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Carbonate build-up growth model integrating seismic attributes and stratigraphic-sedimentological modeling in the Campos Basin Pre-salt

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Introduction

Estimating hydrocarbon reservoir properties is a challenge task in areas that miss an amount of well data being considered enough to deal with the uncertainties of exploration and appraisal areas of Campos and Santos basins, brazilian offshore Pre-salt targets. Aiming to circumvent this difficulty we developed an approach that combines drilled well, even being few of them, and seismic attributes to predict the non-drilled portion of the reservoir. Integrating these data sets with stratigraphic-sedimentological modeling procedure as we believe it is a key aspect that enhances the reliability of geological and flow models and further providing inputs to improve strategies for reservoir development and production.

Method

To illustrate the success of this methodology, we show a study using fewer drilled wells, seismic data and stratigraphic-sedimentological modeling, focused on a lacustrine carbonate environment, in the distal portion of the Campos Basin, helping to understand sedimentation times, and based on this procedure we proposed a growth model for carbonate build-ups in the area. Macabu Formation was chosen as the target unit in this study. First, we identified carbonate mound features using seismic attributes, and they were split into distinct sedimentation periods. Using these geometrical bodies, we modeled geological processes by accounting them. Before doing this, it was necessary to incorporate other parameters such as surfaces that encompass the topography and the bathymetry information, besides variations in the lake level, subsidence mapping, and rates of carbonate deposition. We decided to adopt four depositional domains for the lacustrine carbonates: high-energy sediment, build-ups, low-energy sediment, and clayey sediment. With this integration we could develop a more reliable growth model of carbonate mounds that can be indicated as the best positions for drilling new producers and injectors wells, enhancing oil recovery and the inherent project profit.

Results and Conclusions

The use of this methodology delivered results that demonstrate the efficiency of representing carbonate reservoirs, which improve the understanding of them, facilitating the full-project reservoir characterization of the studied region, mitigating associated risks.