



The Mangana–Alberton aeromagnetic survey —a preliminary interpretation

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Abstract

A regional aeromagnetic survey was flown over the Mangana–Alberton gold belt in February 1989. Despite the known problems with a widely varying terrain clearance, both qualitative and quantitative interpretations show that the subsurface geology is dominated by materials with the magnetic properties of granodiorite. The gold belt is marked by a magnetic low which corresponds to a narrow depression in the magnetic basement.

INTRODUCTION

Austrex International Ltd were selected to fly the area bounded on the west by 560 000 mE, on the east by 585 000 mE, on the south by 5 390 000 mN and on the north by 5 430 000 mN, with a flight line spacing of 500 m and a nominal terrain clearance of 150 m. Both magnetic and radiometric data were acquired. Budgetary constraints required the use of a fixed-wing aircraft, and terrain clearances of up to 700 metres have been reported by the contractor.

In much of the area published geological maps are only available at 1:250 000 scale but discussions with workers in the area, including Drs R. Findlay and D. Leaman, have assisted with the interpretation. A more detailed interpretation will require correction of the magnetic data for terrain clearance and more detailed geological input.

QUALITATIVE INTERPRETATION

The radiometric map (fig. 1) has been corrected by the contractor to correspond to a nominal terrain clearance of 250 metres. In areas of low topographic relief this has produced acceptable results but in the more rugged parts of the area the correction process has produced spurious anomalies in areas of high terrain clearance. Beyond a terrain clearance of 300 m the gamma radiation is almost completely attenuated by the air (Minty, 1988), and a different style of processing is required to produce a useful map.

The main features of the radiometric map are:

- (i) Linear features following rivers and valleys. In the flatter central and south-eastern parts of the sheets the elevated values represent the nature of the source of the stream sediments. In the areas of more rugged terrain most of the known features over valleys result from the correction during processing.
- (ii) A region of high counts over the adamellite in the north-eastern corner of the sheet.

The magnetic map (fig. 2) is dominated by the granodiorite or equivalent materials. There are anomalies

of smaller areal content attributed to dolerite and basalts but both the adamellite and Mathinna Beds have little character.

Dolerite crops out at locations 1, 2, 3, 4, 5, 6, 7, 8, 9 and 14 on Figure 2. It should be noted that Mt Young (580 000 mE, 5 420 700 mN) has only a very low amplitude anomaly, implying the presence of a thin dolerite capping. Locations 10, 11 and 12 correspond to basalt outcrop. The linear anomaly near 580 000 mE between 5 390 000 mN and 5 403 000 mN corresponds to either a thin shallow basalt, or basalt or dolerite boulders, perhaps in an old river bed.

The other large high-amplitude anomaly (location 13 on fig. 2) corresponds to mapped granodiorite. It has steep margins and is surrounded by a small magnetic low. Several small intense anomalies (563 000 mE, 5 411 500 mN; 585 400 mE; 5 404 500 mN; 585 000 mE; 5 408 000 mN) are attributed to basalt. The character of much of the rest of the map suggests that, with the exception of the magnetic low along the gold belt, much of the area is underlain by granodiorite or a material with the same magnetic properties at a depth of 1 to 2 kilometres. The magnetic low represents either more deeply buried granodiorite, an alteration zone, or an absence of granodiorite.

QUANTITATIVE INTERPRETATION

Two east-west sections (A–B, C–D) and a south-west–north-east section (E–F on fig. 2) were chosen as being representative of the area. The initial models for section A–B assumed thin layers of metamorphosed Mathinna Beds overlying adamellite in the eastern and western parts of the area, whilst the other two sections had metamorphosed Mathinna Beds in the west and granodiorite in the east.

The final models (fig. 3, 4 and 5) show sections dominated by granodiorite (or materials of similar magnetic properties). Section A–B (fig. 3) shows two shallow (1.5–2.5 km) masses separated by a deeper zone with granodiorite at a depth of about 3.5 km. Section C–D (fig. 4) shows the effect of including a thin (500 m) skin of metamorphosed Mathinna Beds on top of the western granodiorite body. Because of the lack of data on terrain clearance it is not possible to determine if this, or the simple granodiorite body of section A–B, best represents the true situation. There are three distinct granodiorite masses present, with a small dolerite or basalt body near the western end of the section.

Section E–F links the other two sections and shows the western granodiorite to be at a depth of 800 to 2200 metres. Once again there is a distinct deepening adjacent to the eastern granite. The dolerites of the Ben Lomond area

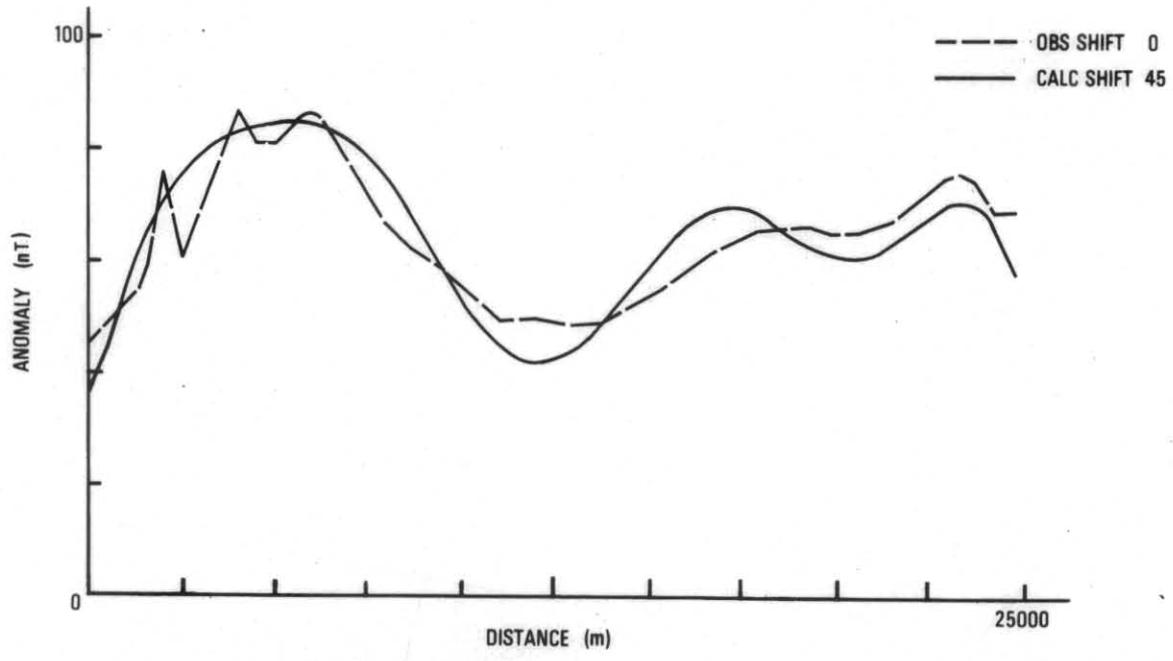
produce an increased anomaly at the south-western end of the section.

Because of the varied, and at this time unknown terrain clearance, a complete interpretation will require corrections to simulate uniform clearances and altitudes and three-dimensional modelling. Only then will it be possible to resolve some of the present ambiguities.

REFERENCE

MINTY, B. R. S. 1988. A review of airborne gamma-ray spectrometric data-processing techniques. *Rep. Bur. Min. Res. Geol. Geophys. Aust.* 255.

[7 June 1989]



W MATHINNA REGION 5410N, 560-585E E

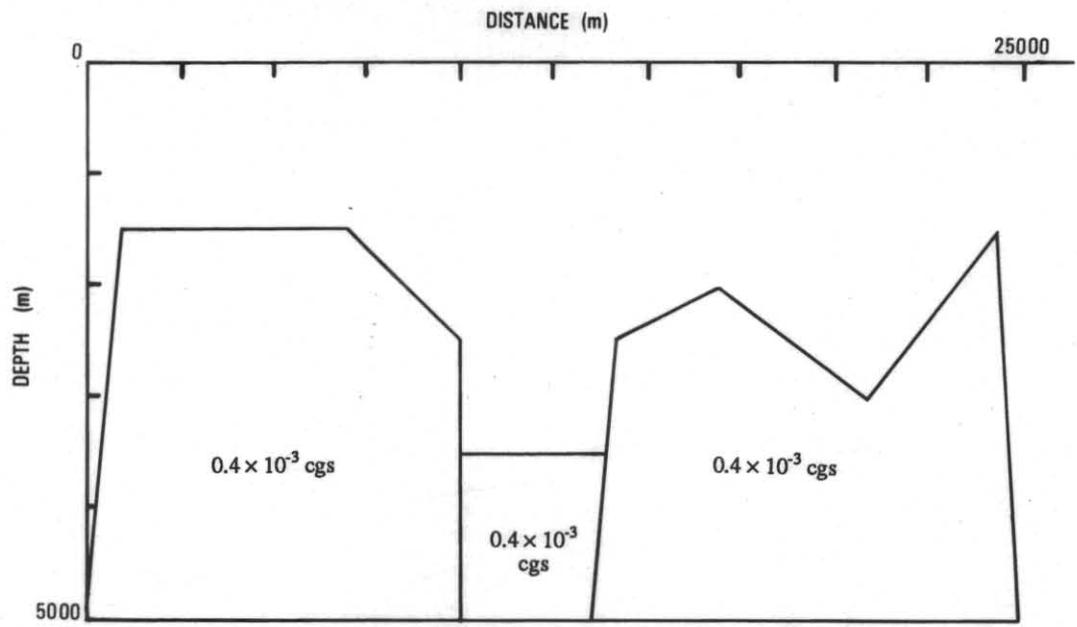
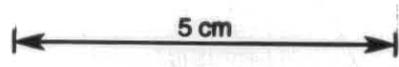
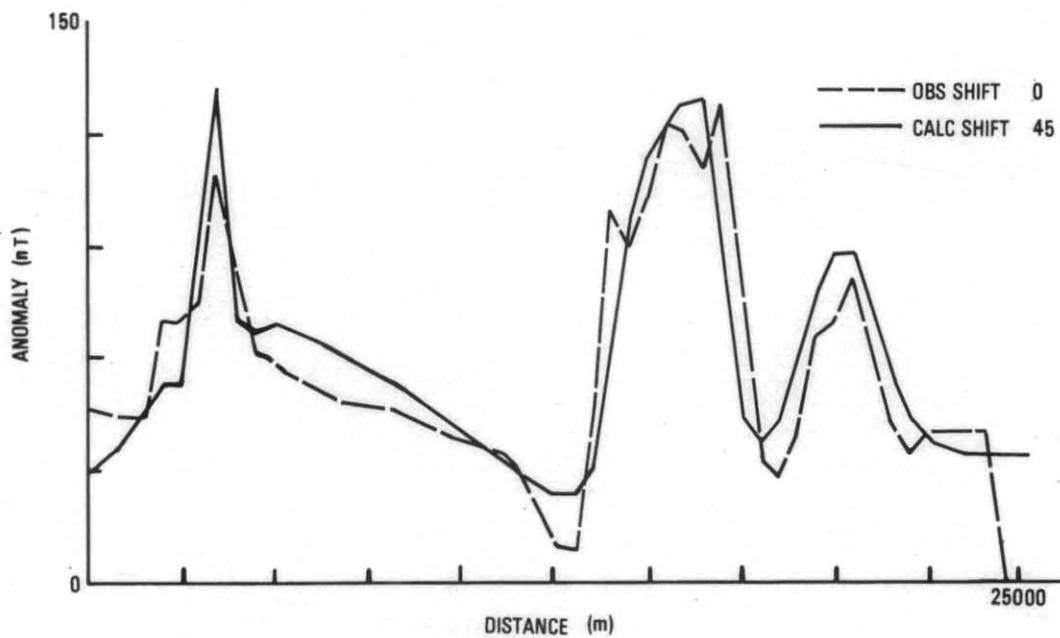


Figure 3. Magnetic model, Section A-B.





W MATHINNA REGION 5420N, 560-585E

E

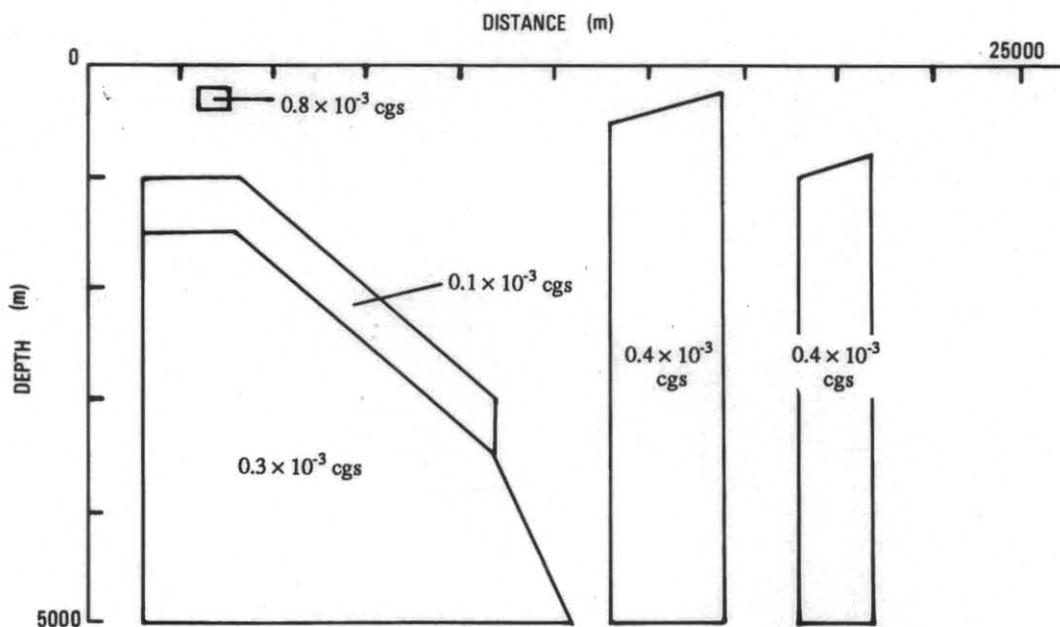


Figure 4. Magnetic model, Section C-D.

5 cm

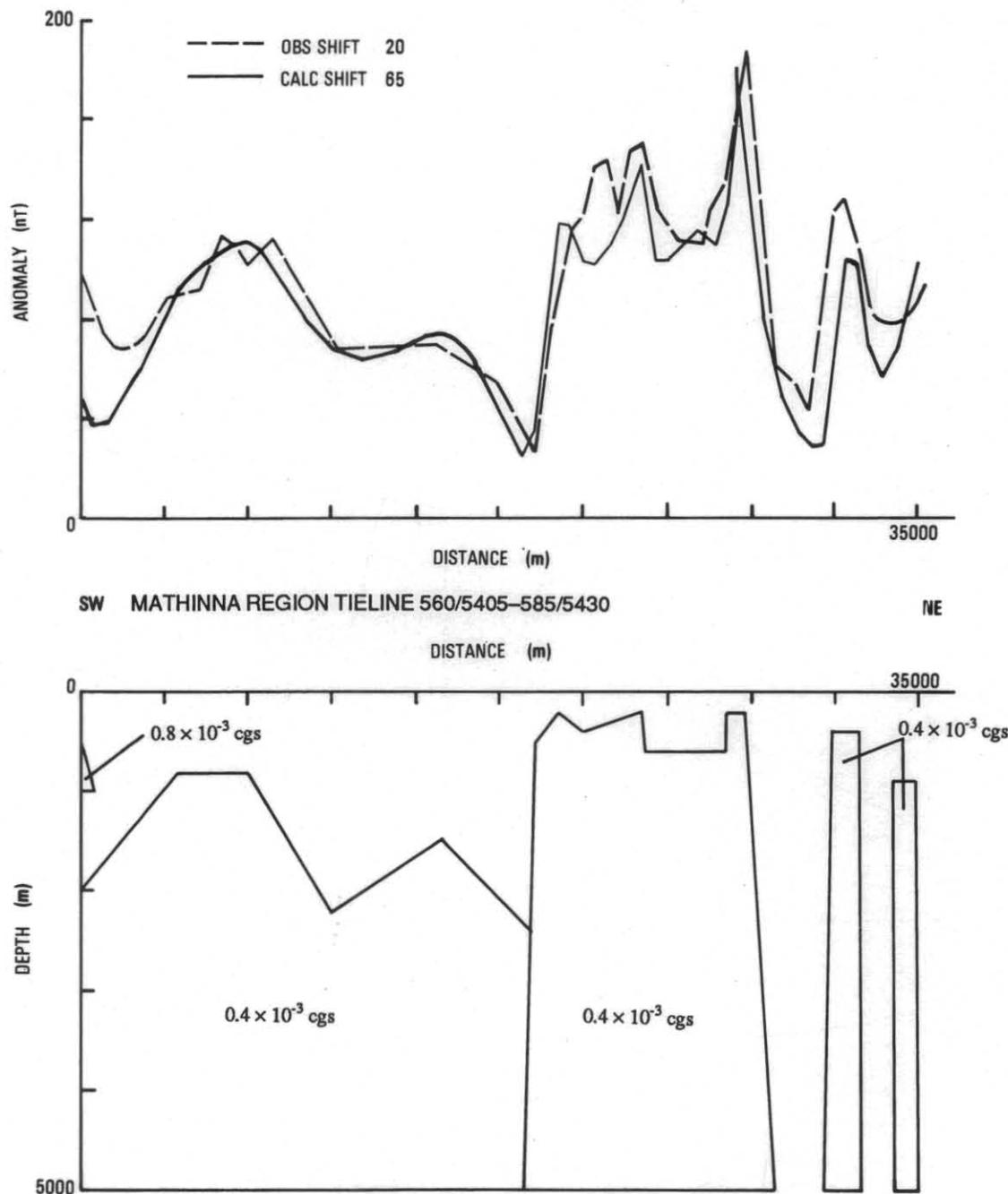


Figure 5. Magnetic model, Section E-F.