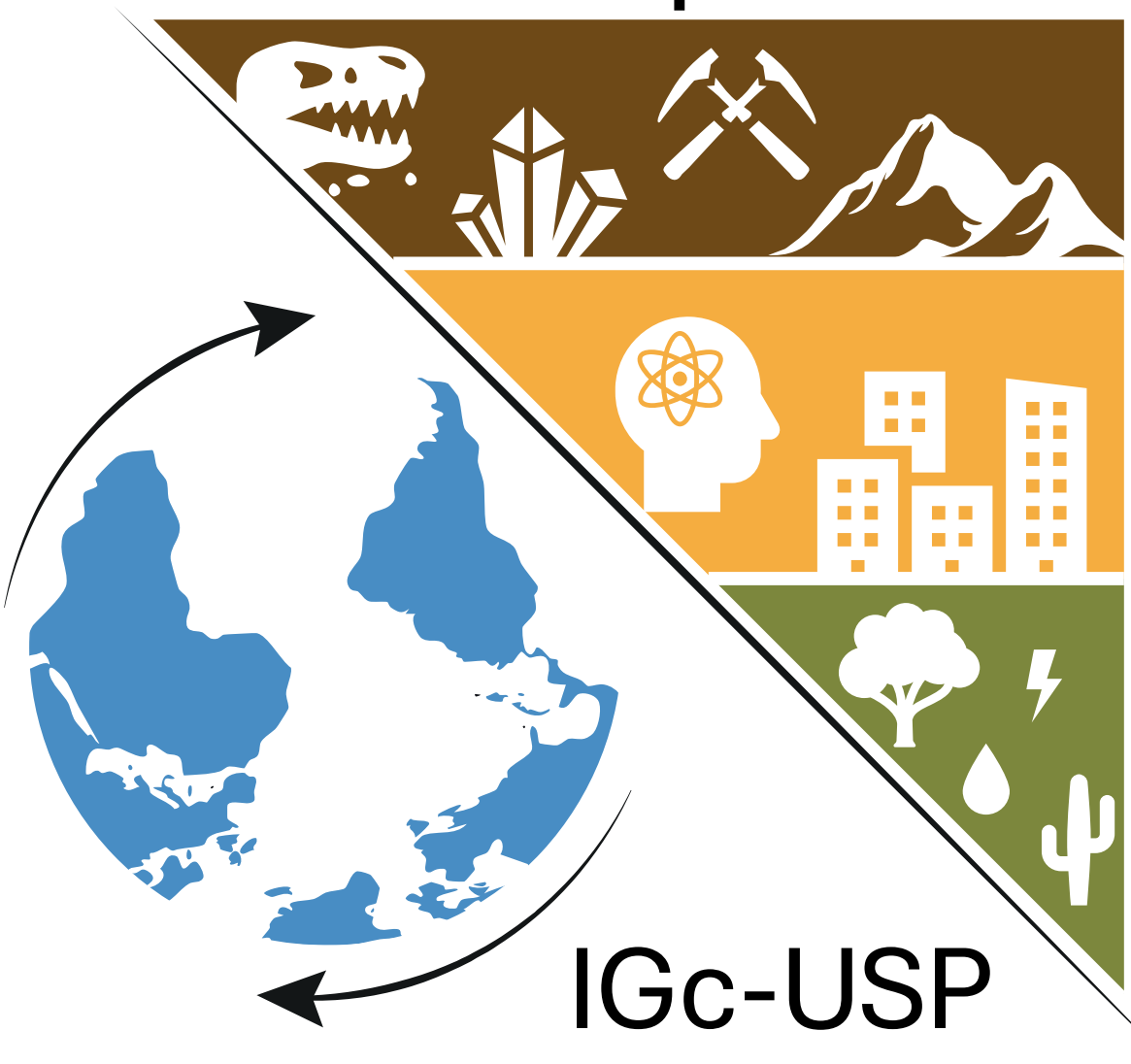
IV Simpósio



Pós-Graduação

IGc-USP

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Desafios e Soluções para um
Futuro Sustentável

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3D GEOPHYSICAL INTEGRATION FOR THE EXPLORATION OF IOCG DEPOSITS IN THE AQUIRI REGION, CARAJÁS MINERAL PROVINCE, BRAZIL

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The Aquiri Region, located in the western portion of the Carajás Domain (Carajás Mineral Province, Brazil), represents an emerging frontier for mineral exploration in the state of Pará. Similar to the eastern Carajás Domain — which hosts world-class iron oxide-copper-gold (IOCG) deposits — the Aquiri Region contains several promising targets currently under exploration by VALE S.A., including the AQW2 target.

This particular target comprises two prominent magnetic anomalies, referred to as the Deep and Infill targets. Both targets are predominantly hosted within an Archaean-age gabbroic body attributed to the Cateté Suite, structurally controlled by a NW-SE shear-zone.

The Infill target exhibits characteristics consistent with an iron oxide-copper-gold (IOCG) system; Hydrothermal alteration is zoned and progresses through distinct assemblages: sodic → potassic-sodic → calcic-ferric → ferric-calcic → ferric (Cu-Au). Copper-gold mineralization is associated with the later-stage ferric alteration and is hosted within a breccia system exhibiting a predominant E–W structural orientation. The mineralization consists primarily of chalcopyrite and shows a direct spatial association with magnetite. Geophysical signatures are notably similar to those of IOCG deposits worldwide, characterized by strong and juxtaposed magnetic and gravity anomalies, as well as uranium and potassium enrichment, intermediate resistivity (up to 180 Ohm.m) and high chargeability (up to 20 mV/V).

In contrast, the Deep target presents a greater exploration challenge due to the presence of a broad magnetic anomaly that has been poorly tested to date. Limited drilling has revealed hydrothermal alteration patterns similar to those observed at the Infill target such as sodic → potassic-sodic → calcic-ferric assemblages. However, significant ferric alteration associated with magnetite, typically linked to copper-gold mineralization, has not been identified to date. In order to investigate the source of this broad magnetic anomaly, a 3D magnetotelluric (MT) and DC-resistivity/induced polarization (DC-IP) models were calculated.

The 3D MT resistivity model revealed a large, deep-seated conductivity anomaly extending from approximately 400 to 800 m depth, dipping eastward, with resistivity values around 10 Ohm.m. In addition, the 3D resistivity and chargeability models from the DC-IP survey identified a significant shallower anomaly, up to 2 km in length, characterized by resistivity values reaching 150 ohm.m and chargeability values up to 10 mV/V. Both anomalies exhibit geophysical signatures consistent with those of the Infill target, suggesting the presence of a potential new mineralizing system with IOCG deposit characteristics.

PALAVRAS-CHAVE: geophysics, mineral exploration, magnetotelluric method, IOCG deposits