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# 3D GEOLOGICAL MODELING AND CALCULATION OF RESERVES OF THE OLIGOCENE-MIOCENE TURBIDITE SYSTEM IN THE EASTERN MARLIM OILFIELD, CAMPOS BASIN, BRAZIL

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**ABSTRACT**: The Eastern Marlim oilfield is a portion of the Marlim Complex located in the Campos Basin distant approximately 120 km from the coast of Rio de Janeiro, in water depths ranging from 780 to 2000 m, considered as one of the most important giant oil accumulations of the post salt section in Brazil. This research presents a representative static model merging geological and geostatistical simulation methods, providing a realistic approach based on the application of seismic interpretation, well log analysis, sedimentology, stratigraphy, petrophysics, and geostatistics, combined in a three-dimensional model honoring the geological features observed in the research area. As a result, four principal lithofacies were identified in the entire section, where two are eminently reservoir facies associated with sandy facies (Sm and Smcf lithofacies) and the remaining lithofacies are evidently non-reservoir facies represented by shaly and calcareous deposits (Sh and M lithofacies). In addition, five petrophysical lithotypes were defined in the Oligocene-Miocene interval of the Carapebus Formation such as Clean Sandstones (Ss1), Muddy Sandstones (Ss2), Calcareous Sandstones (Ss-Lm), Limestones (Lm), and finally Shale (Sh) lithotypes. Likewise, each lithotype was defined by particular distributions of petrophysical properties that allow classifying them as reservoir (Ss1 and Ss2), retardant (Ss-Lm) or seal-cemented rocks (Lm and Sh) displaying a very good correlation with the main lithofacies recognized in the study area. Additionally, three different major zones were identified as Lower sandstone (LS), Middle sandstone (MS), and Upper sandstone (US), taking into account correlatable electric and/or lithological markers. The sand proportion and distribution maps of the mentioned zones exhibit lobe-shape features and discrete channelized structures. Along the axis of the channels, a thickest distribution of sandstones is present, representing distal lobes feeding channels suggesting at least two bipartite turbiditic flows representing different stages of deposition related with a deep-water turbidite sequence, composing the elements of a submarine lobe complex. Turbiditic massive unconsolidated amalgamated sandstone bodies displaying very good porosity, as well as lateral and vertical continuity, represent most of this time interval representing excellent reservoirs, as it was expected. Furthermore, a structural modeling was established displaying and following the structural style of the Campos Basin, which is predominantly subject to a distensive regime, causing normal faults with listric geometry associated with salt tectonics. All the mentioned information was merged into a 3D geological model displaying outstanding accordance with the geological framework established in this research allowing for completeness, self-descriptiveness, and quality of standard descriptive methods conducted in the study area. Finally, the outcomes of this investigation were integrated with volumetric hydrocarbon calculations where deterministic calculations yields at least 3,774 billion barrels of oil (Bbls) of original oil in place (OOIP), and, probabilistic models provides 3.603 Bbls (P10), 3.678 Bbls (P50), and 3,763 Bbls (P90), displaying a great match with the proven hydrocarbon reserves calculated by the Brazilian National Agency of Petroleum, Natural Gas and Biofuels (ANP).

**KEYWORDS**: EASTERN MARLIM OILFIELD, CAMPOS BASIN, 3D GEOLOGICAL MODELING