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The Tectonic Framework of Santos Basin: an approach from aeromagnetic data

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The southeastern Brazilian margin exhibits a structural configuration that reflects its tectonic evolution during the Mesozoic break up of Gondwana supercontinent. The offshore structures are mainly NE-SW oriented, i.e. sub parallel to the adjacent basement (The Ribeira Belt) framework orientation. Nevertheless, at Rio de Janeiro region, between Campos and Santos Basins, the coastline, hingeline and rifting structures differ from the previous statement, following an E-W direction. We investigate this structural pattern change and the tectonic framework of the Santos Basin, based on a new compilation of aeromagnetic data. The magnetic field was modeled using the method of local functions, in order to produce a magnetic basement map for the Basin. The structural trends and discontinuities were interpreted from the aeromagnetic anomaly map and show mainly NE-SW positive lineaments, intercepted by NW-SE negative lineaments, related to a main WNW-ESE axis of extension during rifting. The proximal margin accommodated the extensional process giving origin to NE-SW faults and widespread magmatic intrusions, which are well represented by high amplitude, linear magnetic anomalies.
The deeper margin shows large crustal blocks forming structural highs and lows, locally intruded by basaltic bodies, giving rise to a complex basin architecture. The hingeline and main rifting structural system are well correlated with a linear magnetic anomaly following the configuration of the continental slope, probably a region of high extended and intruded crust that crosses the Sao Paulo Platô. A strong attenuation on the magnetic intensity to the east of the hingeline and its correlation with a lateral gradient on the gravity anomaly map suggests the deepening of the basin and thinning of the crust. The magnetotelluric results enabled to identify the location and depth extension of the salt bodies, and the presence of elevated crustal blocks, showing a good correlation with the magnetic and gravity data interpretation.
The results provided a regional view of the Santos Basin architecture, adding some constrains on the location of elevated crustal blocks and asssociated faults, related to the basin's formation and evolution. These structures may have influenced the oil migration and their imaging constitutes an important tool to understand the rifting process.