



Potiguar Basin, Brazil – New 3D seismic elevates exploration opportunities from Leads to Prospects

Randall Etherington, Eric Newman and Pedro Zalan

Copyright 2021, SBGf - Sociedade Brasileira de Geofísica.

This paper was prepared for presentation during the 17th International Congress of the Brazilian Geophysical Society held in Rio de Janeiro, Brazil, 16-19 August 2021.

Contents of this paper were reviewed by the Technical Committee of the 17th International Congress of the Brazilian Geophysical Society and do not necessarily represent any position of the SBGf, its officers or members. Electronic reproduction or storage of any part of this paper for commercial purposes without the written consent of the Brazilian Geophysical Society is prohibited.

The Potiguar Basin is the largest oil-producing region in equatorial Brazil along the onshore and near offshore areas of the basin. The petroleum system of the basin contains lacustrine to marine prolific source rocks of rift to post-rift spanning in age from Barremian through Turonian. Proven reservoir rocks range in age from Barremian to Eocene times. Seal rocks are observed throughout the entire stratigraphic column and are represented by intra-formational lacustrine shales, fine-grained argillaceous sandstones and shales, and thick deep marine pelitic rocks.

The Pitu well, announced in December of 2013 became the first deep water oil discovery of the Potiguar Basin. The Pitu well found a 188 meter hydrocarbon column in Upper Aptian sands of the Pescada Formation in a rift structure at depths of 4,300 meters, thus confirming that the proven petroleum system extends into the deep water.

Two main play types have been identified. The confirmed 'Rift' play which follows the Potiguar oil basin off the shelf is the same play as Pitu and extends across all of the basin. The well-defined horst blocks at Pescada Formation level show several thickened intervals. The greatly anticipated 'Drift' Late Cretaceous-Tertiary play is a turbidite sand play of channel sands and toe of slope fans, many with amplitude anomalies.

Broadband, long offset 2D seismic clearly shows the Aptian 'Rift' play and ample evidence of the 'Drift' Late Cretaceous-Tertiary turbidite channel complex and basin floor fan play. The turbidite channel and fan complexes of the post-rift drift sequences can be mapped at several Late Cretaceous and Tertiary intervals depicting a sequence of stacked leads.

The most recent 3D seismic data clearly breaks out the detail structure of the Aptian 'Rift/Syn-rift' section and elevates the visualization of the Cretaceous-Tertiary turbidite channel/fan complexes. The application of multi-attributes to this large 3D seismic volume helps evaluate the prospectivity of this under-explored basin. As an example, the use of spectral decomposition with RGB blending creates clear images of the turbidite channel/fan complexes. Other images such as RMS amplitude maps and pseudo relief seismic sections adds to the plethora of evaluation tools.