Thermomagnetic Study of Different Brazilian Geostructural Contexts and Curie Surface Mapping

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Abstract

The Brazilian geological setting, in the crust, has the potential to contain important minerals, oil and geothermal resources. Crustal structural provinces are segments of the lithosphere that have the same range of geochronological ages and similar thermogeological histories.

Fault or shear zones, non-conformities or rapid changes can mark the boundaries between these provinces to the metamorphic degree or by intrusive contacts. The study of the thermal structure of the crust that characterizes the upper lithospheric layer allows the knowledge of this great potential of the country that remains unknown due to limited exploratory research.

Thus, a possibility of crustal thermal modeling is based on the use of aeromagnetic data to estimate the depth of the Curie Surface (CS) to assess the potential for geothermal exploration. The CS is an isothermal surface on which ~~the~~ magnetic minerals lose their magnetization and, as such, delineate an isotherm around 580^0C (Curie temperature of the magnetite). We used spectral analysis technique in these data to estimate the depth of the layer related to the deep sources of the crust and its spatial distribution and to compare our findings with geothermal fields known as direct modeling.

Results and Conclusion

For the construction of the Curie grid, 236 spectral windows ranging from 100-500km were selected, which allowed regular sampling of 2x2 degrees with the curie information located in the center of the windows. The result of this distribution is illustrated in Figure (1). The centroid model brought information from three deep magnetized layers into the crust, which are separated by types of sources: shallow (z_{mean} = 3.6km), intermediate (z_{mean} = 7.6km) and deep (z_{mean} = 29.5km). Thus, the average depth of the Curie Surface for the entire national territory varies by about 31.2 km, the differentiation occurs in the different structural provinces allowing its thermal history associated with the most diverse Tectono-evolutionary processes.

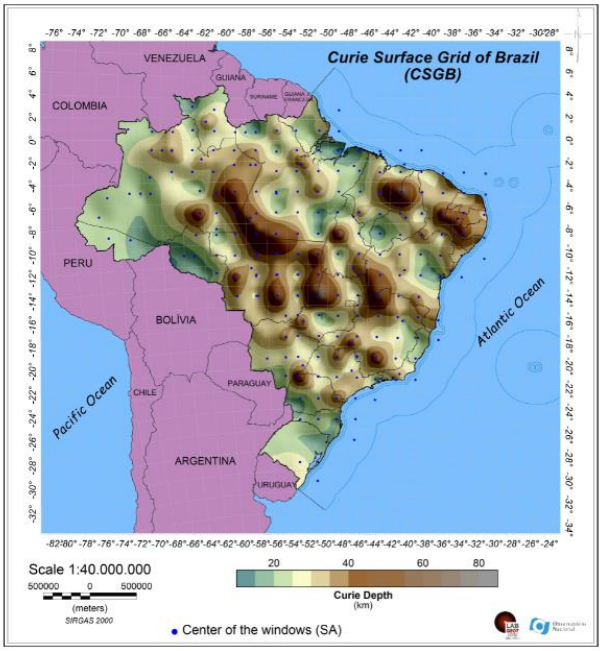

Figure (1) – Curie Surface Grid of Brazil (CSGB) using spectral analysis of the aeromagnetic data.