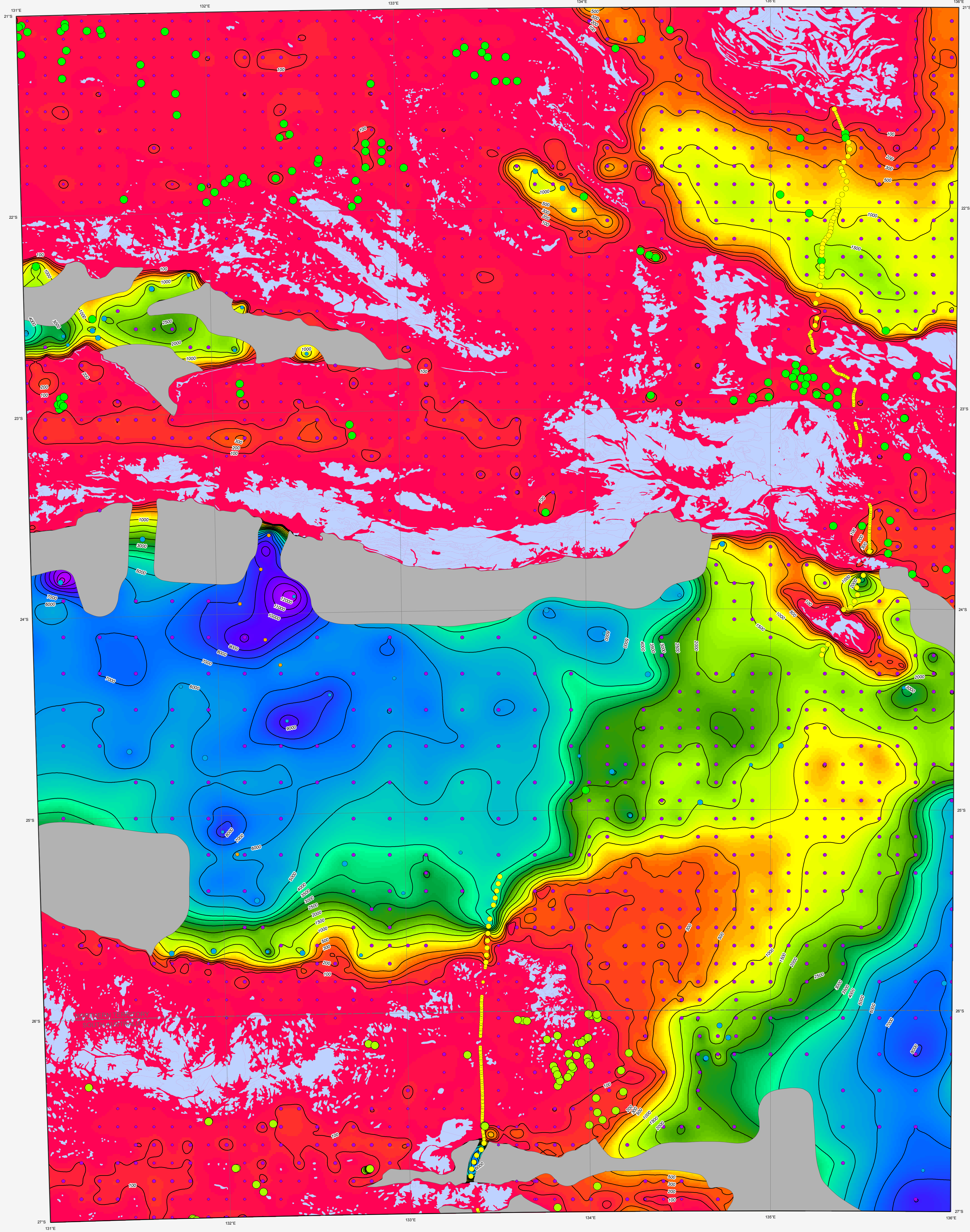
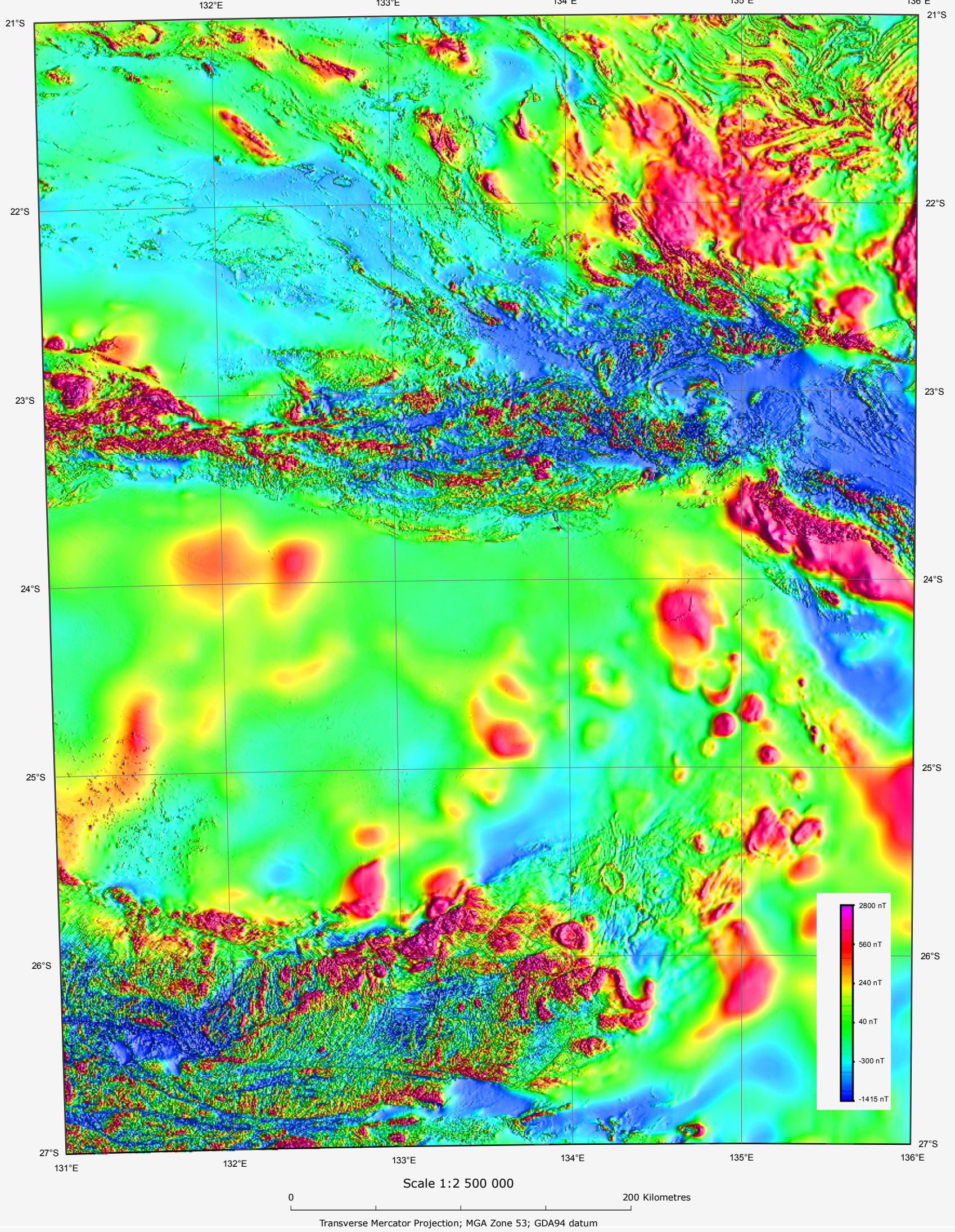


DEPTH TO MAGNETIC BASEMENT of the
ARUNTA-GEORGINA-AMADEUS-MUSGRAVE REGION



TOTAL MAGNETIC INTENSITY



A pseudocolour image of the total magnetic intensity (TMI) (reduced to the pole), with a "sun-angle illumination" from the north-east. Separate survey grids of TMI data have been merged into the composite grid from which this image is derived, with original survey data acquired by the Northern Territory Geological Survey, the Geological Survey of South Australia, Geoscience Australia and open file data acquired by companies.

The depth to magnetic basement map was constructed from a compilation of point-located depth values in metres below ground level. These point depths, sourced from drill hole, seismic and depth to magnetic source estimation methods, were combined with mapped geology (Whittaker et al., 2008) to delineate where magnetic basement crops out, and gridded using Intrepid Geophysics (<http://www.intrepid-geophysics.com/g/index.php>) variable density gridding routines using reduction factors of 2 and 3, and a cell size of 1000 m.

The depth-delineating data points which constrain the depth to magnetic basement map, ranked in approximate order from high to low relative confidence, are listed below.

Confidence	Depth-delineating data
High	● Drill hole data derived from Northern Territory company reports
	● Drill hole data derived from Geoscience Australia's PEDIN database (Aug 2009)
	● Drill hole basement intersections supplied by Geological Survey of South Australia (pers. comm.)
	● Interpreted basement depth estimates from seismic lines 08GA-OM1 and 09GA-GA1
	● Depth to magnetic source estimate from profile modelling - small residual (observed data minus modelled result)
	● Depth to magnetic source estimate from profile modelling resulting in a moderate residual (observed data minus modelled result)
	● Depth to magnetic source estimate from improved spectral method - using β optimisation (Meixner and Johnston, 2012)
	● Depth estimates derived from refraction static corrections which delineate near-surface low velocity zone for seismic lines 08GA-OM1 and 09GA-GA1
	● Interpreted basement depth estimates from seismic line L121-BMR85 (Shaw et al., 1991)
Low	● Depth to magnetic source estimate from improved spectral method - using a constant β value of 5 (Meixner and Johnston, 2012)

The magnetic basement surface as depicted here mostly delineates the interface between the Mesoproterozoic and older crystalline rocks, and the overlying Neoproterozoic and younger cover sediments. The magnetic basement includes the Aileron, Warumpi, Davenport and Musgrave provinces and the Kawa Domain. The non-magnetic cover includes the Amadeus, Georgina, Ngalla, Officer, Warburton, Pedirka and Eromanga basins. The Harts Range Group of the Neoproterozoic to Cambrian age Irmindila Province has been included as magnetic basement due to the strong magnetic character of these highly metamorphosed units.

The interpreted basement depths of the Amadeus Basin in the central portion of the seismic line L121-BMR85 (Shaw et al., 1991) are up to 7400 m shallower than the depth to magnetic source estimates. The shallowing of the base of the Amadeus Basin in this region is supported by geological interpretations of outcropping Amadeus Basin stratigraphy (Wellman, 1991). The discrepancy is interpreted to be due to a non-magnetic interval between the base of the Amadeus Basin and the top of the magnetic anomalies. The depth estimates from the interpreted seismic and the magnetic methods converge in the north and the south of the basin indicating that, in these regions, the base of the Amadeus Basin is coincident with the magnetic basement.

The data that were used to construct this map, depth-delineating points and 3D surfaces of the magnetic basement image, are available in Chopping et al., 2012.

References:

Chopping, R., Brennan, T., Meixner, A.J., and Schofield, A., 2012. 3D geophysical and geological map of the Arunta-Georgina region. Digital data, in prep.

Meixner, A.J., and Johnston, S., 2012. An iterative approach to optimising depth to magnetic source using the spectral method. ASEG 22nd International Geophysical Conference and Exhibition, Brisbane, 2012, extended abstract.

Shaw, R.D., Korsch, J.R., Goleby, B.R., and Wright, C., 1991. The BMR regional seismic line across the Amadeus Basin, Central Australia: Implications for the tectonics of the basin for hydrocarbon exploration. *Exploration Geophysics* 22, 345-352.

Wellman, P., 1991. Amadeus Basin, Northern Territory, structure from gravity and magnetic anomalies. In: *Geological and geophysical studies in the Amadeus Basin central Australia*, eds. Korsch, R. J. and Kennard, J.M. Bureau of Mineral Resources, Australia, Bulletin, 236, 594pp.

Whittaker, A. J., Glanville, H. D., English, P. M., Stewart, A. J., Retter, A. J., Connolly, D. P., Stewart, G. A., and Fisher, C. L., 2008. Surface geology of Australia 1:1,000,000 scale, South Australia [Digital Dataset] Canberra: The Commonwealth of Australia, Geoscience Australia. <http://www.ga.gov.au>

Outcropping magnetic basement geology (from Whittaker et al., 2008)

Regions where gridded magnetic basement surface has been masked due to very low confidence. The low confidence is the result of a lack of depth-delineating data

— 500 — Depth to basement contour (metres)

INDEX TO 1:250 000 MAPPING

MOUNT SOUTHERN F300	LANDER RIVER F300	ROBERT HILL F300	FREW RIVER F300
MOUNT BATH F300	MOUNT ROSE F300	BARROO CREEK F300	LALGO F300
ARNT-GORGINA F300	WARREROO F300	ALCOOTA F300	ALCOOTA F300
MOUNT BATH F300	HERMANUS F300	ALICE SPRING F300	LALGO CREEK F300
LANDER RIVER F300	HEBURN F300	ROCKING F300	HALE RIVER F300
ALICE SPRING F300	ALICE SPRING F300	ALICE SPRING F300	ALICE SPRING F300
ALICE SPRING F300	ALICE SPRING F300	ALICE SPRING F300	ALICE SPRING F300
ALICE SPRING F300	ALICE SPRING F300	ALICE SPRING F300	ALICE SPRING F300
ALICE SPRING F300	ALICE SPRING F300	ALICE SPRING F300	ALICE SPRING F300
ALICE SPRING F300	ALICE SPRING F300	ALICE SPRING F300	ALICE SPRING F300

It is recommended that this map be referred to as: Meixner, A.J., and Haynes, M.W., 2012. *Depth to magnetic basement map of the Arunta-Georgina-Amadeus-Musgrave region, Northern Territory* (First Edition), 1:1 000 000 scale, Geoscience Australia, Canberra. GeoCat No. 74053

Depth to magnetic basement image generated by A. J. Meixner. Geophysical image processing by A. J. Meixner. Cartography by L. M. Hughes.

Produced by GIS Services Group, Minerals and Natural Hazards Division, Geoscience Australia using ESRI ArcGIS 9.3 and 10.0 software

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Sales Centre, Geoscience Australia
GPO Box 378, Canberra, ACT, 2601
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