

New wideband magnetotelluric imaging of the Carpentaria Conductivity Anomaly

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SUMMARY

The Mount Isa region of northern Australia contains one of the strongest known crustal conductors on the Australian continent, named the Carpentaria Conductivity Anomaly (CCA). Originally imaged with geomagnetic depth soundings in the 1970s, the source and extent of the feature remains poorly constrained. Long period AusLAMP data collection across the CCA suggests that the conductive anomaly is a broadly north-south striking feature aligned with the eastern margin of the Proterozoic Mount Isa Province. High resolution magnetotelluric surveys in the Cloncurry area in 2016 and 2021 highlighted a possible link between the mid-deep crust CCA anomaly and iron-oxide copper gold mineralization in region. This signature is similar to that seen in the Olympic Dam deposit in South Australia.

A new wideband magnetotelluric survey has been collected as a collaboration between the Geological Survey of Queensland and Geoscience Australia. The survey was collected broadly to the south of the Cloncurry MT survey, with the aim to trace the location of the southern part of the CCA. Data were collected at approximately 10 km site spacing, with approximately 20 km between survey lines. Data at over 250 new MT sites are now publicly available through the Geological Survey of Queensland open data portal.

Data analysis shows complex 3D character across much of the survey, necessitating 3D inversion of the dataset. Strike is complex with a tendency to meridional in the range of 100hz to 0.001hz and longitudinal below 0.01hz. Preliminary inversion using ModEM3D suggests that there is a major conductivity feature which runs north south through the survey area which is broadly coincident with the location of the eastern boundary of the Numil Seismic province at mid crustal depths. This feature is consistent with the CCA and extends to the southern extent of the new survey bounds. Comparison to other available datasets suggests that the southern-most extent of the CCA has a lower conductivity, suggesting a change in nature along the strike of the feature.

Keywords: Magnetotelluric data, data analysis, inversion
