Lake Percy 2934, section C–D, 1:100 000 geological map

(Lake Johnston greenstone, Yilgarn Craton)

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Location

Maps: Boorabbin (SG 51-13) and Lake Percy (2934)

Zone: MGA Zone 51

End coordinates: 250812E 6459171N to 260297E 6469290N

Length: 13.8 km

Scale of interpretation: 1:100 000

This is a southwest to northeast section across the Lake Johnston greenstone belt (Fig. 1).

Tectonic units

Greenstones in Lake Percy are in the northernmost part of the Lake Johnston greenstone belt. They are located in the southern part of Southern Cross Domain of the Youanmi Terrane in the Yilgarn Craton. The greenstones are intruded by strongly to weakly sheared monzogranite and granodiorite, ranging in age from 2720 to 2660 Ma (Romano et al., 2014).

The greenstone succession itself is dominated by mafic volcanic rocks, with discrete ridges of banded iron-formation (BIF) and associated komatiites and poorly exposed felsic rocks. A felsic volcaniclastic conglomerate found in a drillcore in the centre of the greenstone belt on Lake Percy has been dated at 2735 ± Ma (GSWA 207573, preliminary data).

Steeply dipping southwesterly to northeasterly trending Proterozoic mafic dykes of the Widgiemooltha Supersuite are crosscutting the Archean granite and greenstones, in particular the Binneringie Dyke.

West of the greenstone belt is a large area of migmatites and tonalite–trondjhemote–granite (TTG) is exposed, presumably presenting a lower crustal level.

Structure

The geometry of the Lake Johnston greenstone belt is an overall wedge-shaped synclinal structure, with a north-northwesterly to south-southeasterly trending axis, folded around several granite domes of laccolithic shape (2770–2710 Ma). Younger granites ranging from 2695–2640 Ma are either crosscutting the stratigraphy or are aligned within the regional strain pattern.

Pre-2260 Ma structures and units are generally truncated and transposed by east-dipping shear zones. A major regional scale feature is the northwest–southeast-trending Koolyanobbing Shear Zone (KSZ), which has transposed and overprinted the eastern limb of the greenstone belt.

East of the greenstone belt, synkinematic monzogranites (c. 2660 Ma) are aligned parallel to the KSZ. This ductile synkinematic regional-scale crustal zone can be traced along the western side of the greenstone belt for at least 100 km. Only small slivers of an older, strongly deformed granitic gneiss are preserved along the shear zone on the eastern margin of the greenstone belt.

Geophysical data

The magnetic profiles were extracted from the Geological Survey of Western Australia (GSWA) 2014 merge of the total magnetic intensity (TMI) of Western Australia (GSWA, 2014) along the position of the cross-section A–B on the Lake Percy map (Romano, 2015; Fig. 2b). Topographic data were taken from the Shuttle Radar Topography Mission (SRTM) at the same points. Gravity modelling was not done as the data density in this area was not sufficient enough to provide a representative profile.

Physical property data were estimated from Yilgarn average values and are listed in Table 1.

Modelling

All modelling was performed in the GM-SYS software run within the Oasis Montaj software. All models are 2.5D with polygons extending perpendicular to the profile.

Results

This profile is parallel to profile A–B on sheet Lake Percy (Romano, 2015). The magnetic profile has a smooth background with several discrete peaks (Fig. 2b). Each can be associated with units within the greenstone belt. Two strands of the Binneringie Dyke of the Widgiemooltha Supersuite form two strong magnetic peaks in the west (Fig. 2c).

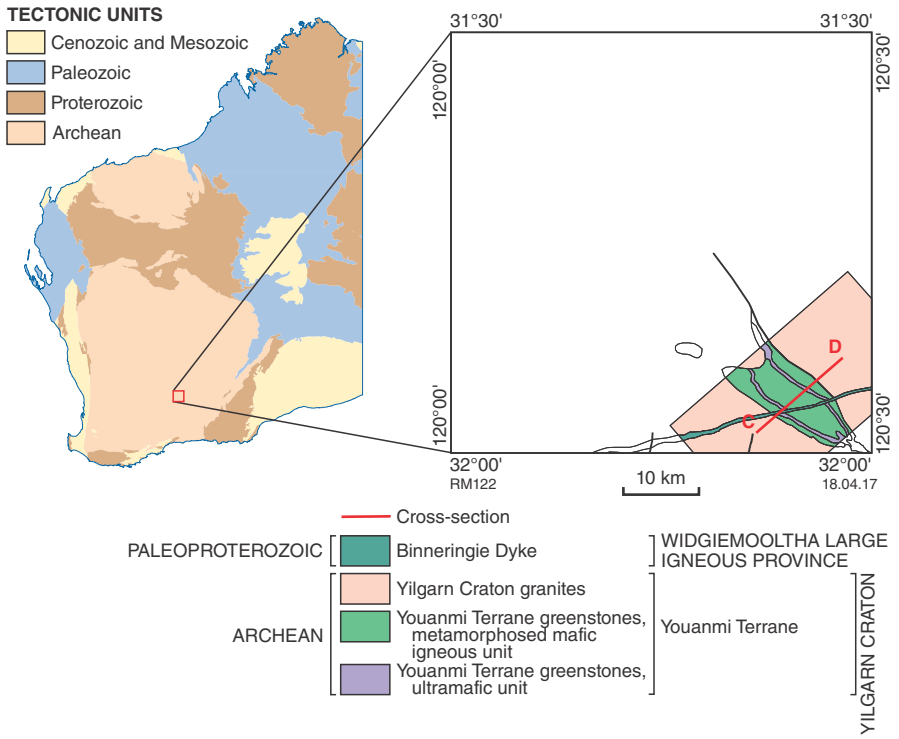

Figure 1. Location of Lake Percy 1:100 000 map sheet with simplified interpreted bedrock geology within 8 km of cross-section C–D

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

Colour	*Modelled unit*	*Map code*	*Rock type*	*Magnetic susceptibility (SI)*
	Binneringie Dyke	P_-Wlbi-o	Dolerite	0.085
	Yilgarn Craton granites	A-gm-Y, A-gmfp -Y, A-gmys-Y	Granite	0.000 – 0.008
	Yilgarn Craton metagranites	A-mgi-Y, A-mgss-Y	Metagranite	
	Youanmi Terrane greenstones	A-mwa-YYO, A-xmwa-mhs-YYO	Metamorphosed igneous rocks	0.000 – 0.125
		A-xfdv-mhs-YYO	Felsic volcanic and sedimentary rocks	
		A-mba-YYO	Basalt rocks	
		A-xcx-uk-YYO	BIF and komatiite	0.010 – 0.032

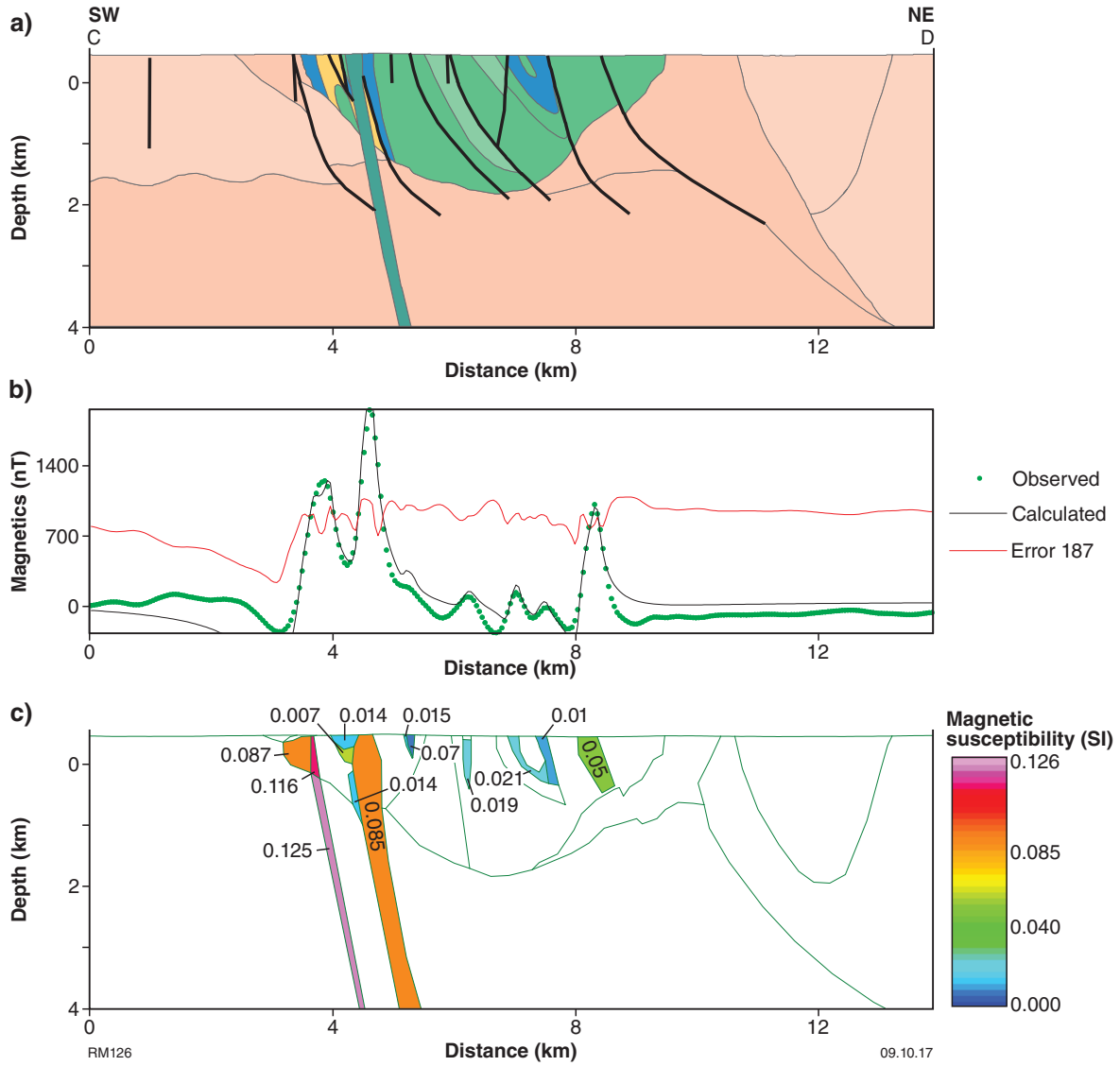

Figure 2. Profiles across the section C–D showing: a) lithological section from Lake Percy 1:100 000 map sheet; b) observed and calculated magnetic anomaly profile with error line; c) section of magnetic susceptibility per unit lithology

Minor magnetic peaks in the central part of the greenstone belt are caused by narrow units of BIF and adjacent komatiites. The slightly elevated signal in the eastern part of the profile is the result of increased fluid flow along the eastern side of the greenstone belt limb. This has been affected by the Koolyanobbing Shear Zone, and also the monzogranites with an age of c. 2710 Ma west of the greenstone belt and synkinematic flow-banded monzogranites dated at 2660 Ma (Romano et al., 2014) to the east.

References

Geological Survey of Western Australia 2014, Magnetic anomaly grid (80 m) of Western Australia (2014 – version 1), 16 September 2014 update: Geological Survey of Western Australia, digital data layer.

Romano, SS 2015, Lake Percy, WA Sheet 2934: Geological Survey of Western Australia, 1:100 000 Geological Series.

Romano, SS, Thébaud, N, Mole, DR, Wingate, MTD, Kirkland, CL and Doublier, MP 2014, Geochronological constraints on nickel metallogeny in the Lake Johnston belt, Southern Cross Domain: Australian Journal of Earth Sciences, v. 61, no. 1, p. 143–157.