which has controlled the basin's formation. The shear zone was likely reactivated with a sinistral sense of shear to accommodate rifting, which also helps explain the anomalously wide continental margin at the Pernambuco Plateau.