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Assessment of Hydrocarbon Potential in the Pelotas Basin: A Comparative Analysis with Namibia's Venus Prospect.

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Introduction

The Pelotas Basin, located along the southeastern Brazilian margin, exhibits tectono-stratigraphic similarities with its conjugate margin in Namibia, reflecting a shared origin during the opening of the South Atlantic. This study focuses on the analysis of the Aptian interval on the platform and outer slope of the Pelotas Basin, based on 2D and 3D seismic data, aiming to investigate potential analogs to the petroleum system identified in the Venus prospect (2022), offshore Namibia. Both the potential sandy reservoirs and the associated source rock were evaluated. High-amplitude anomalies and stratigraphic traps were mapped, indicating exploratory potential in underexplored sectors of the Brazilian margin. The Pelotas Basin, located along the southeastern Brazilian margin, shares tectono-stratigraphic characteristics with its conjugate margin in Namibia, reflecting a common origin during the opening of the South Atlantic. This study focuses on the analysis of the Aptian interval on the Pelotas Basin shelf and outer slope, using 2D and 3D seismic data, with the aim of identifying petroleum systems analogous to those associated with the Venus prospect (2022) on the Namibian margin. Seismic correlation was performed between interpreted features in Pelotas and those described in the Venus discovery to support the identification of analogous stratigraphic and structural elements. Features characterized by high-amplitude anomalies and stratigraphic traps have been mapped, suggesting exploratory potential in still underexplored sectors of the Brazilian margin.

Method

The adopted methodology involves the integrated seismic interpretation of 2D and 3D volumes available in the Pelotas Basin, focusing on the Aptian interval. Stratigraphic and structural characterization was carried out through the analysis of seismic attributes such as RMS amplitude, instantaneous phase, and spectral decomposition, aiming to identify features associated with potential source and reservoir rocks. The results were compared with interpretative patterns and exploratory concepts proposed by Hedley (2023) for the Venus prospect, offshore Namibia.

Conclusions

The integrated analysis of seismic data in the Pelotas Basin reveals features suggesting an active petroleum system within the Aptian interval, with evidence of both source rock and potential sandy reservoirs. Amplitude anomalies, lateral variations in derived attributes, and depositional patterns indicate the presence of stratigraphic traps and turbidite systems like those observed on the Namibian margin. The occurrence of preserved structures on the outer slope, associated with sedimentary thickening and intervals showing strong seismic responses, reinforces the potential for hydrocarbon charge and retention. Although still underexplored, the Pelotas Basin exhibits key elements of a complete Aptian petroleum system, positioning it as a promising frontier for exploration, especially considering the recent discoveries at the Venus prospect.