Seismic Stratigraphy of a Deep Water area of Potiguar Basin on the Brazilian Equatorial Margin

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Abstract

The Brazilian Equatorial Margin (BEM) has emerged as a major frontier in deep-water exploration over the past decade, since oil and gas discoveries have been made in upper Cretaceous turbidites from several analogous basins such as Ghana, Guyana, and Suriname deepwater basins. Recently, Potiguar Basin, located in the eastern part of the BEM, experienced the discovery of oil in Albian turbidite reservoirs from well 1-RNS-161 named Anhangá. These turbidites are located in the central part of the basin and indicate the existence of a petroleum system in this area, leading to the increase of exploratory interest in the deep water of Potiguar Basin. In this study, twenty-one 2D seismic data and two wells were used in conjunction with the seismic stratigraphy methodology to understand the drift phase evolution and to discuss the implications for the formation and distribution of turbidite reservoirs along the study area. The seismic stratigraphic analysis allowed the delimitation of six third-order sequences associated with the drift phase, encompassing seven depositional sequences (D1 to D6). Isopach maps from the sequences provide an understanding of the basin-filling model, allowing the identification of the depocenters throughout basin evolution. Also, according to seismic facies, igneous bodies associated to magmatic intrusions were mapped. Interpretations revealed that the drift evolution went through at least three distinct depositional phases: (1) a transgressive phase between the Albian and Neocampanian with the occurrence of turbidites; (2) A regressive phase with predominance of pelagic sedimentation, and with an increase in the number of mass transport deposits; and (3) a progradational/aggradational phase with thick sandstone and carbonate strata, associated to a slope channel system. It is also concluded that depositional sequences 1 and 2 (D1 and D2) have a higher exploratory potential considering the possible turbidite reservoirs. Also, the magmatic event occurred during the depositional sequence 4 (D4).