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Gravity Structure of the Paramirim Aulacogen, São Francisco Craton (NE-Brazil)

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Introduction

The northeastern region of the São Francisco Craton hosts the Paramirim Aulacogen, a partially inverted rift filled with the Espinhaço and São Francisco Supergroups of Paleo/Mesoproterozoic and Neoproterozoic ages, respectively. This aulacogen is bounded to the north by the Rio Preto brasileiro orogenic system. The inversion of the aulacogen produced a faults and folds system with a NNW-SSE trend. This study investigates the gravity register produced by rocks deposition, their deformation and the interaction between the inverted rift structure and the basement rocks.

Method

Since the 1980s, several institutions have conducted gravity surveys in the Paramirim Aulacogen region, notably the Geological Survey of Brazil (SGB), the National Agency of Petroleum (ANP) and the Brazilian Institute of Geography and Statistics (IBGE). The data used in this study were grouped and standardized with reference to the Brazilian Fundamental Gravity Network (RGFB). The Bouguer anomalies were calculated relative to the geoid, considering a rock layer density of 2.67 g/cm³.

Results and Conclusions

To highlight the structures of the Paramirim Aulacogen, a regional-residual separation filter was applied to the gravity data to remove a wavelength of 100 km. The residual component resulting from this filtering was used in the correlation with the geological data and in the interpretation of tectonic structures.

The Paramirim Aulacogen is structured in two gravity compartments.

The southern compartment is characterized by a negative gravity anomaly elongated in the NNW-SSE direction, with an average wavelength of 100 km and an average amplitude of -30 mGal. In this compartment there are Paleo/Mesoproterozoic (Oliveira dos Brejinhos, São Marcos and Córrego Sítio Novo Groups) and Neoproterozoic (Santo Onofre Group) metasediments of the Northern Espinhaço, as well as a part of basement of the Paramirim Valley. The asymmetry of this anomaly suggests that the rift was originally formed as a half-graben with the main fault located on the western margin.

The northern compartment is characterized by a positive gravity anomaly elongated in the NNW-SSE direction, with an average wavelength of 50 km and an average amplitude of +20 mGal. The Neoproterozoic metasediments of the Sítio Novo Group outcrop in the western and eastern margins of this anomaly and correspond, respectively, to the Serra do Boqueirão and Serra do Estreito mountain ranges. The widening of this anomaly in the northern direction is correlated with Neoproterozoic metasediments of Rio Preto Group and the Paleoproterozoic basement of the Cristalândia of the Piauí Complex outcrops, suggesting a strong influence from the orogenesis of the Brasileiro.

The polarity alternation of the gravity signal associated with the Paramirim Aulacogen may correspond to variations in sedimentary infill, deposition source and tectonic structuring. Therefore, more in-depth analyses based on geological knowledge and magnetic and seismic reflection data are needed.