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Statewide 3D Model: Explanatory Notes

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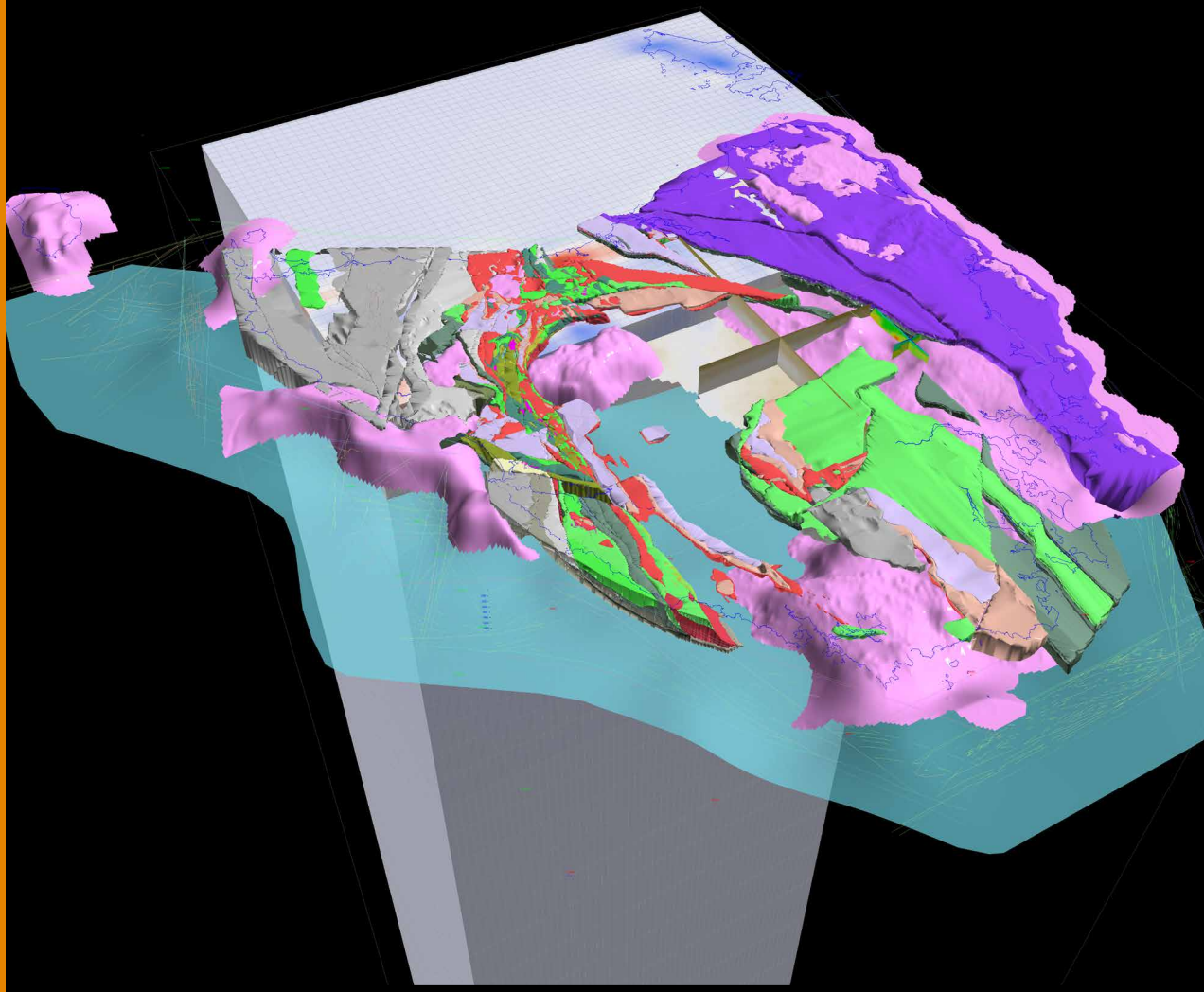

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Cover: View of the Statewide 3D Model.

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CONTENTS

1.0 INTRODUCTION

The State-wide 3D geological model released by MRT in 2004 (Murphy et al., 2004) was the first such construction for an entire jurisdiction in the world. This re-release incorporates the original State-wide 3D model with new additions including a granite surface model (after Leaman, 2012), a 3D shear wave velocity model from ambient seismic noise dispersion measurements (Young et al., 2013), the Tasmanian component of the AusLAMP continental 3D resistivity model (Ostersen, 2021) spanning the upper-crust through to lithospheric mantle depth range (sea level to ~100 km), and updated state-wide gravity and magnetic grids.

The State-wide 3D geological model was built from 51 interpretive cross-sections across the entire state, mostly at 10 km spacing and E-W orientation, interpreted to around 7 km. Sections were completed within six tectonic elements on a domain-by-domain basis. Details of each element in terms of rock associations, tectonic setting and structure, intrusions, and mineralisation are given in Murphy et al. (2004). Additional cross-sections showing greater detail and complexity were developed for the mineral-rich central MRV belt (15 x 5 km-spaced E-W sections and 2 N-S sections). Interpretation of features at depth on the cross-sections was strongly informed by automated potential field source edge mapping ("worms" and 2D forward models). Stacked worm profiles derived from various continuation heights (thereby related to source depth) and attributed by amplitude were used extensively for determining the relative shape, depth extent, and continuity of edges (e.g., faults, intrusive boundaries).

Additional information on MRT 3D geological and geophysical modelling methodology can be found in Bombardieri et al. (2021), Section 4.0, p 9.

2.0 MODEL CONTENTS

2.1 Cross Sections

This dataset group contains a total of 875 geological objects comprising 51 cross sections. Most are oriented E-W except in the central north of the State. Greater geological detail is present on the 5 km spaced E-W sections associated with the central Mount Read Volcanics belt.

2.2 Commodities

Isometric ore grade shell data of the major ore deposits of western Tasmania . These include Hellyer, Henty, Hercules, Mt Lyell, Que River, Renison Bell and Rosebery.

2.3 Faults

Fault surfaces are interpreted from surface mapping and cross sections. Most are named, some in line with established local practice, others for the first time in the course of model construction.

2.4 Pasminco 3D Model

The Pasminco Mt Read model for western Tasmania as described in Murphy et al. (2004). Subdirectories of major lithology and structural models including interpreted cross sections.

2.5 Raster

- **TasGeol500K:** Statewide geological map extracted from published MRT 1:500,000 series , which should be referred to for legend information.
- **Gravity - Isostatic residual, 1:500,000:** The gravity grid is a complete Bouguer anomaly residual following subtraction of Moho effects (MANTLE09 regional model), interpolated to 200 m cells from MRT open file data.
- **Total Magnetic Intensity, 1:500,000:** The TMI grid, containing values in nT after subtraction of the International Geomagnetic Reference Field, was generated with a mesh size of 40 m and has been coloured with the 'cube' perceptually balanced palette of Niccoli (2014). The magnetic grid is a stitch of various TMI surveys flown between 1957 and 2022 with line spacings varying between 50 m and 1500 m.

2.6 Seismic

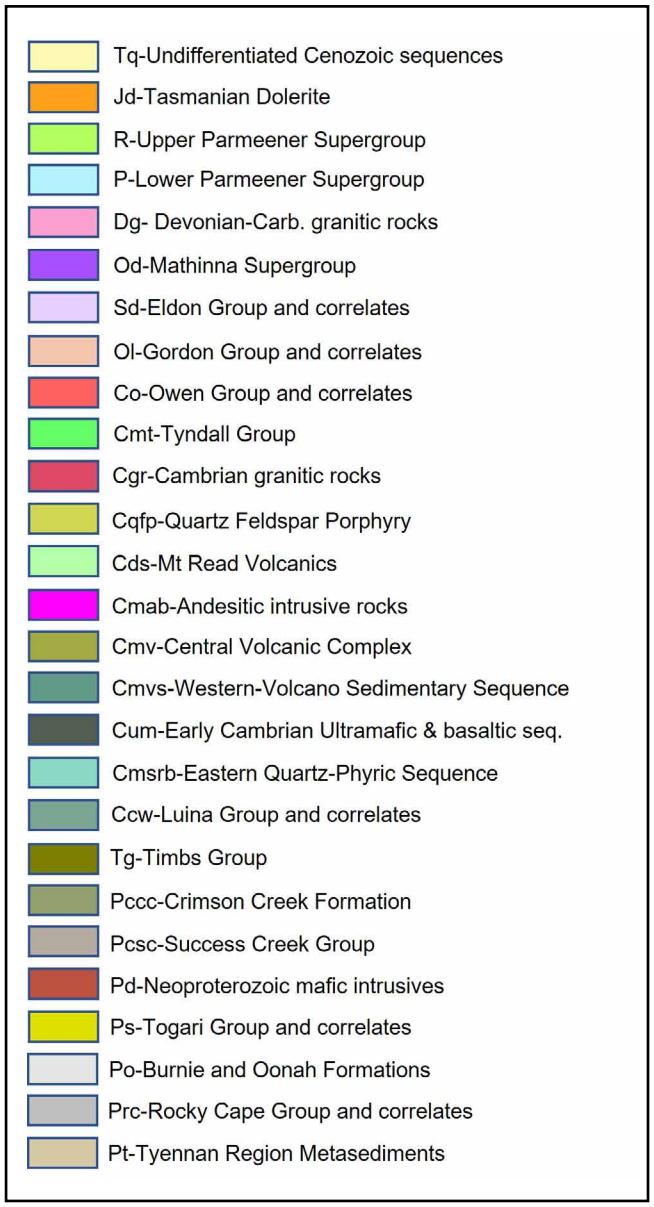
Linear features interpreted from AGSO offshore deep crustal seismic surveys (Drummond et al., 2000; Murphy et al., 2004; Kennett, et al., 2016).

2.7 Statewide granite model

Granite model of the upper contacts of regional granitic intrusions. The interpolated granite surface was derived from 2D gravity and magnetic modelling and modified after Leaman (2012).

2.8 Volumetric Surfaces

Geological unit volumes according to the standard geological legend in Murphy et al. (2004). Lithologies in GeoScience Analyst are listed numerically from youngest (1) to oldest (23). Alpha characters preceding lithological names are linked to the legend in Murphy et al. (2004). Note lithological derivatives of alpha characters also exist for volumetric and cross-sectional surfaces. With some exceptions, volumetric surfaces generally relate to pre-Permian units at the level of stratigraphic groups and subgroups, rather than formations, and to major intrusive bodies.



2.9 Passive Seismic Surveys

Shear wave velocity models from inversion of ambient seismic data.

- East Midlands shear wave velocity model from a 2021 survey using 2-3 km-spaced nodes (MRT report in preparation).
- Onshore shear wave velocity model (Young et al., 2013).

AusLAMP_MT

Resistivity in Ωm inverted from AusLAMP magnetotelluric data (Ostersen, 2021).

Coast

Vector file of Tasmanian coastline from 1:250,000 scale mapping.

Digital Elevation Model (DEM)

Surface topography of the State-wide model. Extracted from MRT's statewide digital elevation model (Kain and Mazengarb, 2021) resampled to 300 metre cells.

Moho

Crust-mantle boundary produced from inverted refraction and wide-angle reflection travel-times (Rawlinson et al., 2001).

3.0 DATA FORMAT AND VISUALISATION

The model is being distributed as a Geoscience ANALYST project and is described here as such. Geoscience ANALYST is visualisation and communication software for GoCAD® 3D models, made freely available by Mira Geoscience (http://www.mirageoscience.com/).

GoCAD_Objects.zip Individual model components in native GOCAD® format.

Statewide_3D_Model.prj.zip Entire model in native GOCAD® project workspace.

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