Investigating Crustal Anomalies in the Curnamona-Mundi Mundi Region

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SUMMARY

In the advancement of geophysical exploration, the magnetotelluric (MT) method stands out as a crucial technique for mapping the subsurface electrical conductivity distribution, offering profound insights into the Earth's crust and mantle properties. This method, relying on natural electromagnetic fields, permits the delineation of conductivity anomalies to great depths, from the surface to several hundred kilometres below. The Curnamona Province, hosting one of the most electrically conductive crusts in the world, holds significant potential as a target for the MT method. This region is of particular interest due to its sequence of conductivity anomalies extending to mid-crustal depths, presenting a distinct eastern boundary beneath the core of the Mundi Mundi region. The 3D MT inversion study over the Mundi Mundi region reveals a significant world-class conductor within the Proterozoic basement, highlighting the interconnection between geological features such as the Stanley Fault and the Curnamona Conductor (CC). Furthermore, a 2D hierarchical clustering technique is employed on the post-inversion resistivity, gravity, and magnetic data. This approach enables a comprehensive, quantitative interpretation of the primary features within the univariate geophysical models. By integrating these distinct geophysical methods through cluster analysis, we effectively characterized the near-surface structures, even within the complex geological setting of the Mundi region. The hierarchical clustering proves advantageous in identifying and correlating subsurface features across various geophysical datasets, thereby improving the accuracy and reliability of geological interpretations. The combined use of MT data and potential field methods through clustering analysis offers a robust framework for exploring and characterizing subsurface conductivity anomalies, ultimately contributing to a better understanding of the region's geophysical and geological dynamics.

Keywords: Australia, Curnamona Province, Mineral Exploration, Magnetotellurics, Hierarchical clustering