



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

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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 high strain, 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 (Rio de Janeiro State) there is an expressive magnetic anomaly onshore that extends to offshore and also a magnetic lineament that matches with a suture zone of the Ribeira Belt. High P-T rocks and also mafic/ultramafic ophiolite sequences mark this Ediacaran-Cambrian suture between the Cabo Frio Tectonic Domain (CFTD) and the Oriental Terrane (OT) formed during the latest stage of amalgamation of southwest Gondwana (Búzios Orogeny) by a thrust fault. Once Santos basin basement includes an extension of Ribeira Belt geological units, the tectonic limit prolongation offshore will be investigated.

The present research combines aero and terrestrial magnetic data at onshore and offshore aiming to characterize the magnetic pattern of main lithologies and structures in order to determinate the geometry and dip angle of the suture in depth. The area comprises mainly two geological units: Região dos Lagos Complex (RLC) and Búzios-Palmital Group (BPG). The RLC includes dioritic to granitic Paleoproterozoic rocks with some meta mafic bodies. In turn, BPG is a paraderived succession interleaved with metamafic sequences, interpreted as an ophiolite complex. Both are folded into NW horizontal open folds. At the study area (Ponta Negra beach) 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. Two ground magnetic sections and magnetic susceptibility measurements were made on field. Measurements were also made on samples in the laboratory. The aero and ground magnetic anomalies were constrained with the database for future magnetic modelling.

Based on the amplitude (intensity), geometry, texture of the magnetic signal and lineament's pattern observed in map view, two types of lineaments and three main magnetic domains were identified. The straight lineaments display a NE-SW preferred orientation turning to the east at the northern region of the area. At the southwestern part NW-SE lineaments can be also observed. The curvilinear 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 follow 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 BPG is thrust over a granitic migmatitic orthogneiss of RLC. The highest values of magnetic susceptibility are from RLC, although the low mean magnetic anomalies of ~ 50 to - 50 nT. The BPG is associated with higher magnetic anomalies (~150 a 250 nT), especially at the suture zone where the contrast with RLC reaches more than 500 nT.

These results raise some hypothesis: (1) The smooth magnetic gradient of the studied anomaly to NW at the continental region suggests that the suture is dipping to NW; (2) This anomaly can be result of both units magnetic response, or a some of them, once RLC and BPG are folded into horizontal folds; (3) The high positive anomaly in the offshore continuation of the CFTD can represent 2 magnetic sources, one related to the proximal basement constituted by the lithological units of the RLC and the BPG and another interpreted as a deeper source, possibly a mafic/gabbroic pluton. Modelling sections will provide further constrains on these hypothesis.