REGIONAL MT SURVEY ACROSS AN ARCHAEAN CRATON IN SOUTH AUSTRALIA – INFLUENCE OF SEDIMENTARY BASINS AND PLATE BOUNDARIES

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Long-period MT data at more than 200 stations have been collected across the Late Archaean – Early Proterozoic Gawler Craton, South Australia, during numerous field campaigns between 2002 and 2009. The total site coverage spans an area of approximately 800x500 km providing a unique dataset to image one of the oldest cratons in the world. The Gawler Craton is known for its mineral exploration potential, i.e. the IOCG Olympic Dam deposit (Heinson et al, 2006). MT data can help constrain the position of lithospheric structures which could provide clues to the genesis of mineral deposits throughout the region. Moreover, large parts of the craton are covered with sediments ranging from tens to thousands of meters in thickness. The sedimentary basins have a significant influence on the MT responses and if not taken into account can lead to erroneous results in a smooth inversion scheme due to their high conductances.

We present 3D inversion models using a subset of sites in the period range of 10-10000s in order to image the subsurface resistivity distribution of the Gawler Craton. Initial 2D and 3D inversions of a subset of MT sites indicates an electrically resistive Archaean core. The thick sedimentary basins surrounding most of the Gawler Craton are taken into account by using starting models with the basins included as a priori information. Together with the inclusion of bathymetry data of the Southern Sea the inverse procedure has more constraints and is able to produce better results than an unconstrained inversion.

The results provide additional constrains to the understanding of the evolution of the Archaean-Proterozoic Gawler Craton by imaging the crust and upper mantle. Tectonic models are largely based on limited outcrop due to thick regolith cover and domain boundaries inferred from potential field data. These can now be validated with the use of large-scale MT modelling.

3D modelling, Gawler Craton, lithosphere

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