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Evidence of Post-Albian Transpression in the Southern Santos Basin, Brazil

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Introduction

The discovery of the world-class Pre-salt Petroleum Province along the southeastern Brazilian margin has driven significant interest in tectonostratigraphic analyses to better understand hydrocarbon accumulation in rifted margin settings. This study focuses on an area adjacent to the Abimaël Ridge (AR) and the Helmut Transfer Zone (HTZ), where major tectonic elements interact spatially. A representative dip-oriented seismic section was interpreted in conjunction with data from a single well located on the crest of the northern AR.

Method and/or Theory

In the southern Santos Basin, a comprehensive dataset comprising 2D seismic surveys, magnetic and gravimetric maps, and wellbore information was integrated to constrain the structural framework and regional kinematics. This multi-disciplinary approach supports a revised interpretation of the tectonic evolution of this portion of the Santos Basin and its control on carbonate facies distribution in potential exploration targets.

Results and Conclusions

The structural configuration beneath the salt layer is dominated by a regional high that dips toward the northwest, terminating into a structurally controlled low governed by a major fault system forming a broad half-graben. Adjacent to the well, a positive flower structure indicates transpression across a sinistral strike-slip component, consistent with a possible stratigraphic inversion observed in well data. This transpressional deformation is interpreted to have occurred after the salt deposition and may have initiated halokinetic processes. As a result, Albian carbonate deposits, interbedded with anhydrite, were emplaced in an atypical stratigraphic position within the basin. Sidewall core facies analysis corroborates the seismic interpretation.

The kinematic interplay between the AR and HTZ appears to exert significant post-Albian tectonostratigraphic control in this sector of the Santos Basin. Complementary findings from the Merluza Graben further suggest that post-salt faulting and consequent deformation played a critical role in shaping reservoir architecture. These insights highlight the importance of incorporating tectonic and halokinetic influences when assessing prospectivity in structurally complex regions of the basin.