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Correlation of Cenozoic Deformation Between the Campos Basin and the Basins of the Central Region of the Southeast Brazil Continental Rift: Taubaté, Resende and Volta Redonda – Patterns and Evidence of Tectonic Reactivation

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Introduction

The southeastern Brazilian offshore basins have traditionally been interpreted as primarily influenced by salt tectonics, as exemplified by the Campos Basin. However, recent studies suggest that the reactivation of Neoproterozoic basement faults may have played a significant role in controlling the Cenozoic deformation of the sedimentary succession. Concurrently, the onshore sector, particularly the central domain of the Southeast Brazil Continental Rift (RCSB), has experienced significant tectonic activity throughout the Cenozoic, from the initial formation of the basins to more recent tectonic reactivations. These include episodes of tectonic inversion, tilting of younger sedimentary packages, and reactivation of inherited fault systems. This study aims to investigate and compare structural patterns across selected segments of both the offshore domain, specifically in the Marlim Complex, Campos Basin, and the central domain of the onshore RCSB (Taubaté, Resende, and Volta Redonda basins), with the objective of identifying potential regional structural controls associated with basement fault reactivation during the Cenozoic.

Method and/or Theory

The analysis integrates seismic interpretation of offshore data from the Marlim Complex, Campos Basin, and 2D seismic lines from the Taubaté Basin, along with field observations in the Resende, Taubaté and Volta Redonda Basins. Emphasis was placed on identifying inversion structures, reflector geometries, and evidence of post-depositional deformation to evaluate the structural inheritance from Neoproterozoic basement reactivation.

Results and Conclusions

In the Campos Basin, a harpoon-style inversion structure was identified, characterized by the uplift of Paleogene and Neogene strata above an inverted Cretaceous rollover structure. This deformation affects Lower Miocene turbidite deposits and is interpreted as the result of reactivation of deep-seated Neoproterozoic basement faults. In the Taubaté Basin, seismic data reveal inversion-related features along the basin margins, indicative of compressional reactivation overprinting an originally extensional setting. Field observations in the Resende Basin document the tilting and inversion of sedimentary strata of the Resende Formation, suggesting the occurrence of multiple tectonic pulses from the Paleogene through at least the Quaternary. Additionally, in the Volta Redonda Basin, recent sedimentary units also display evidence of deformation, further supporting the persistence of tectonic activity into the younger geological record. Actually, the whole Volta Redonda Basin has been inverted during the Neogene, as indicated by its uneven and discontinuous geomorphologic pattern.

The structural similarities observed across these basins, both offshore and onshore, indicate that Cenozoic deformation was likely governed by a shared tectonic regime associated with the reactivation of inherited Neoproterozoic basement structures. These results underscore the significance of integrated offshore-onshore structural analyses for advancing the understanding of the tectonic evolution and neotectonic framework of southeastern Brazil.