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Subsurface Architecture of the Tingua Massif from Aerogeophysical Methods

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Introduction

The Tinguá Massif, located in Nova Iguaçu, in Rio de Janeiro, is a prominent intrusion associated with the continental alkaline magmatism of the eastern Brazilian margin. It stands out within the central Ribeira Belt due to its structural and mineralogical complexity, with lithologies dominated by syenites and nepheline syenites. It intrudes late-collisional granitoids of the Serra dos Órgãos and exhibits distinctive topographic and morphological features. Despite its geodynamic importance, the massif's internal structure remains poorly constrained.

Geotectonically, Tinguá is aligned with the Poços de Caldas–Cabo Frio Magmatic Lineament, which hosts NE–SW trending alkaline intrusions along the Serra do Mar. These bodies are interpreted as products of lithospheric reactivation during the South Atlantic opening. In this context, the massif may preserve key information on crustal segmentation and post-collisional magmatic evolution in southeastern Brazil.

Materials and Methods

Regional-scale aeromagnetic data from the Geological Survey of Brazil (SGB/CPRM), acquired under project 1038 (São Paulo–Rio de Janeiro), were processed using Oasis Montaj software to investigate their subsurface architecture. A set of processing steps, including Upward Continuation, Reduction to the Pole (RTP), horizontal and vertical derivatives, total gradient, and tilt derivative, was applied to enhance different aspects of the magnetic signal. This processing improved the delineation of structural discontinuities, lithological boundaries, and internal susceptibility variations within the Tinguá Massif.

Results and Conclusions

Residual magnetic anomaly maps reveal strong susceptibility contrasts within the Tinguá Massif, suggesting lithological zonation and possible tectonic compartmentalization. High-wavenumber anomalies may indicate shallow intrusions, while broader anomalies are interpreted as deeper, homogeneous intrusive domains. These features align with expected mineralogical heterogeneities, including diamagnetic and ferromagnetic responses.

Ongoing 3D magnetic inversion will refine source geometry and depth estimates, improving the understanding of the massif's structure and emplacement. These results contribute to characterizing the role of Tinguá in the broader geodynamic evolution of the Ribeira Belt and related alkaline provinces, supporting refined geological models and future investigations. In parallel, the processing and interpretation of radiometric data will be conducted to provide additional constraints on surface lithological variations and compositional heterogeneities, complementing the magnetic analysis and enhancing the geological understanding of the area.