ARCTAN Services Pty Ltd

9 Marshall Avenue, Warrawee NSW 2074
Phone (02) 9489 6836 Fax (02) 9489 2761
Email: arctan@arctan.com.au

ABN 46 002 948 361

Mineral Exploration Consultants

Rum Jungle Project
Batchelor N.T.

Computer Modeling and Interpretation of Airborne Magnetic Anomalies

Author: Steve Collins
Client: Compass Resources NL.
Date: 6 January 2002

Computer Modelling of Airborne Magnetic Data
Rum Jungle NT

Steve Collins 6 January 2002

A prominent anomaly in airborne magnetic data from Rum Jungle, Northern Territory has been modeled using a truncated prism model to determine the depth, orientation and size of the causative magnetic source. The initial models generated were not self consistent and appear to be unlikely from a geological viewpoint. Closer examination of the anomaly indicates that the source is likely to be strongly remenantly magnetised which suggests a source composed of disseminated pyrrhotite. As a result of this remenance it is not possible to determine the dip or magnetic susceptibility of the source but a good estimation of the depth and possibly the thickness of the source has been obtained.

The anomaly of interest extends from approximately 715,500E / 8,562,000N to 716,800E / 8,562,700N (GDA94 - MGA Zone 52 coordinates) over a strike length of about 1600 metres. The strike direction is approximately 53 degrees true. The raw magnetic data are shown in Figure 1.

Initial computer modelling of this magnetic feature was run on a north-south line, 716,400E using a truncated prism model (Figure 2). The model suggests a very flat dip to the southeast and a depth below the survey height of 160 metres. When the flying height of the survey is subtracted this corresponds to a depth below the surface of about 90 to 100 metres. The model fails to adequately account for a lack of a well defined low southeast of the main anomaly and this was examined further by subtracting the model response from the data to obtain a residual which could be further modeled. The residual was modeled as a second flat dipping body (Figure 3). The combined model of two flat dipping thin magnetic sheets produced a very good match to the observed data on this line. However, these models were tested on adjacent lines and failed to adequately account for the observed magnetic data. Since the mapped geology of this area was not under consideration at the time of this modelling, the geological validity of flat dips to the southeast is not known. These are not consistent however with the magnetic character of the surrounding area and the possibility that the source of the magnetic anomaly was strongly remenantly magnetised was considered.

A review of the magnetic data was undertaken. In particular it was noted that the inclination of the earth's magnetic field of between 40 to 45 degrees at this location should produce predominantly asymmetric anomalies but that the anomaly under examination is reasonably symmetric in a north-south direction. Reduced to pole magnetic data for this area (Figure 4) display a strong low north of the anomaly and striping to the south. This again is diagnostic of magnetic remenance.

A second modelling line was generated by from interpolated data in a direction approximately perpendicular to the strike of the magnetic anomaly. If the mismatch on the southeastern side of the anomaly is ignored a reasonable match between the observed data and a steeply dipping, wide, depth limited body is obtained (Figure 5). If the inducing field is steepened from the 40 to 45 degrees which occurs in this area to about 60 degrees then a very good match between the observed and modeled data is obtained (Figure 6).

The conclusion drawn from this is that the modeled magnetic anomaly at Rum Jungle is not due to induced magnetisation but to remenance. There are a number implications of this observation and the generated models.

1. The source of the magnetic anomaly is highly likely to be disseminated pyrrhotite. While it is common for remenant anomalies to occur from magnetite bodies, strong remenance is much more likely to occur in pyrrhotitic rocks. In tests by David Clark from CSIRO samples of rock containing disseminated pyrrhotite had on average magnetic anomalies due to remenance of twenty times the induced magnetisation. Thus on average a sample of disseminated pyrrhotite produced a magnetic signature almost entirely due to remenance. Modelling of such magnetic features based on an assumption of induced magnetisation is unlikely to produce accurate results.

2. The dip of the source body is undetermined since the magnetic anomaly observed is a function of the direction of the remenance not the dip of the source relative to the earth's field.

3. The susceptibility of the body is undetermined and in fact is irrelevant.

4. The location of the source is less well defined than with induced magnetic anomalies since the location of the observed anomaly will depend on the dip of the remenance. However, a good fit was obtained by modelling the source as if the anomaly was due to a steeper inducing field, and so it is likely that the location of the centre of source will be reasonably defined in this model. That is, the centre of the top of the source is approximately 30 metres northwest of the origin point of the oblique line (716,100E / 8,562,100N) or just south (approximately 100m south) of the peak of the observed magnetic anomaly. This will be the same for the length of the anomaly. The model also suggests that the source is quite broad (480m) so the exact centre of the top of the source is not particularly relevant.

5. The source is probably quite broad. The model suggests a width of 480 metres but this is probably poorly defined and the source may not have well defined edges anyway.

6. The interpreted depth of the source is relatively unaffected by remenance. The model depth of 170 metres indicates a depth below the surface of the source of this anomaly of about 100 metres (after subtracting a nominal 70 metre flying height for the airborne survey).

7. Reduced to pole magnetic data should not be used to interpret this anomaly.

In conclusion, the source of the modeled magnetic anomaly at Rum Jungle is probably remenantly magnetised and so disseminated pyrrhotite is likely to be the cause. The source of the anomaly lies at a depth of about 100m below the surface and is centred about 100m southeast of the strongest magnetic measurement. The source is likely to be several hundred metres wide but may not have well defined edges. It is also likely to be limited in depth extent to well within one kilometre. The orientation (dip) of the source is unknown as is its magnetic susceptibility.

Other magnetic anomalies west of the modeled body are likely to be of similar composition and lie ate about the same depth (based on a comparison of anomaly half widths). No modelling was done on these since it is unlikely that further information can be obtained on the assumption that these are also strongly remenantly magnetised.

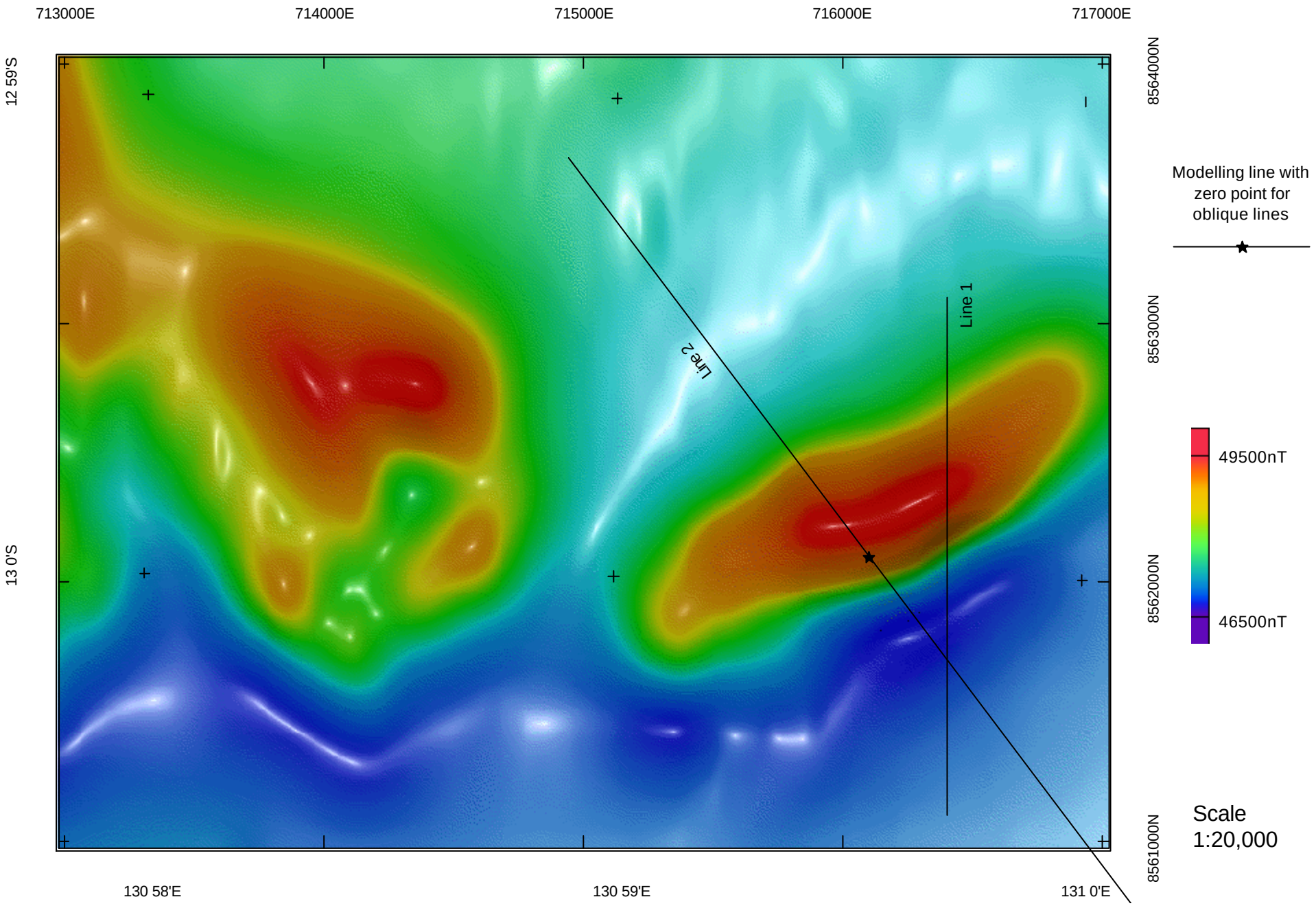
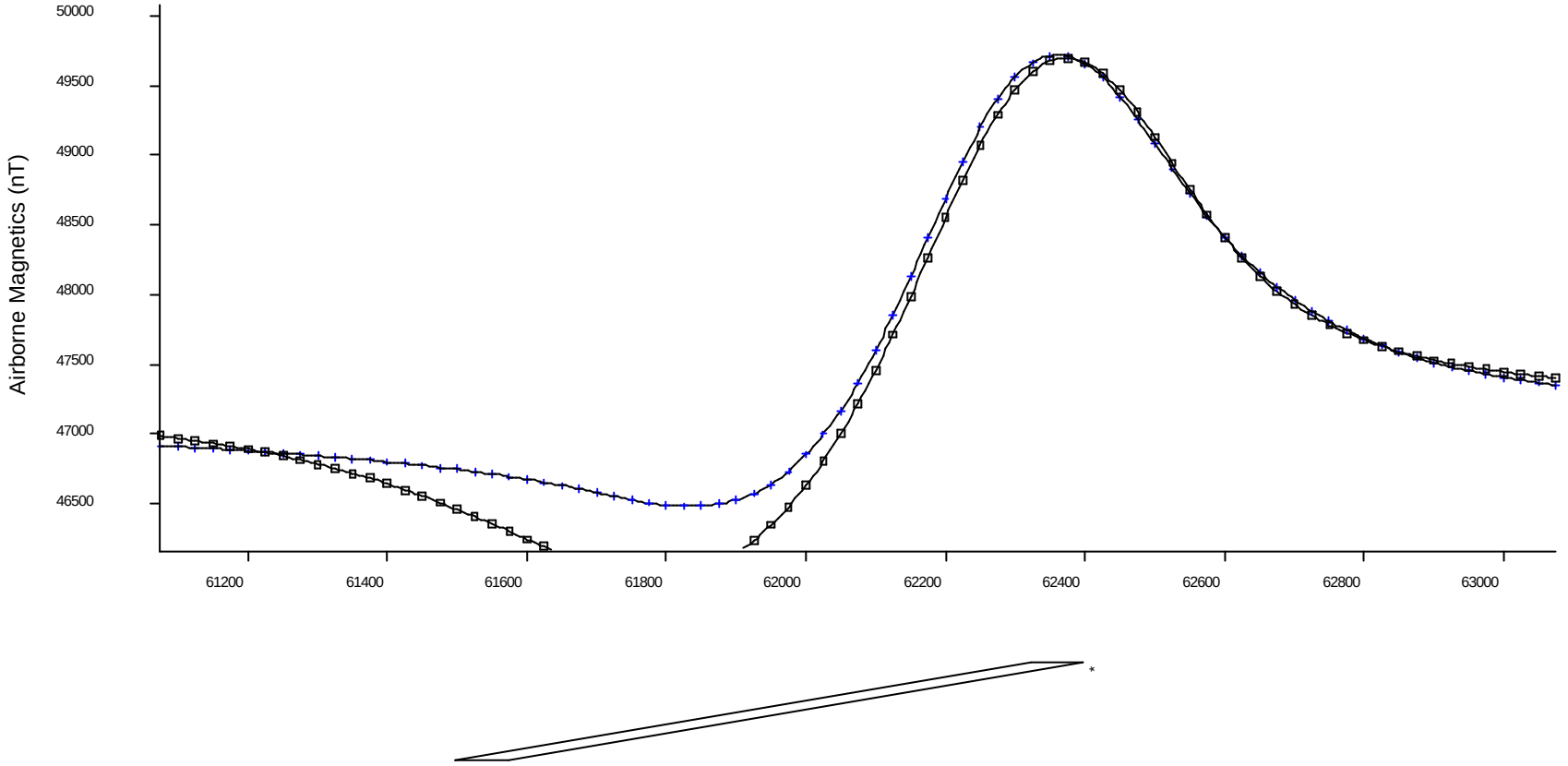
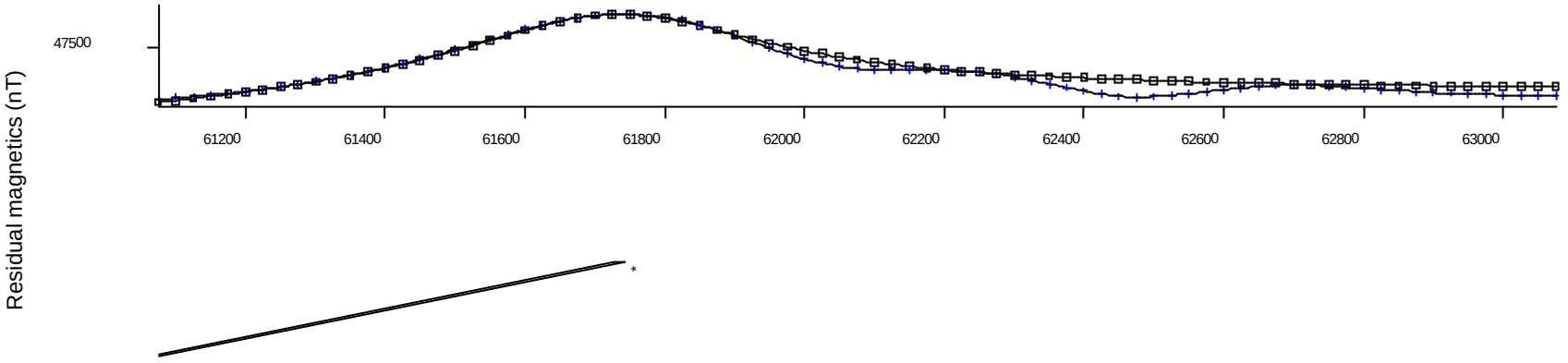


Figure 1. Rum Jungle Airborne magnetic data



LINE 716,400E Rum Jungle
SCALE 1:10000.0
Depth below survey height = 160m
Vertical extent = 140m
True width = 75m
Centre of top of source = 62360 N
Dip =20 degrees Southeast
Magnetic susceptibility = 111,700 x10-5 SI
Approximate equivalent magnetite = 20%

Figure 2. Rum Jungle Model of magnetic anomaly on line 1 (716,400E AMG)



LINE 716,400E Rum Jungle
SCALE 1:10000.0
Depth below survey height = 220m
Vertical extent = 280m
True width = 17m
Centre of top of source = 61735 N
Dip = 20 degrees Southeast
Magnetic Susceptibility = 111,700x10-5SI
Approximate equivalent magnetite = 20%

Figure 3. Rum Jungle Model of residual magnetic anomaly on line 1

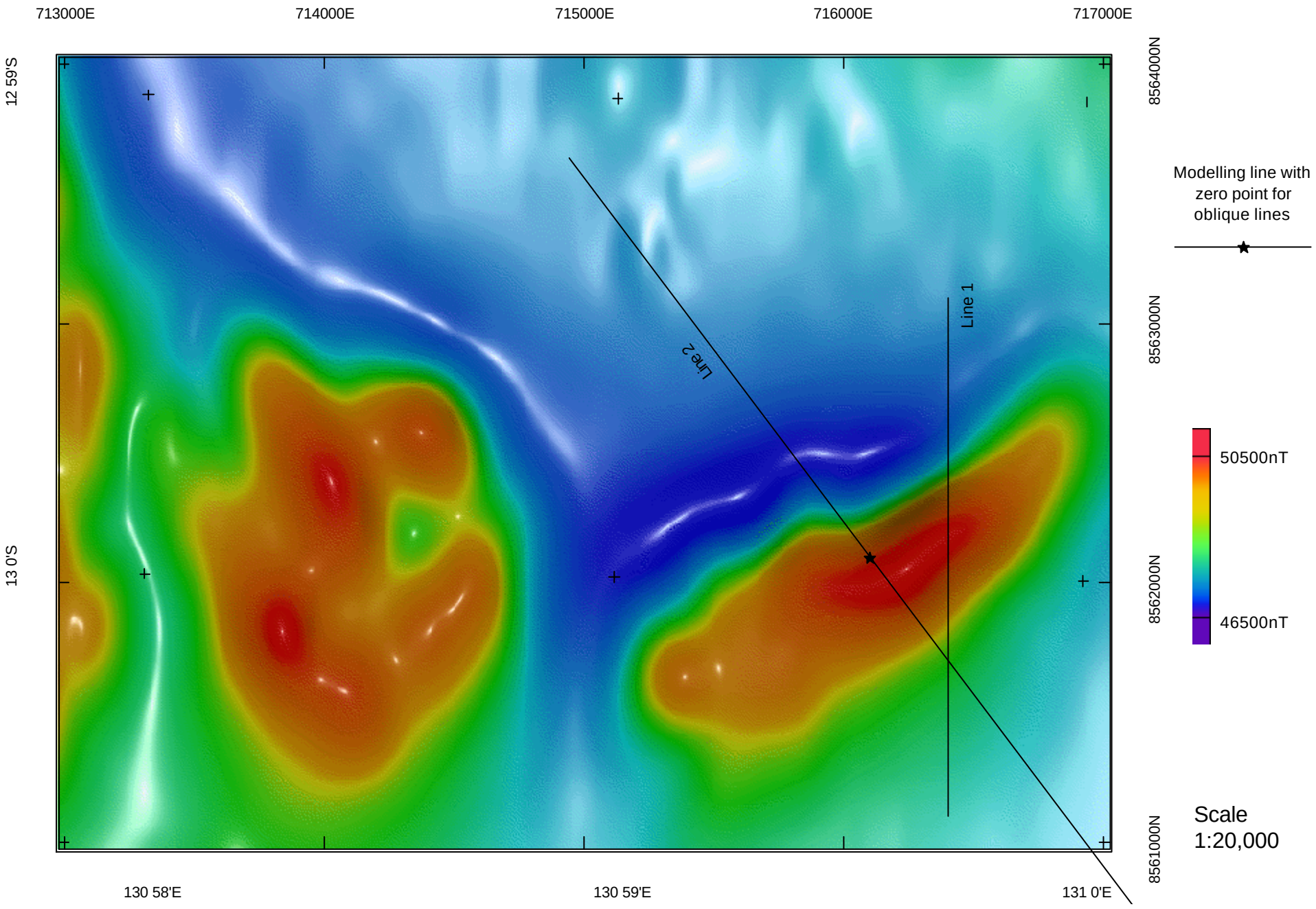
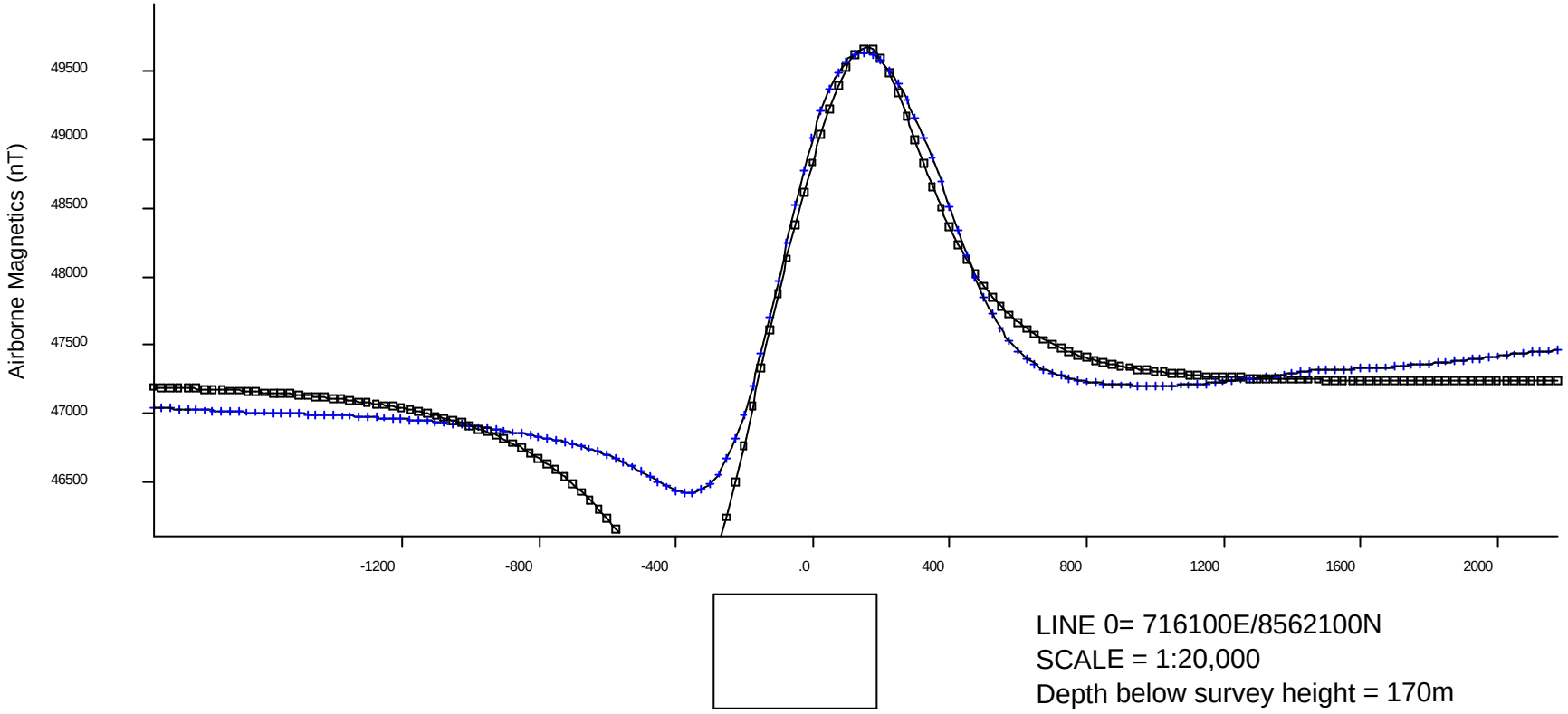


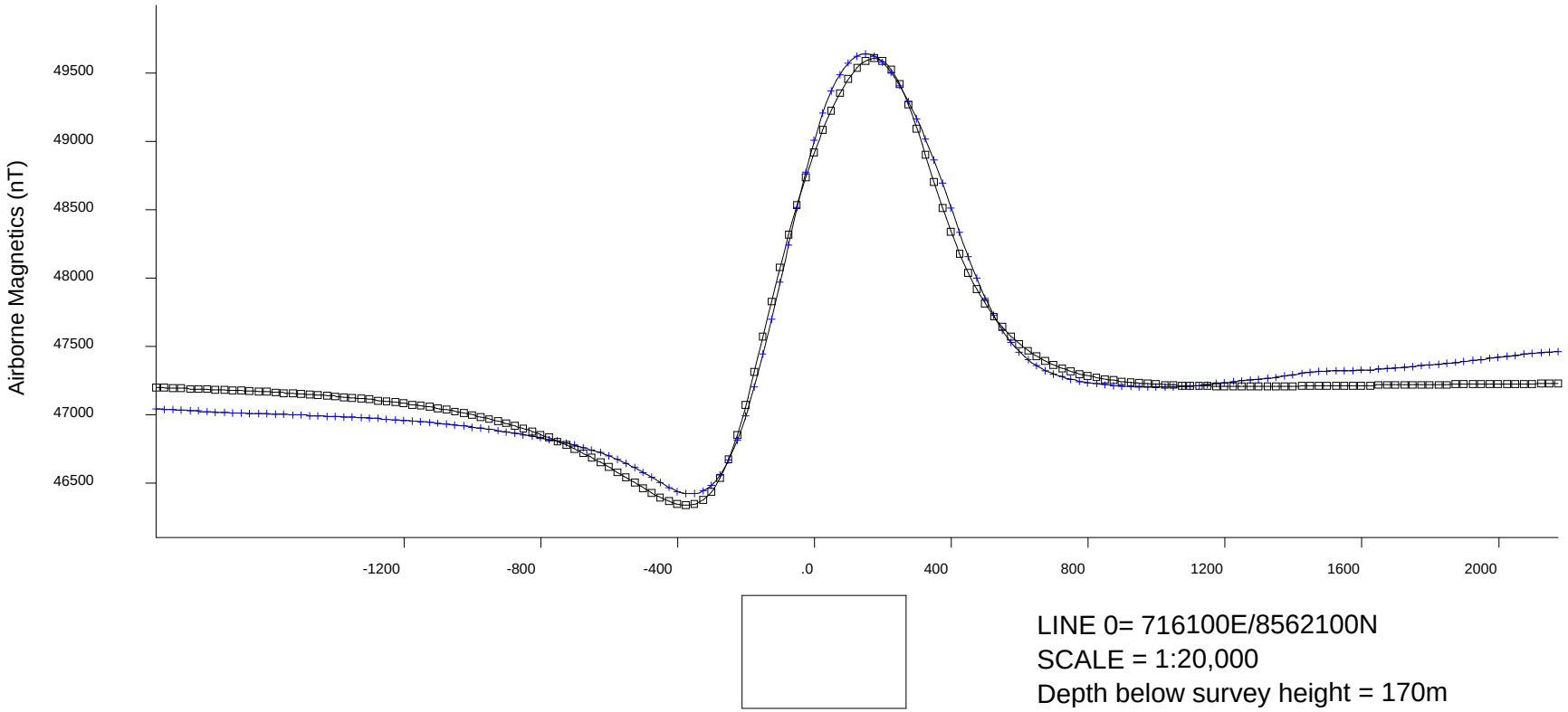
Figure 4. Rum Jungle Reduced to Pole Airborne magnetic data



LINE 0= 716100E/8562100N
SCALE = 1:20,000
Depth below survey height = 170m
Vertical extent = 330m
True width = 480m
Centre of top of source = -50m
Dip = Vertical
Magnetic susceptibility = 40,000x10-5 SI
Approximate equivalent magnetite = 9.4%

Inducing field inclination = 45 degrees

Figure 5. Rum Jungle Model of magnetic anomaly on oblique line 2



LINE 0= 716100E/8562100N
SCALE = 1:20,000
Depth below survey height = 170m
Vertical extent = 330m
True width = 480m
Centre of top of source = 30m
Dip = Vertical
Magnetic susceptibility = 28,900x10-5 SI
Approximate equivalent magnetite = 7.4%

Inducing field inclination = 60 degrees

Figure 6. Rum Jungle Model of magnetic anomaly on line 2 with steep inclination