

Uncover: MT transect across the Western Gawler Craton and Eucla Basin

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ABSTRACT

The Eucla Basin in Southern Australia is a Tertiary Basin, which covers Proterozoic crust between the Yilgarn Craton in Western Australia and the Gawler Craton in South Australia. However, very little is known of the crustal framework of this major orogenic belt, and as a result, the geological evolution of the area is poorly understood. In 2014, a deep reflection seismic and magnetotelluric (MT) transect was undertaken to provide new constraints on the survey area. The MT profile was 830 km long, with 167 stations separated 5 km apart. Broadband MT responses were obtained at all sites in the bandwidth of 200 – 0.0005 Hz (0.005-2,000 s) which records data from the top 100 m, up to 100 km in depth.

The MT responses showed different characteristics along the line. In the western 500 km of the profile, the responses were approximately 1D and were more sensitive to the presence of thick sedimentary sequences with high porosity. For much of the Eucla Basin, the sedimentary thickness was about 500 m, but in places reached depths of around 2 km. Two dimensional inversion revealed a generally very electrically resistive upper crust of $> 1,000 \text{ Ohm.m}$, but more conductive lower crust of $< 100 \text{ Ohm.m}$. However, the lower crustal conductive regions were not continuous, indicating that there are significant crustal domains with different thermal and fluid evolutions. In the eastern 300 km of the survey, the Eucla basin sediments thin and the profile crosses major shear zones and the western extent of the Gawler Craton. The MT responses here are much more three dimensional and the crust appears to be much more electrically heterogeneous.

KEYWORDS

Magnetotellurics, Eucla Basin, Gawler Craton, Crust, Upper Mantle

TABLE OF CONTENTS

Abstract..... i
Keywords..... i
List of Figures..... 2
Introduction 3
Geological Setting and Background 7
Methods 13
Results 17
Discussion..... 26
Conclusions 35
Acknowledgements 36
References 36

LIST OF FIGURES

Figure 1 (a&b): Location map	6
Figure 2 (a&b): Magnetic and gravity maps of Australia	7
Figure 3: The phase tensor displayed as an ellipse.....	16
Figure 4 (a&b): Phase tensors for the western and eastern extent of the MT line.	19
Figure 5 (a&b): Western phase tensors plotted on gravity and magnetics	21
Figure 6 (a&b): Eastern phase tensors plotted on gravity and magnetics	22
Figure 7: 2D inversion of the western most MT data.....	24
Figure 8: 2D inversion of the eastern MT data.....	25
Figure 9: 2D inversion of the MT data in the Eucla Basin sediments.....	26
Figure 10: The MT survey line printed over regional TMI.....	29
Figure 11: Geology of the Coompana Province and surrounding areas.....	32