



Mapping a Neoproterozoic suture in the South Atlantic at the Brazilian margin: integration of magnetic and geological data

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This paper was prepared for presentation during the 18th International Congress of the Brazilian Geophysical Society held in Rio de Janeiro, Brazil, 16-19 October 2023.

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Abstract

Orogenic sutures are mega lineaments that mark the limit between tectonic active plates with different genesis as a result of terranes collage. These zones are characterized by massive deformation, high grade metamorphism and/or ophiolite complexes. On aeromagnetic maps these sutures are normally well represented by lineaments with high positive anomalies. At proximal Santos basin there is an expressive magnetic anomaly onshore that extends to offshore and also a magnetic lineament that match with a suture zone already mapped on Ribeira Belt. High P-T rocks and also mafic/ultramafic ophiolite sequences suggest a Cambrian suture between Cabo Frio Tectonic Domain (CFTD; remain part of Angola Block) and Oriental Terrane (OT) formed during the latest stage of amalgamation of southwest Gondwana (Búzios Orogeny) by a thrust fault. It believed that this fault is prolonged under Santos basin once your proximal basement includes an extension of Ribeira Belt geological units, what will be investigated on this study.

The present research combines aero and terrestrial magnetic data at onshore and offshore aiming to characterize the magnetic pattern of the CFTD crust and main structures. The main objective is determinate the geometry and deep angle of the suture in depth. Two geological units became the main focus of discussion: Região dos Lagos Complex (RLC) and Búzios-Palmital Group (BPG). The meta granitic complex includes dioritic to granitic Paleoproterozoic rocks with meta mafic bodies occurrences. In turn BPG is a paraderived mafic sucession interleaved with volcano-sedimentary sequences, interpreted as an ophiolite complex. Both are folded into NW horizontal open folds, results of Búzios Orogeny. At the study area (Ponta Negra beach, Rio de Janeiro State) the suture zone is exposed/outcrops enabling the recognition of its geophysical and geological signature, used to draw a correlation between different units of CFTD and OT composition and their magnetic response. Based on that signature we investigate its possible prolongation at depth and offshore at the Santos Basin. The aero and ground magnetic anomalies were constrained with magnetic susceptibility measurements, which along with detailed lithological description will integrate a database, essential for future magnetic modelling.

Based on the amplitude (intensity), geometry, texture of the magnetic signal and lineament's pattern observed in map view, two magnetic lineaments pattern and three main magnetic domains were identified. The straight lineaments displays a NE-SW prefer orientation inflecting more to east at the northern of the map. At the southwestern part NW-SE lineaments can be also observed. The curveous lineaments are concentrated in the southwest quadrant, where positive anomalies achieve more than 150 nT. They can vary from NE-SW to almost E-W orientation and include the investigated suture zone, that has a reduction of amplitude signal to NW and curve geometry that follows the main regional Proterozoic folding pattern. At this quadrant an oriented roughness texture prevails, except for a punctual rounded smooth anomaly. Other results were two magnetic and geological sections that cross the suture zone. In both Palmital Succession is thrust over a granitic migmatitic orthogneiss from RLC, displaying porphyritic or migmatitic textures. The porphyritic facies exhibits the highest values of magnetic susceptibility, although with low mean magnetic anomalies (~ 50 a -50 nT). The Palmital Succession is associated with higher magnetic anomalies (~150 a 250 nT), especially at the suture zone where the contrast between the Palmital and the RLC reaches more than 500 nT.

The results raise some hypothesis: (1) The smooth magnetic gradient from Ponta Negra to NW at the continental region suggests that the suture is deepening to NW; (2) The high positive anomaly associated with Cabo Frio Tectonic Domain as it offshore continuation can be divided into 2 sources. The more proximal source can be result of both units magnetic response, individually or summed, once Região dos Lagos Complex and Búzios-Palmital Group are folded horizontally. The more offshore one could be related to mafic/gabbroic deep plutons. Modelling sections will give more assertive answers about it.