



Seismic geomorphological analysis of deep-water gravity-driven deposits in the Ceará Basin, Brazilian Equatorial Margin

Vinicius Carneiro*, Michael Holz – PPGEOf-UFBA

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Abstract

In the last couple of decades, the Brazilian equatorial margin (BEM) has played a significant role as the new frontier in deep water exploration areas. Since the discoveries of oil and gas turbidites accumulations in analogous basins such as Jubilee in Ghana and several in Guyana, the interest in equatorial Brazilian basins has increased. One of these basins is the Ceará Basin, located in the eastern part of the BEM, positioned in a region tectonically characterized by a transition between a divergent and a transcurrent setting. In this context, mapping gravity-driven deposits such as turbidites and debrites has importance for the understanding of the geologic controls on their deposition, as well as for the development of hydrocarbon exploration. In this study, a 3D seismic dataset comprising of around 3000 km², 28 2D seismic lines, and 10 wells were used to map the distribution of deep-water gravity-driven deposits in the basin. The seismic-well tie helped to correlate seismic facies and attributes with lithologies, and supported correlation with chronostratigraphic data from wells. Seismic attributes such as variance were used for structural interpretation, as well as to map mass transport deposits (MTDs). Root Mean Square Amplitude, Spectral Decomposition, and Acoustic Impedance were used to map the distribution and depositional architecture of the gravity-driven deposits and helped to characterize intervals with magmatic rocks. The study resulted in the recognition of a major North-South Albo-Cenomanian canyon, that concentrated the gravity-driven deposits, which are linear and straight at the base, and over time evolved into a confined meandering system. This canyon is limited laterally by a structural high where the strata were preserved, as well as it is linked with a regressive stratigraphy setting marked by an unconformity that exposed the platform to an intense erosional process. From the Turonian to the end of the Late Cretaceous, the strata are dominantly horizontal, with a higher mudstone content, indicating the complete infill of the canyon and deposition in a non-confined gravitational context.