

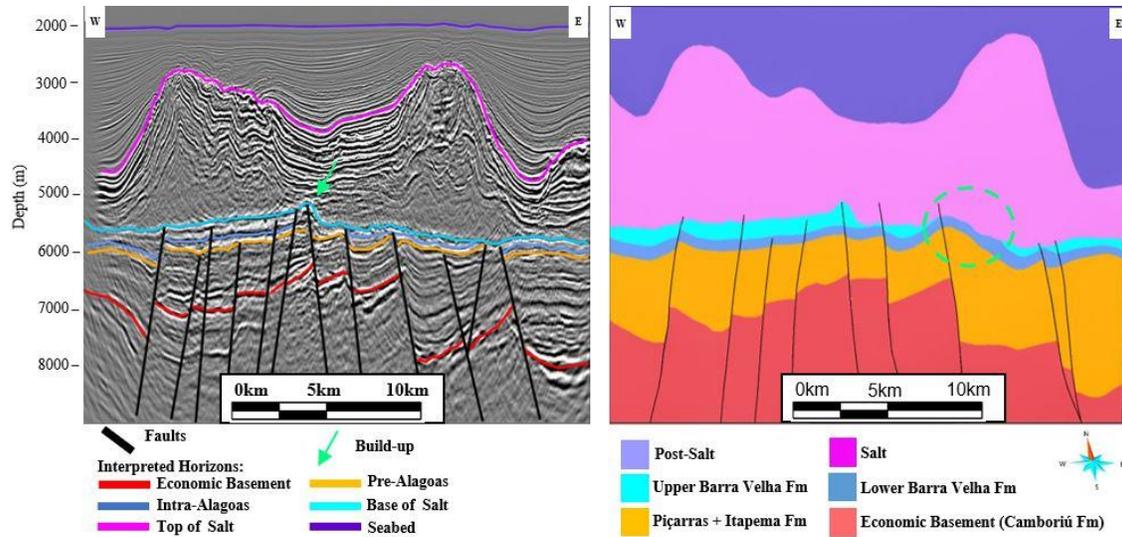
CONSTRUCTION OF A TECTONO-STRATIGRAPHIC MODEL OF THE WILDCAT (GATO DO MATO) PROSPECT, SANTOS BASIN

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Given the importance of analyzing underexplored areas for better understanding of the petroleum system, we construct a 3D tectono-stratigraphic model of the Gato do Mato (Wildcat) Prospect. It is on Outer High, main region of the presalt carbonate reservoirs in the Santos Basin, Brazil. This basin is currently the main hydrocarbon producer in the country. 3D models allow an integrated interpretation of geological and geophysical elements such as faults, stratigraphic horizons, topography and well log analysis, which improves the knowledge of study area. These models help to plan more efficiently the development of the field and the well location, reducing the costs and risks inherent in drilling (Polson and Curtis, 2010). For the 3D model of the Wildcat Prospect, that is focused on the presalt interval, we discuss the main structures found in this area and their relationships that conditioned the deposition of the carbonate rocks. The following steps was perform to build and analyze the tectono-stratigraphic model (Figure 1): (I) generation and analysis of seismic attributes; (II) well correlation and analysis; (III) seismic interpretation of horizons and faults, which were used as input for the modeling as surfaces and fault planes; (IV) isopach maps, showed that the wells located on the build-ups facies presented greater thickness in the upper part of the Barra Velha Formation (limited by Intra-Alagoas and Base of Salt unconformities); (V) Generation of the structural-stratigraphic model. The proposed methodology individualized stratigraphic units from the faults and the six interpreted horizons (Economic Basement, Pre-Alagoas, Intra-Alagoas, Base of Sal, Top of Salt and Seafloor), showing that the structuring of the pre-salt interval is by horsts and grabens, conditioned by normal faults. This study showed that few faults reach the Upper Barra Velha Formation (Sag phase) and highlighted erosive regions with the Base of Salt. Also, we identified and characterized the seismic patterns of the carbonate build-up, carbonate platform, debris and lake bottom facies (Buckley et al., 2015; Neves et al., 2019) regarding the response of the amplitude and coherence attributes. The carbonate build-up facies are aligned in the NNW-SSE direction near the large-throw faults. The evaluation and correlation of the well showed that 2 of 3 wells are located on build-up seismic facies and they have the highest porosity and permeability, representing the main reservoir in the study area. The Pre-Alagoas (upper rift) and Intra-Alagoas (sag phase) surfaces follow the same morphology as the Economic Basement (lower rift). The greatest structural differences in the surface of the Economic Basement occur on the L-NE of the Wildcat Platform. We can notice a strong domain of faults, which in general, influence more the L-NE part of the prospect. In this region of the block are the large-throw faults, which can reach 1230 meters. The source rocks (shales from the Itapema and Piçarras formations) may be located in this depocenter, that faults may have been important conduits for the migration of fluids to the carbonate build-ups, and salt is the seal of this petroleum system. The constructed Wildcat Prospect 3D opens new paths for the seismic facies, fracture, and porosity modeling.



At the left a seismic section with reflectors and faults that were interpreted in the study area. The green arrow signaled the location of the build-up, with is crossed by a fault. At the right, interpreted section generated from the tectono-stratigraphic model. Observe the influence of faults, mainly in the rift phase, where there is bigger to the east of the section. The dashed circle shows the Upper Barra Velha eroded by the Base of Salt (Sag Phase).

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Keywords: Tectono-stratigraphic modelling, Carbonate reservoirs, Santos Basin.

Topics related: Reservoir Characterization, Seismic Interpretation.

References

- Buckley, J.D., Bosence, D.W., Elders, C.F., 2015. Tectonic setting and stratigraphic architecture of an Early Cretaceous lacustrine carbonate platform, Sugar Loaf High, Santos Basin, Brazil. Geological Society, London, Special Publications 418, 1–17. <https://doi.org/10.1144/SP418.13>.
- Neves, I.A., Lupinacci, W.M., Ferreira, D.J.A., Zambrini, J.P.R., Oliveira, L.O.A., Olho Azul, M., Ferrari, A.L., Gamboa, L.A.P., Presalt reservoirs of the Santos Basin: cyclicity, electrofacies and tectonic-sedimentary Evolution. Interpretation 7(4), 1-11, 2019.
- Polson, D., Curtis, A., 2010. Dynamics of uncertainty in geological interpretation. Journal of the Geological Society, London, 167, 5–10, <http://dx.doi.org/10.1144/0016-76492009-055>.