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Integrated Geophysical Approaches for Orebody Knowledge in Rift-Controlled Terranes

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Understanding orebody distribution in structurally complex and rift-related terranes requires improved characterization of subsurface architecture and the pathways that may localize mineralizing fluids. In extensional settings, inherited basement structures and rift-related faults are hypothesized to play a key role in focusing hydrothermal circulation, but their geometry and connectivity at depth often remain poorly constrained.

This study proposes an integrated geophysical approach to enhance deposit characterization in underexplored extensional provinces. Gravity and magnetic data will be processed using derivative filtering, spectral analysis, and two-dimensional forward and inverse modeling to delineate density and susceptibility contrasts associated with basement structures and major fault networks. Complementary Audio-Magnetotelluric (AMT) soundings using the ADU-08e system will be acquired to generate resistivity-depth models capable of identifying potential fluid pathways within the subsurface.

By integrating these datasets, the project aims to develop a conceptual model of structural architecture, fault connectivity, and lithological contrasts that may control mineralization. Expected outcomes include identification of key corridors for hydrothermal fluids and refinement of exploration targets within rift-controlled basins.

This research seeks to provide a transferable workflow for combining potential field and electromagnetic techniques to strengthen orebody knowledge in extensional terranes globally. The results are anticipated to improve understanding of mineral system controls, reduce structural uncertainty, and support data-driven exploration strategies in frontier basins.