Seismic Attributes — A Promising Aid for Hydrocarbon Prediction in Deep Water of the Ceará Basin, Brazilian Equatorial Margin

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Abstract

The discoveries of the Jubilee field offshore Ghana in 2007, as well as the Pecém well in the Ceará Basin in 2012, and Pitu well in the Potiguar Basin in 2013 have attracted the attention of the oil industry to other global transform margins. However, studies on the tectonic regimes associated with transform margins and their evolution, structures, and petroleum potential are still lacking due to the geological complexity of these regions. To address this knowledge gap, research has been done to better understand the geological structures, as well as to identify potential hydrocarbon accumulations in the deepwater Ceará Basin. To achieve this, a large seismic data set was combined with new exploratory borehole data, as well as older well data that has been reexamined and the biostratigraphy updated. This data analysis refines the basin architecture and the Cretaceous-Paleocene tectonic evolution, including implications for hydrocarbon prospectivity in the Ceará Basin deepwater.The analysis identifies potential hydrocarbon accumulations in turbiditic reservoirs and presents new insights about the dimensions of the underlying rift sections situated in the continental slope. The results also reveal a high potential for drift sequences in deepwater where the thickness of sediments reach from 3-6 km for the Late Albian-Early Cenomanian-Turonian sediments. Also, seismic attributes analysis and an unsupervised machine-learning technique called self-organizing maps were applied focusing on this Cenomanian-Turonian interval. These techniques provide additional insight to hydrocarbon potential in this area, and aided in understanding the distribution and classification of the deepwater geological elements. Further, seismic geomorphology and facies analysis were examined to improve interpretation of the internal

and external architecture of the depositional elements, and so helped to identify and to predict the possible reservoirs related to the turbiditic sandstone.