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Aerogamma spectrometry applied to geological mapping: Case study in the Serra do Mar region of Paraná

Miguel Crispim (UFPR),Ricardo Michael Pinheiro Silveira (UFPR),Alessandra de Barros e Silva Bongiolo (UFPR)

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Introduction

The Serra do Mar (SMP) of Paraná and its surroundings have been the focus of several geological, geomorphological, geochronological, geochemical and petrographic studies, most of which sought to understand tectonic and morphogenetic processes. However, there are gaps in knowledge regarding the focus on investigating geological contacts. To this end, the use of airborne geophysical surveys as an investigation method for mapping the limits of geological contacts is an alternative for this research. In this context, this work investigated the relationship between the contacts defined in the geological map of Paraná (Brazilian Geological Survey - SGB), the granite cores of the Serra do Mar and the airborne gamma spectrometric data. The study area includes five granite massifs located in the SMP, the central portion of the Graciosa Intrusive Suite, located between the Luiz Alves and Curitiba metamorphic terrains. The objective of this work was to analyze the aerogamma spectrometric responses of the Serra do Mar massifs, in order to understand the geophysical signatures that may allow the characterization of the granite massifs, differentiating them from the host rocks and individualizing each massif.

Method and/or Theory

For this work, data from the Paraná-Santa Catarina project, carried out in 2011 by CPRM, were used. The project was carried out with a flight height of 100 m and a flight line spacing of 500 m. The data were treated and processed in the Oasis Montaj software and interpolated using the minimum curvature method with 100 m cells. From these data, CT, K, eTh, eU maps were generated, followed by the F factor, Anomalous Potassium (Kd) and Anomalous Uranium (Ud) maps, as well as the RGB ternary map, which was used as a basis for the interpretation of the aerogeophysical domains, together with a digital elevation model extracted from the XYZ data of the same project.

Results and Conclusions

The CT, K, eTh, and eU maps showed great spatial correspondence in their anomalies. Within the analyzed indices, anomalous potassium (Kd) showed positive anomalies within the geological limits of the SGB, as well as the F factor, which presents large positive anomalies with a NE-SW direction, where the granitic plutons are located. Anomalous uranium (Ud), on the other hand, presents milder responses compared to the other elements investigated. With the RGB ternary composition, it was possible to identify some groups of gamma-spectrometric domains, derived from the different balance between the elements present in the rocks of the region. The ternary composition was able to segregate and mark the spatial limit of the granitic plutons, where the zones of high presence of the elements (K, eTh, eU), referring to the white color in the ternary diagram, are geographically positioned in agreement with those mapped in the present geological map of Paraná. Thus demonstrating the relevance of aerogamma spectrometric surveys for geological mapping.