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Stratigraphic Characterization of the Belém Metropolitan Region (Brazil) Using Vertical Electrical Sounding

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Introduction

This study integrates geological and geophysical data to investigate stratigraphy in the Belém Metropolitan Region (BMR), using Vertical Electrical Sounding (VES) in representative areas. The geological formations of interest include the Barreiras Group, the Pirabas Formation, Post-Barreiras deposits, and recent Quaternary sediments. These units exhibit distinct lithological characteristics, such as variations in grain size, porosity, and thickness, which directly influence electrical resistivity contrasts, aiding data interpretation. In the BMR, which sits atop a thick Cenozoic sedimentary cover, stratigraphic analysis is particularly relevant due to lithological diversity, as evidenced by previous investigations. The characterization of lithological units, considering their relationship with topography, depth, and subsurface physical properties, is essential to support technical and environmental studies in the region.

Method

The methodology is based on acquiring electrical resistivity profiles using the Schlumberger array. This configuration is particularly effective for investigating vertical variations in subsurface layers, providing greater penetration and depth resolution. Its symmetrical setup allows for detailed stratigraphic sequence characterization, making it widely used in studies requiring the identification of interfaces between different lithological units. The technique is especially advantageous in areas with thick sedimentary cover, such as the BMR. Data interpretation will be conducted through computational modeling using specialized software such as IPI2Win and RES2DINV, which fit theoretical curves to field measurements to estimate layer resistivity and thickness, enabling the construction of geoelectric profiles. These profiles will be compared and correlated with existing geological records from literature, technical data of the region. The correlation between VES-derived data and existing geological records will allow for method consistency assessment and refinement of local stratigraphic models.

Conclusions

This study proposes the integration of geological and geophysical data through VES technique for stratigraphic characterization in the Belém Metropolitan Region. The methodology aims to identify electrical resistivity contrasts associated with major geological units, with the potential to delineate subsurface layers with distinct lithological properties. The expected correlation between geoelectric profiles and existing geological data may validate the method as an efficient tool in regions lacking direct subsurface information. This research seeks to refine local stratigraphic models and may contribute to sustainable territorial development in the Amazonian context.