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Facies Analysis and Depositional Environments of the Carapebus Formation in the Campos Basin (Eastern Marlim Field)

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Abstract

The Carapebus Formation, Tertiary Unit of the Campos Basin is an important target for studies, since it has the main hydrocarbon reservoirs in the Campos Basin. Based on sedimentological data from the 1RJS0541 RJ and 1 BRSA 187 RJS wells of the Eastern Marlim Oil Field (Offshore of the Campos Basin), stratigraphic sections of the Carapebus Formation were elaborated in order to achieve facies analysis and paleoenvironmental reconstruction. The data provided by the Agência Nacional de Petróleo, Gás e Biocombustíveis (ANP), are constituted by drill cuttings descriptions and geophysical profiles (Gamma, Resistivity, Sonic, Density and Neutron Rays). The facies association and architectural elements allowed the identification of sedimentary processes associated to deep waters, which according to Bruhn et al. (1998) indicate proximal, intermediate and distal deposition of turbidite systems. Deposits of mass flows associated with higher energy conditions were formed in channel complexes in the proximal portion. Muddy and sandy-rich turbulent flows were deposited in unconfined channels in the intermediate portions, while in the distal portions shales and marls were the main sediment deposits. The reconstruction of paleoenvironmental, based on the architectural models proposed by Haughton et al. (2006), suggest a decrease in sea level during the deep-sea submarine fans deposition.

Key words:

Campos Basin, Carapebus Formation, Turbidites.

Introduction

Sedimentological and stratigraphic interpretations are important for determining depositional patterns and relating them to relative sea level variations. These interpretations also collaborate with the understanding of petrophysical and geometry of the reservoir bodies, and thus allowing to improve the quality of oil and gas exploitation. The research of Scientific Initiation developed since 2016 has proposed to determine a depositional and evolutionary model based on the facies analysis of two wells of the Marlim Leste Oil Field, in the Campos Basin. Based on the facies association, processes were identified and relate the Tertiary deposition to turbidite systems. The architectural elements made it possible to identify that the deposition occurred in three distinct portions of the Deepwater Fans System: proximal, intermediate and distal. The data also allowed to identify aspects related to sea level variation, during the evolution of the Carapebus Formation, in southeastern Brazil.

Results and Discussion

The descriptions of lithofacies based on the facies code of Bruhn et al. (1998), and the interpretation of the stratigraphic columns indicated four lithofacies related to the depositional turbiditic systems: (Famg) massive, feldspathic, medium to coarse sand (mass flow deposits in the basal layer of sandy currents); (Fac) medium-to-thick calcareous-feldspathic massive sand (mass flow deposits in the basal layer of sandy currents); (Ffol) micaceous shales, formed by clay settling in distal regions; (Fmar) marls, whose paleodepositional interpretation consists of the same ones of facies (Ffol). The facies (Ffol) and (Fmar) are intercalated with the facies (Famg) and (Fac) throughout the column.

Conclusions

From the base to the top of the sections, it was observed that the more distal facies are superposed by proximal facies. The distal and intermediate portions configure, based on the architectural models proposed by Haughton et al. (2006), deposition of fine material (marls and shales), associated to the settling processes that occurred in the final part of the turbiditic flows. These deposits constituted by lamitic bodies have different thicknesses in the study area, and can cover sandy lobes. With the increase of the grain size up ward of the sections, the intercalations of calcarenite and medium sandstone with shales come into existence and these form plane-parallel layers. The increase in the deposition of medium to coarse sandstones, interspersed with calcarenites, indicates overlapping of channel deposits, indicating the system's progradation, probably associated to the relative fall of the sea level. This implies a greater influence of continental environments and an increase of the sedimentary input, increasing the record of turbidities of greater density. Finally, they formed medium to coarse sandy deposits associated with channels, levee and amalgamated channels.

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