

YALGOO 2241, section C–D, 1:100 000 geological map

(Youanmi Terrane, Yilgarn Craton)

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Location

Maps: YALGOO (SH 50-2) and YALGOO (2241)

Zone: MGA Zone 50

End coordinates: 464859E 6854865N to
488243E 6856304N

Length: 23.4 km

Scale of interpretation: 1:100 000

The east- to west-trending section C–D traverses the Yalgoo greenstone belt with the granitic ‘Yalgoo Dome’ to the west (Ivanic et al., 2015). It lies approximately 26 km south of section A–B (Fig. 1 in that section).

Tectonic units

The Yalgoo greenstone belt hosts supracrustal rocks of the Norie, Polelle, and Glen Groups (Van Kranendonk et al., 2013) and mafic–ultramafic intrusive rocks of the Annean Supersuite. The supracrustal rocks are dominantly tholeiitic to komatiitic basalts with lesser banded iron-formation (BIF) and andesite. However, the Glen Group, which unconformably overlies the Polelle and Norie Groups, is dominated by siliciclastic sedimentary rocks. Ten kilometre-scale layered mafic–ultramafic bodies of the Warriendar Suite dated at c. 2793 Ma (GSWA 198299; MTD Wingate, 2016, written comm., 4 May) intrude the Norie Group and the lower parts of the Polelle Group. In this region, these units are typically 0.5 km thick.

Crosscutting the Polelle Group are foliated tonalitic to granodioritic rocks of the Goonetarra Granodiorite (Rothsay Suite) to the east and foliated granodiorite to monzogranite of the Big Bell Suite (Ivanic et al., 2012) to the north and east. This greenstone belt is host to several gold prospects and, to the north, a multitude of pegmatite mineral deposits.

Structure

The overall form of the southern part of the Yalgoo greenstone belt is a north–south-trending, open syncline, which is unconformably overlain by the Mougooderra Formation siliciclastic basin. These are crosscut by north–south trending, steeply dipping greenschist facies shear zones (e.g. the Mulloo Shear Zone in the central

eastern part of the section). Bedding is moderately inclined within older greenstone units and shallower (possibly $\leq 10^\circ$) within the Mougooderra Formation. The Badja Shear Zone at the eastern margin of the Goonetarra Granodiorite is interpreted to have a normal sense of shear with granite-up, greenstone-down movement. A shear zone is also present at the western margin of the Big Bell Suite metagranodiorites to the east of the section with a shear sense consistent with minor thrusting. A splay of shear zones lies to the north and the northwest of this section and is interpreted to be associated with vertical tectonic activity of the ‘Yalgoo Dome’. In greenstones to the north of this section is a large-scale tight isoclinal fold (see section A–B).

Geophysical data

Bouguer gravity, aeromagnetic, and topographic data were sampled every 500 m along the profile. Gravity data were sampled from the Geological Survey of Western Australia (GSWA) merged Bouguer gravity grid of Western Australia (GSWA, 2013). Gravity data have not been terrain corrected. Gravity stations on YALGOO are spaced around a 2.5 km grid. Aeromagnetic data were sampled from the GSWA 2014 merged magnetic grid of Western Australia (GSWA, 2014). On YALGOO, aeromagnetic data are available at 400 m line spacing, with several higher resolution surveys. The topography was sampled from Shuttle Radar Topography Mission version 3 (SRTM3) grid (International Center for Tropical Agriculture, 2004).

Physical property data from Williams (2009) and Emerson (1990) were used to attribute density and magnetic susceptibility values to the forward model and are detailed in Table 1.

Magnetic and gravity modelling

2D magnetic and gravity forward modelling was done with Oasis Montage’s GM-SYS (version 8.2) software. No regional trend was removed from either the Bouguer gravity or aeromagnetic data. Aeromagnetic data were reduced to the pole. Gravity stations were placed 0 m above the topography, and magnetic flight lines were placed at an elevation of 80 m above the topographic surface.

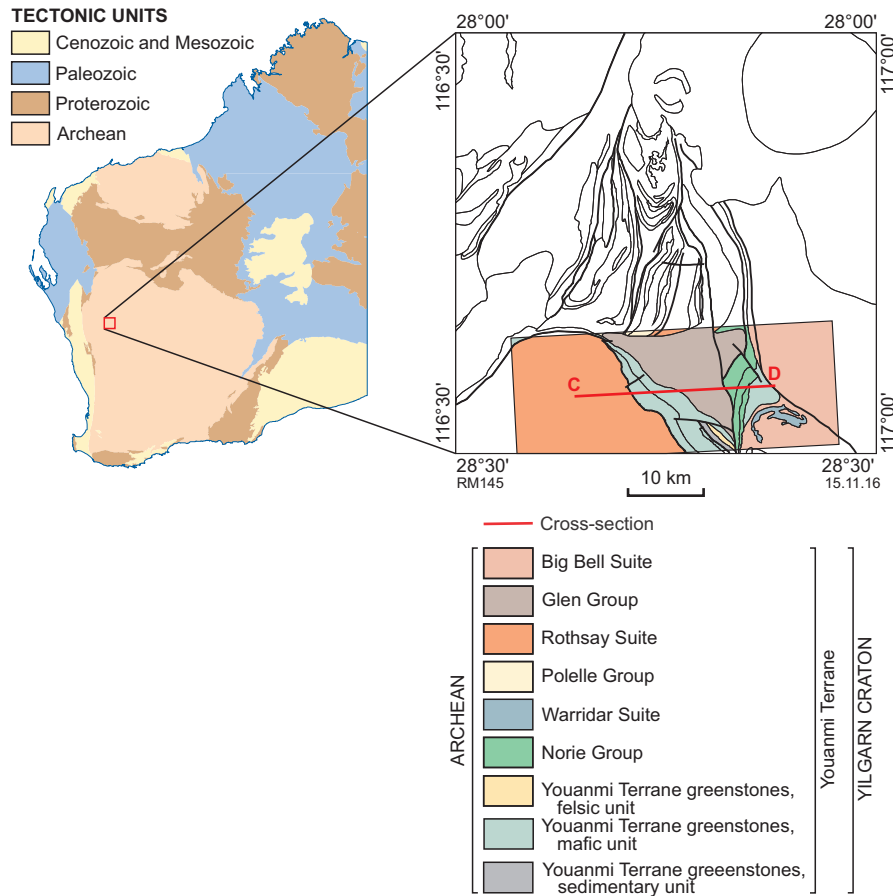


Figure 1. Location of YALGOO map sheet with simplified interpreted bedrock geology within 8 km of cross-section C–D

Table 1. Petrophysical properties of modelled units and the corresponding map codes and lithologies. The colour column refers to colours used Figure 2a

| Colour | Modelled unit | Map code | Rock type | Density (g/cm ³) | Magnetic susceptibility (SI) |
|--------|------------------------------|------------------------------------|----------------------------------|------------------------------|------------------------------|
| | Big Bell Suite | A-SDB-mgg | Metagranodiorite | 2.65 | 0.00 |
| | Glen Group | A-GLm-mhs | Pelite and psammite | 2.68 | 0.00 |
| | <i>Mougooderra Formation</i> | A-ANgo-mgms, AANgo-mgm A-ANgo-mgtn | Metamonzogranite | 2.67 | 0.00 |
| | Goonetarra Granodiorite | A-ANgo-xmgtn-mgm | Tonalite gneiss | | |
| | | A-NO-bb, ANO-bbd | Basalt | 2.83 | 0.00 |
| | Norie Group | A-NO-mbs | Mafic schist | 2.83 | 0.00 |
| | | A-NO-frt | Volcaniclastic rocks (± BIF) | 2.70 – 2.80 | 0.00 – 0.08 |
| | | A-ANW-od | Dolerite | 2.83 | 0.00 |
| | Warriedar Suite | A-ANW-ap | Peridotite with BIF | 2.83 | 0.02 |
| | | A-mwa-YYO | Amphibolite | 2.75 – 2.83 | 0.00 – 0.03 |
| | Youanmi Terrane Greenstones | A-mbs-YYO, A-mbbs-YYO | Mafic schist | 2.83 – 2.85 | 0.00 – 0.05 |
| | | A-bb-YYO, A-bbw-YYO | Basalt (± BIF) | 2.85 | 0.00 – 0.15 |
| | | A-mba-YYO, A-mogs-YYO | Amphibolite, metagabbro with BIF | 2.85 | 0.00 |
| | | A-cib-YYO | BIF and ferruginous banded chert | 2.83 | 0.20 – 0.70 |

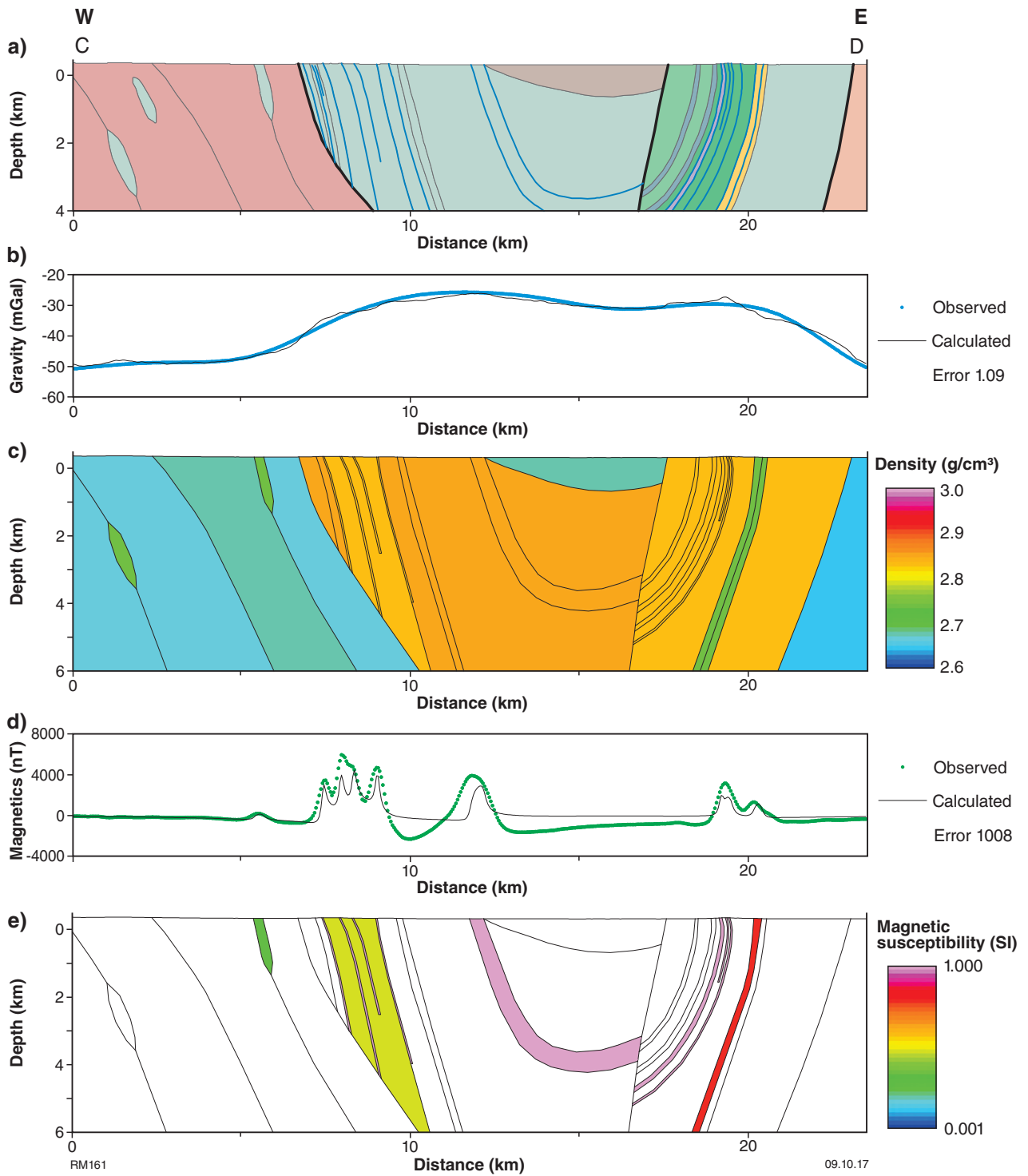


Figure 2. Gravity and magnetic forward model of section C–D: a) simplified cross-section from sheet YALGOO, legend shown in Table 1; b) observed and calculated Bouguer gravity data; c) density model; d) observed and calculated magnetic susceptibility data; e) magnetic susceptibility model

Results

The 25 km-long section was modelled to a depth of 6 km. The initial model was the preliminary cross-section C–D on sheet YALGOO. Where necessary, the physical properties and geometries of the preliminary cross-section were adjusted until the cross-section was consistent with the potential field data.

Section C–D traverses the southern part of the Yalgoo greenstone belt; to the east of the granitic ‘Yalgoo Dome’ and to the west of metagranitic rocks of the Big Bell Suite (Fig. 2a). The observed Bouguer gravity data is dominated by two gravity highs (Fig. 2b) that are attributed to a greenstone belt with densities of 2.70–2.85 g/cm³ (Fig. 2c). High density is attributed to large volumes of tholeiitic basalt to depths of approximately 6 km, which are either unassigned Youanmi Terrane basalts or have been assigned to the Norie Group.

The slight Bouguer gravity low within the greenstone belt is attributed to a ~600 m-thick unit of sedimentary rocks (i.e. the unconformably overlying and shallowly dipping Mougooderra Formation) that thicken eastwards and have a density of 2.68 g/cm³. The Bouguer gravity lows at the ends of the section (Fig. 2b) are attributed to felsic intrusives with densities of 2.65–2.67 g/cm³ (Fig. 2c).

The observed magnetic data are featureless with the exception of several high-amplitude, high-frequency anomalies (Fig. 2d) that were produced by steeply dipping BIF and ferruginous chert (Fig. 2e).

References

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