

EVALUATION OF THE QUANTITY, QUALITY AND MATURITY OF THE ORGANIC FACIES OF ALBIAN-OLIGOCENE SEQUENCES IN THE EASTERN MARLIM OILFIELD (CAMPOS BASIN), BASED ON BULK ROCK GEOCHEMISTRY.

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ABSTRACT: The current research was performed in the eastern portion of the Marlim Complex to identify the hydrocarbon-generating potential of the Albian-Oligocene sequences (Macaé Group, Ubatuba and Carapebus formations) in the Campos Basin, Brazil. On the basis of bulk rock petroleum geochemical proxies, an integrated approach was developed using source rock characterizations to establish the distribution of the quantity, quality and maturity of the organic facies in the study area. The organic facies were recognized using the methodology of Jones (1987) and Tyson (1995, 1996) that defined seven organic facies using petroleum geochemical characteristics for immature sediments (%TOC, HI, OI, %Ro, S₂ and Tmax parameter) aiming to identify environmental factors, distribution and lateral changes in the organic facies present in the Eastern Marlim oilfield. The outcomes of a comprehensive petroleum geochemical characterization were integrated with cuttings and core sample descriptions, biostratigraphic controls, well log analyses and 2D/3D seismic interpretations. As a result, it was possible to identify different organic facies varying with depth. The Macaé Group displays different lithofacies in the study area showing that is mainly composed by marls, calcareous shales and shales presenting organic facies AB to CD. The best organic facies were found at the top of the Macaé Group varying from AB to C from algal/marine-rich organic facies AB to more diffuse organic facies C. The Ubatuba Formation exhibits organic facies C to D associated with shales and marls. The organic facies C are located at the top of the Ubatuba Formation related with terrestrial organic matter possibly oxidized. The organic facies CD and D were found at the mid and lower portion of this formation associated with continental and oxidized/reworking organic matter. Lastly, in the Carapebus Formation different organic facies can be found varying from organic facies BC to CD associated with shales and marls. The best organic facies (organic facies BC and C) are located at the upper portion of this formation associated with a mixing between marine and terrestrial organic matter. The organic facies C and CD were found at the base of the Carapebus Formation related with more diffuse continental organic matter input. In conclusion, the accumulation and preservation of the organic matter were influenced by the paleo-topography and tectonic controls, and the lowest concentrations of organic carbon were attributed to significant siliciclastic dilution taking place mostly toward the middle and southern portions of the Eastern Marlim oilfield. Lateral variations in both the lithofacies and organic facies are the main conditions controlling the behavior of the petroleum potential in the investigated sediments. Finally, our results indicate that the Macaé Group has sufficient source-rock potential, maturation patterns, and hydrocarbon-generating potential to be considered as an active source rock in the Eastern Marlim oilfield. In addition, the Ubatuba and Carapebus formations are also likely to generate oil and/or gas, but due to their relatively low maturity, it is difficult to establish that these rocks can be active source rocks in the study area.

KEYWORDS: EASTERN MARLIM OILFIELD, PETROLEUM GEOCHEMISTRY, SOURCE ROCK CHARACTERIZATION.