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UNLOCKING THE URUGUAY AND SOUTHERN BRAZIL'S EXPLORATION POTENTIAL

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Summary

Recent exploration successes in the Orange Basin off Namibia and South Africa have ignited renewed interest in the offshore potential of Uruguay, Northern Argentina, and Southern Brazil. This study focuses on assessing hydrocarbon prospects in the Punta del Este Basin of Uruguay and the Pelotas Basin, which extends across Uruguay and Southern Brazil.

Introduction

Recent exploration successes in the Orange Basin off Namibia and South Africa have ignited renewed interest in the offshore potential of Uruguay, Northern Argentina, and Southern Brazil. This study focuses on assessing hydrocarbon prospects in the Punta del Este Basin of Uruguay and the Pelotas Basin, which extends across Uruguay and Southern Brazil. Leveraging advanced Amplitude vs. Angle (AVA) seismic techniques and cutting-edge Machine Learning (ML) algorithms, the research aims to identify and evaluate promising stratigraphic traps that may serve as favourable sites for hydrocarbon accumulation.

Method

This study employed two key methodologies: AVA analysis and ML techniques. Both methods allowed rapid screening of the vast area which encompasses both Punta del Este and Pelotas basins.

The AVA analysis utilizes seismic records at varying angles of incidence to detect potential hydrocarbon accumulations and lithology variations. This method relies on measuring how sound waves propagate through subsurface layers, with a focus on attributes such as P-impedance and the Vp/Vs ratio (the velocity ratio of P-waves to S-waves). These properties provide critical insights into zones with potential hydrocarbon enrichment and lithological changes.

An ML technique was also applied to efficiently analyse the 3D seismic library. It extracted thousands of high-resolution reflectivity events, allowing for precise mapping of features of interest. This process also facilitated the extraction of window independent attributes across the seismic, significantly enhancing the resolution and accuracy of the interpretation.

Results

The analysis revealed notable clusters of low Relative P-Impedance and Vp/Vs values, indicative of potential hydrocarbon presence, within an interpreted turbidite geometry in the Lower Cretaceous interval of the Pelotas Basin. A detailed 3D seismic interpretation confirmed these anomalies as components of an elongated turbidite channel complex extending from the Uruguayan to the Brazilian part of the Pelotas Basin. Brazil.

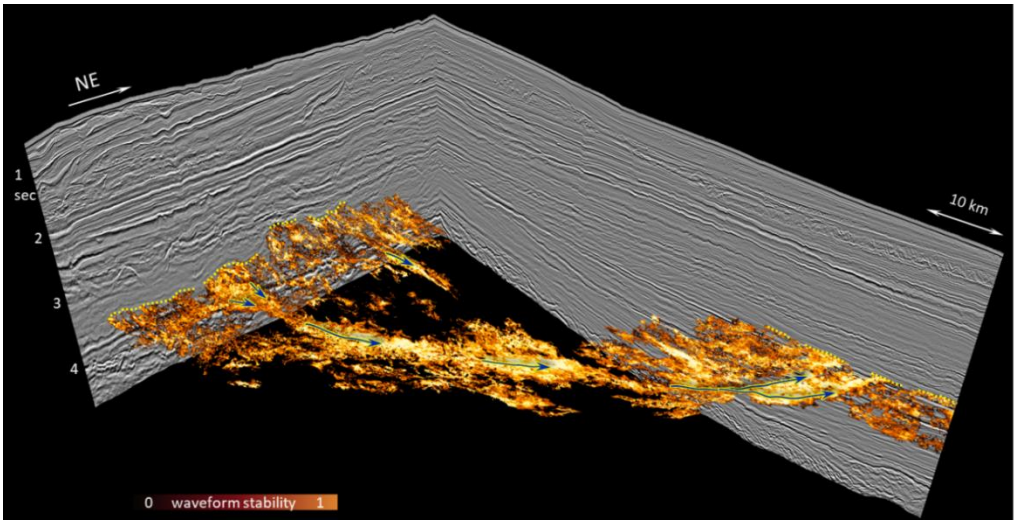

Figure 1 *The extracted ML attribute - waveform stability metric. This attribute can be used for tracking possible lithology changes, structural patterns or even geo-bodies. The presented feature can be interpreted as a possible turbidite complex.*

Machine Learning (ML) techniques significantly enhanced the interpretation by tracking hundreds of high-resolution seismic surfaces across the Punta del Este and Pelotas Basins. These ML-generated surfaces detailed intricate turbidite fan geometries (Figure 1) and feeder channels converging toward deeper water regions of the Pelotas Basin.

In the Punta del Este Basin, ML analysis marked a complex turbidite feature spanning approximately 750 km². Unlike traditional attribute analysis, ML methods preserved fine-scale detail without conditional averaging, providing a more precise mapping of stratigraphic prospects and sedimentary architectures.

Conclusion

The study identified promising sedimentary environments with stratigraphic characteristics analogous to known discoveries in conjugate basins, supporting the potential for significant hydrocarbon reserves. in the Punta del Este and Pelotas Basins offshore Uruguay and Southern Brazil.

The results underscore the importance of leveraging both AVA and ML methodologies to maximize insights from existing seismic datasets, especially in frontier areas with limited well data. These approaches provide a robust framework for delineating complex stratigraphic features, reducing exploratory risks, and identifying high-potential zones for future drilling. Continued advancements in seismic analysis and ML applications will play a critical role in refining our understanding of source rocks and sedimentary systems in these underexplored offshore basins.

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