# 3D Petroleum Systems Modeling of the Pernambuco-Paraíba Basin, Brazil

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## Abstract

The Pernambuco-Paraíba Basin is the last remaining Brazilian offshore basin lacking any well data. We carried out an integrated frontier exploration study utilizing seismic interpretation, geochemical analysis of piston cores, and satellite detection of oil slicks, which has allowed for set-up and analysis of a 3D Petroleum Systems Model (PSM) of the area. The modelling data set comprises of the interpreted map stack (including the Moho), faults, leads, location of the continent-ocean boundary, and distribution of volcanics and carbonate build-ups. The very large uncertainties affecting such frontier environments could significantly be reduced by analysis of crustal thickness and subsequent crustal modelling in order to constrain the all-important heat flow history. In spite of small burial rates during the drift phase, an active petroleum system is present in the Pernambuco-Paraíba basin that is almost exclusively sourced by a Syn-Rift, Aptian, source rock. This finding corroborates the results of geochemical investigation. The majority of charge took place during Late Cretaceous times, but continued at least locally until present day due to Tertiary hot spot activity. The interpreted remaining elements of the petroleum system at hand, i.e., migration, trap, reservoir, and seal, display close resemblance to those known to be present in the adjacent basins in the North (Ceará-Potiguar), and South (Sergipe-Alagoas). Like in these basins, most leads identified in the Pernambuco-Paraíba Basin are situated in the Syn-Rift Sequence (as is the source rock), thus showing favorable conditions of trap formation timing, migration, and preservation. In summary, the exploration potential for giant light oil discoveries in the Pernambuco-Paraíba Basin is deemed too closely resemble that of the adjacent basins, i.e., Ceará-Potiguar, and Sergipe-Alagoas.

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