Vardenis Ground Magnetics Data Review

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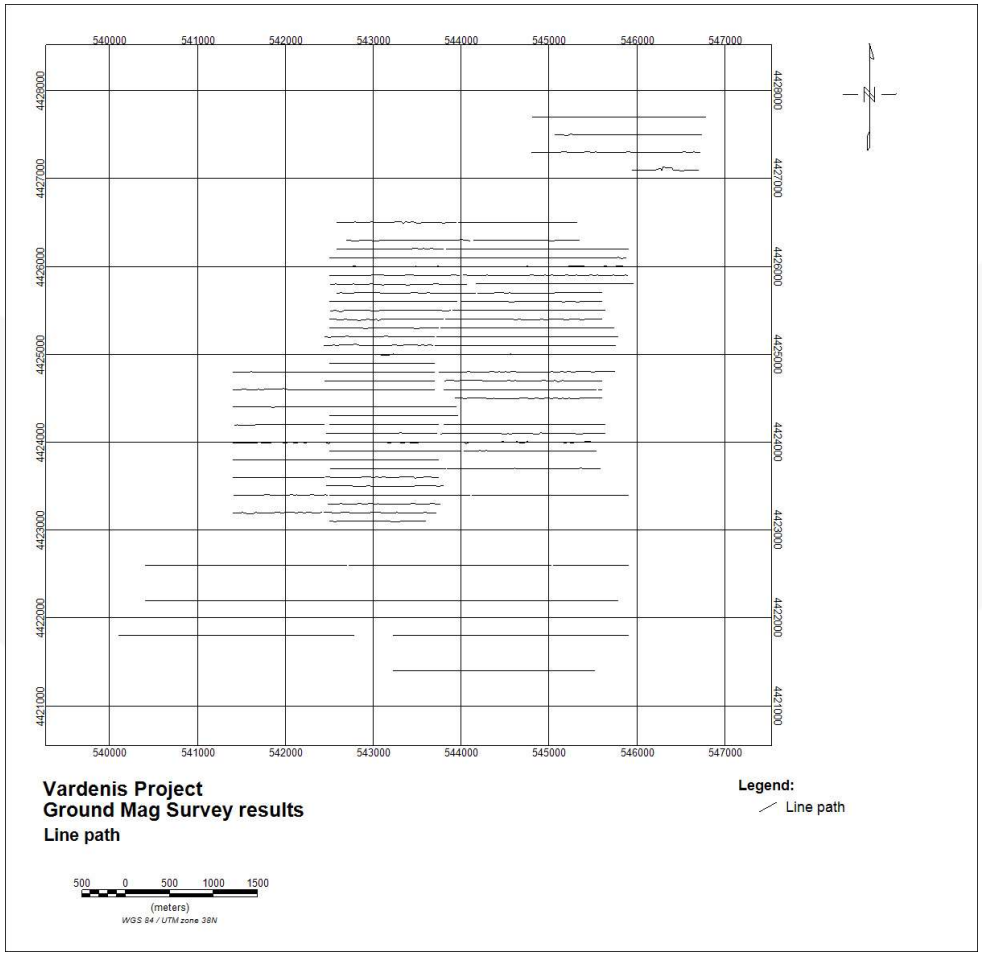
Campbell & Walker Geophysics

Executive Summary

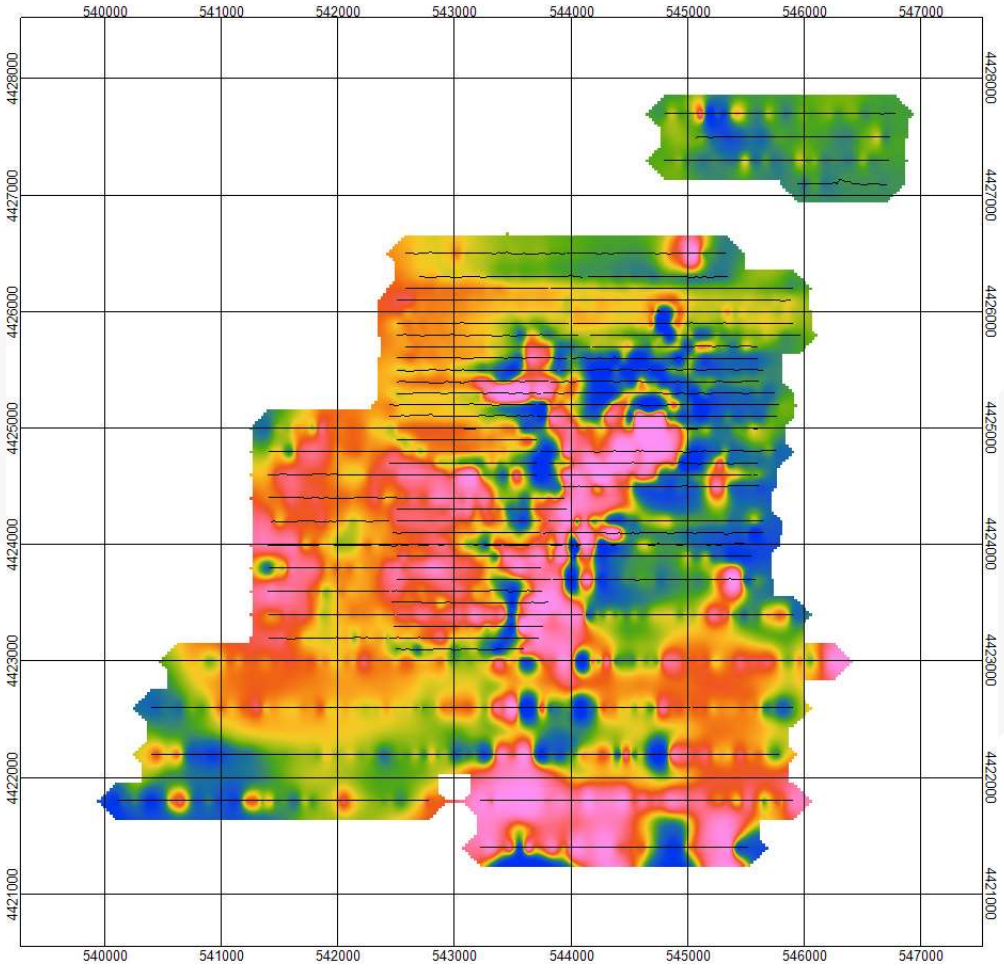
- Ground magnetic data over the Hayasa project were processed to produce a cohesive database
- Multiple phases of acquisition and variable line spacing required a detailed merging process
- Derivative-based products were generated to highlight structures within the data

Survey details



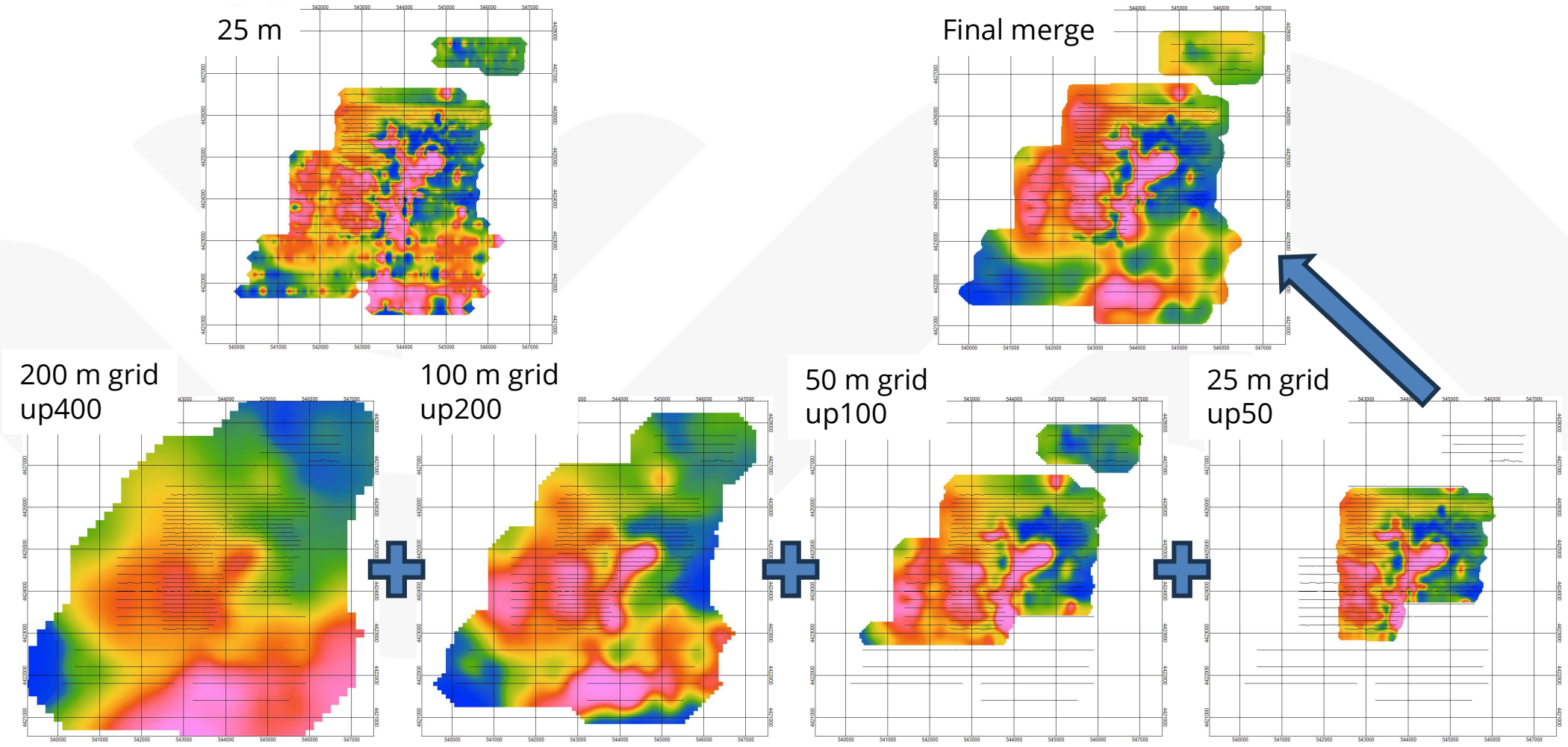
- 130 line-km of ground magnetics data collected during 2023 and 2024
- Variable line spacing 400, 200 and 100 m line spacing
- 20 m station spacing

Data merging (1 of 2)



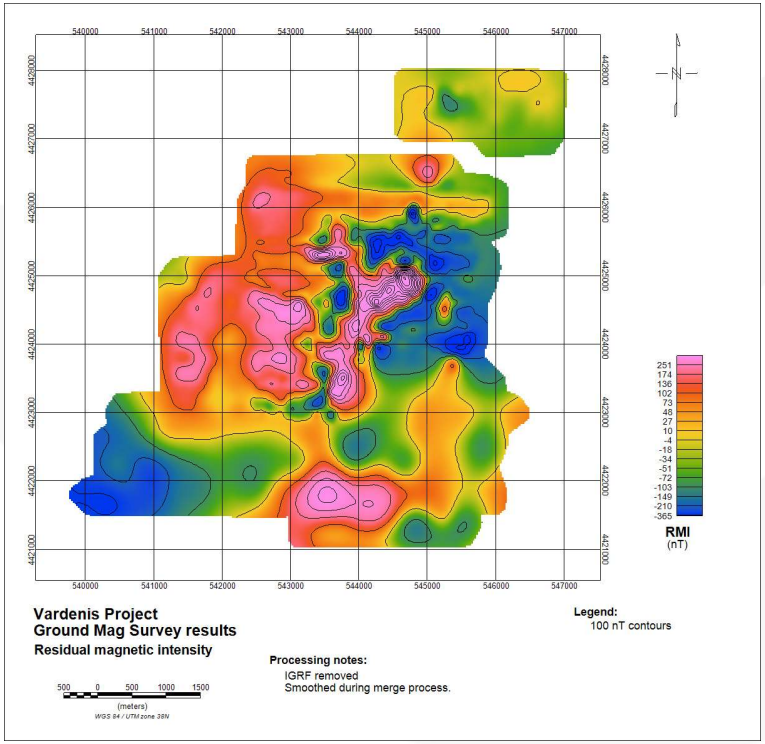
- We want to retain as much detail from the data as possible, however gridding the data at 25 m results in significant aliasing
- Therefore, the data was gridded at multiple scales and then merged based on the line spacing
- The input grids are shown on the next slide

Data merging (2 of 2)

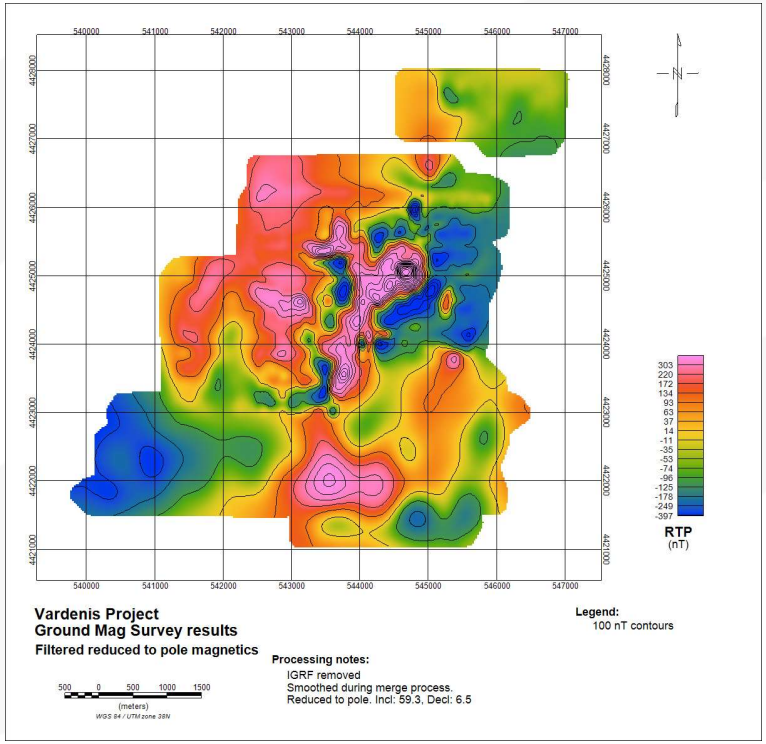


RMI and RTP

RMI



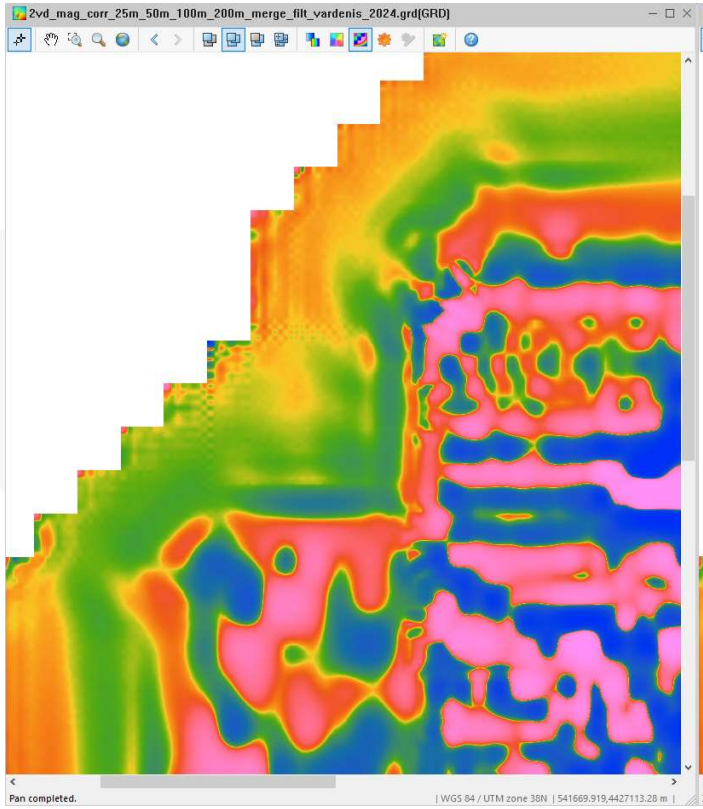
RTP



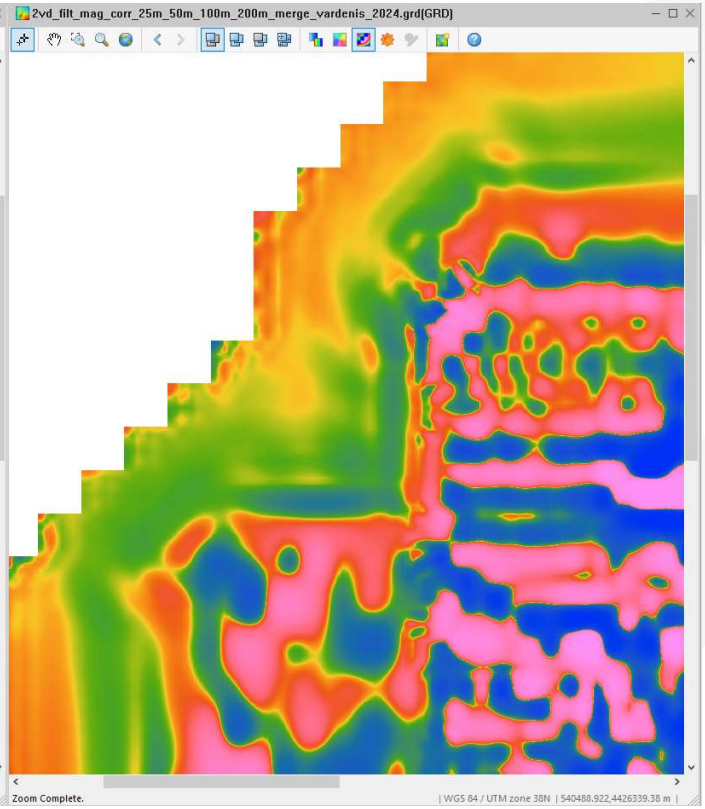
- The RMI image on the left has been diurnally corrected and has had the IGRF field and the mean value removed.
- The magnetic field inclination is 59.3 degrees. Reduction to the pole is required to interpret the data accurately
- The reduced to pole (RTP) is the image on the right

Pre-processing (LP100)

2VD no filtering



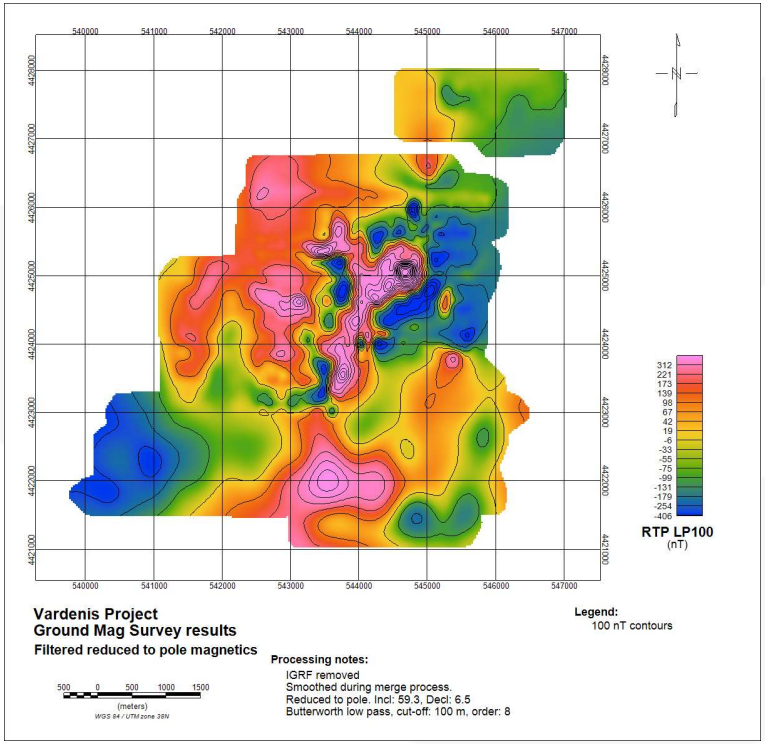
2VD LP100m



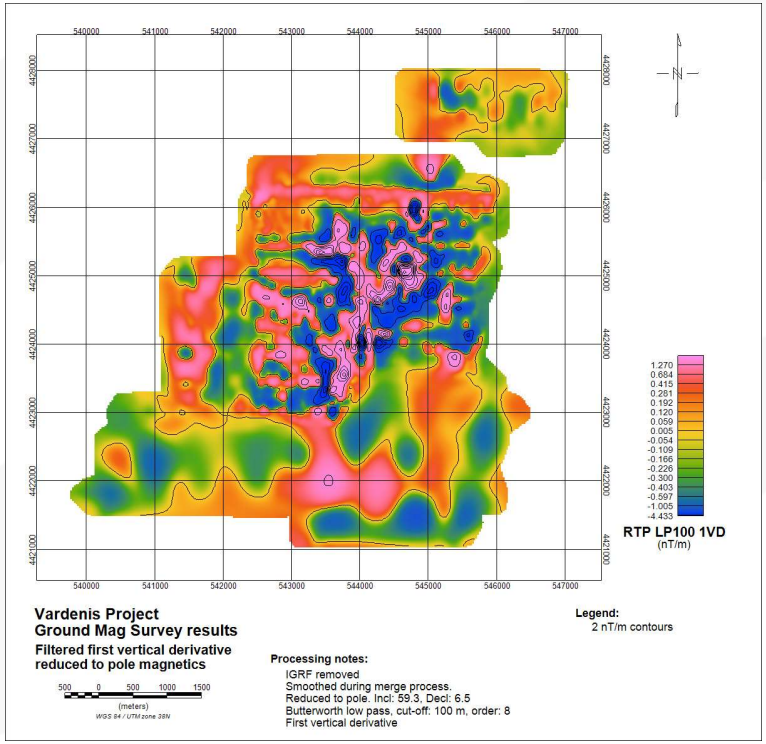
- The grid on the left shows the second vertical derivative with no filtering applied
- The left has had a Butterworth low pass filter applied. Cut off 100 m to reduce the ringing at the edges.

RTP and 1VD (LP100)

RTP LP100



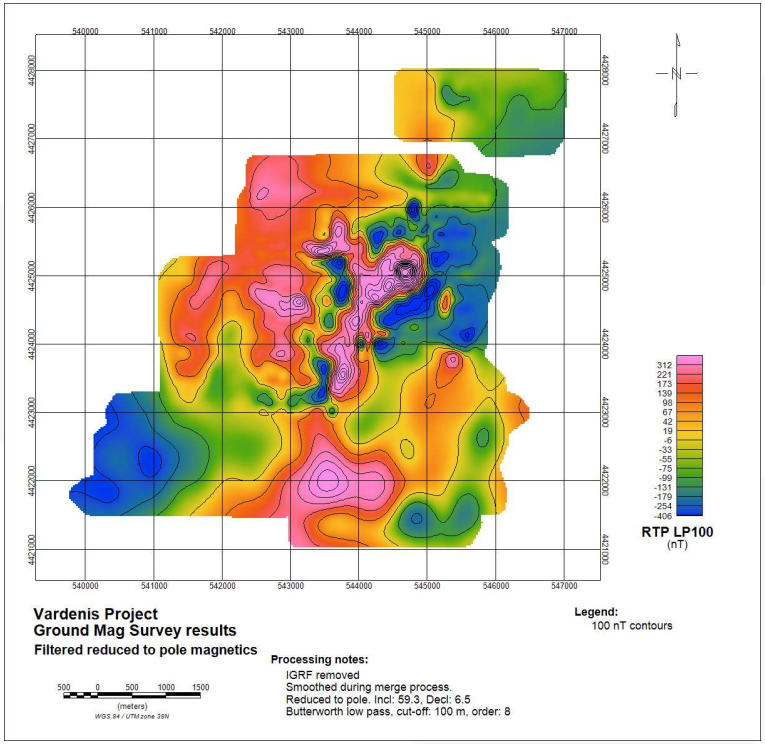
1VD RTP LP100



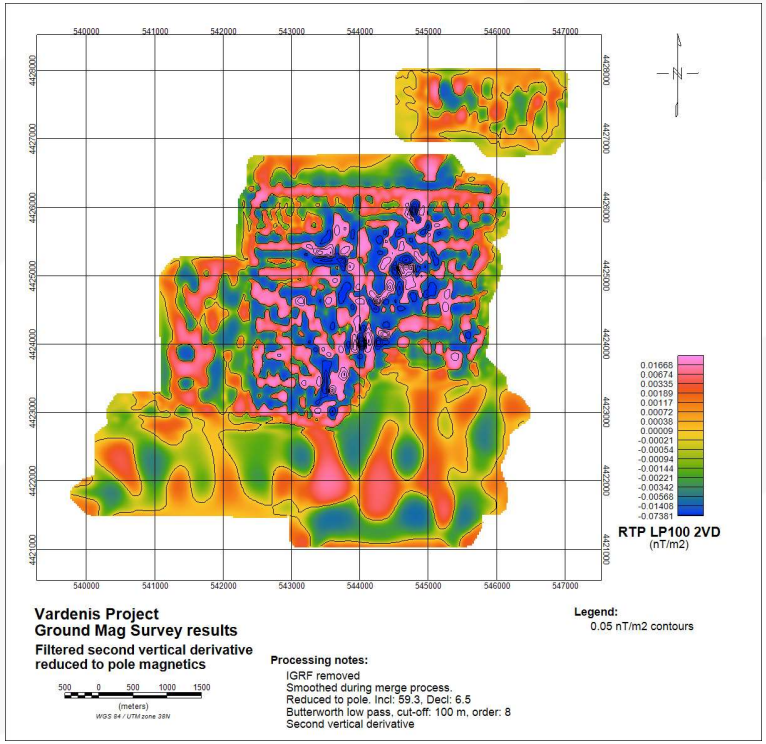
- The RTP shows a complex magnetic body in the centre of the survey area. It is surrounded by negative responses.
- The 1VD highlights the complexity of the response.
- The variation in detail is due to the variable line spacing.
- The E-W trend in the 1VD at the top of the southern block looks suspicious. However, it crosses over a survey line so it might be a real trend in the data.

RTP and 2VD (LP100)

RTP LP100



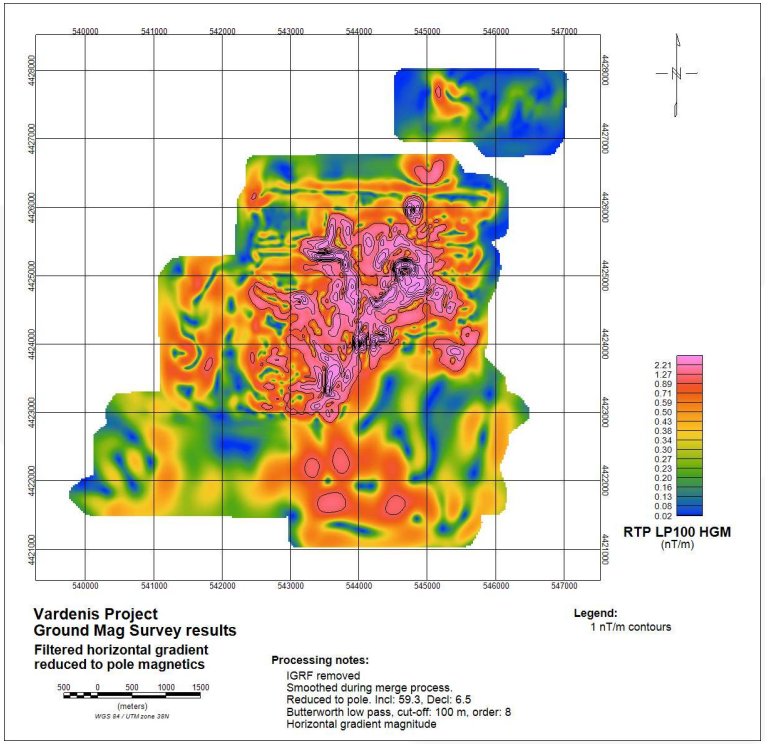
2VD RTP LP100



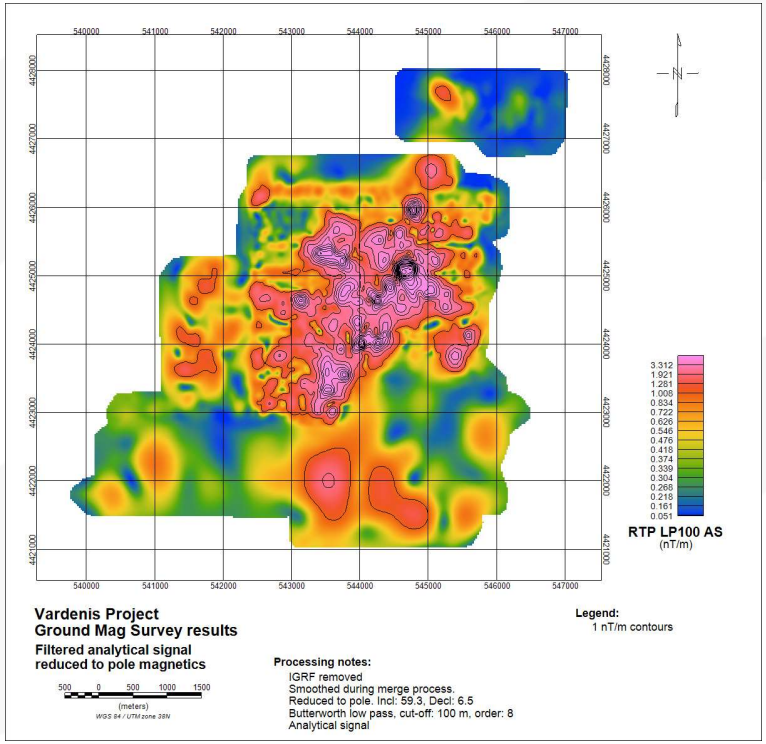
- The variation in detail is due to the variable line spacing.
- Unfortunately, this makes the 2VD less useful than is usually the case

HGM and AS (LP100)

HGM LP100



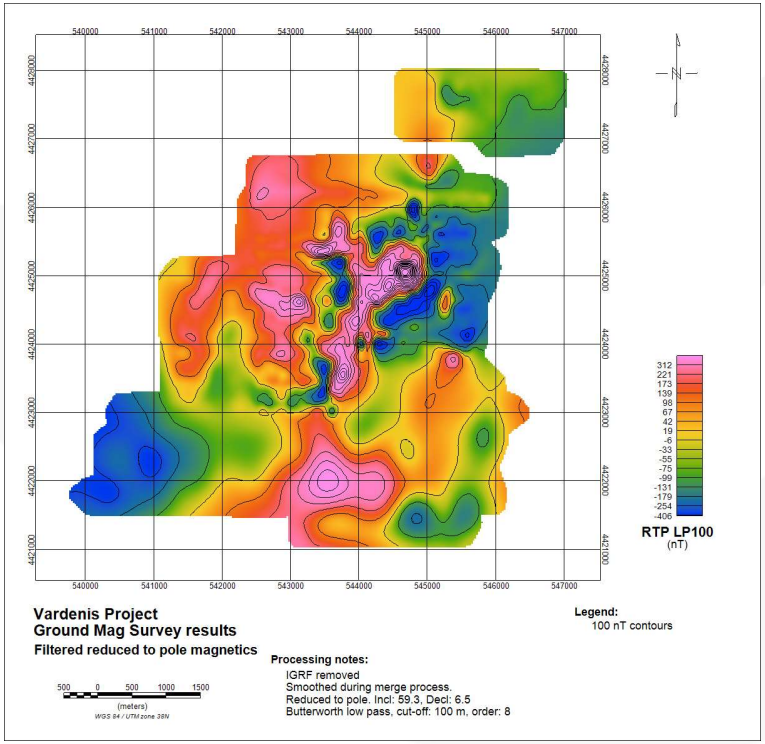
AS RTP LP100



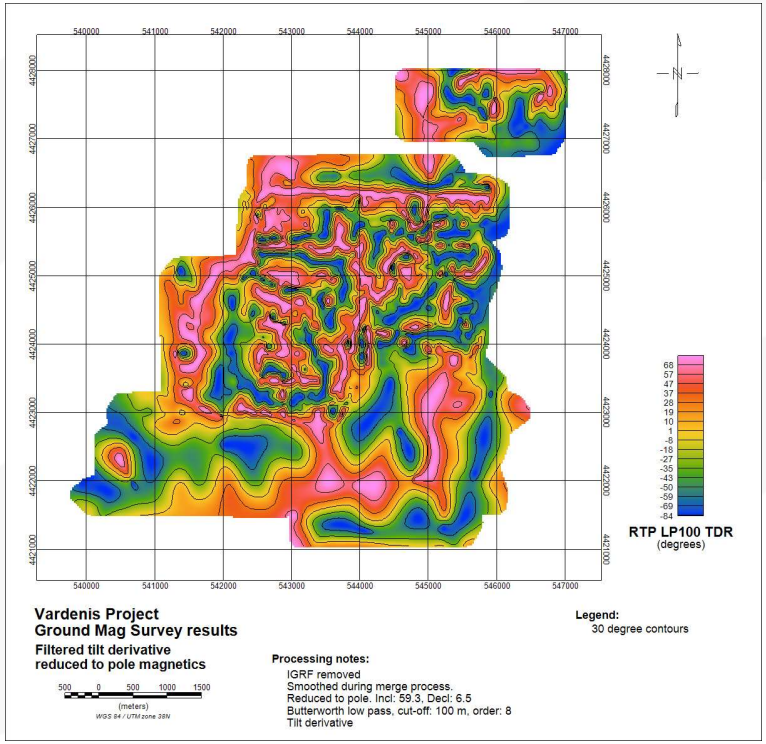
- The variation in detail is due to the variable line spacing.
- The horizontal gradient magnitude (HGM) and analytical signal (AS) highlight magnetic domains within the survey area. These will likely correlate with different geological units and/or variations within geological units.

RTP and TDR (LP100)

RTP LP100



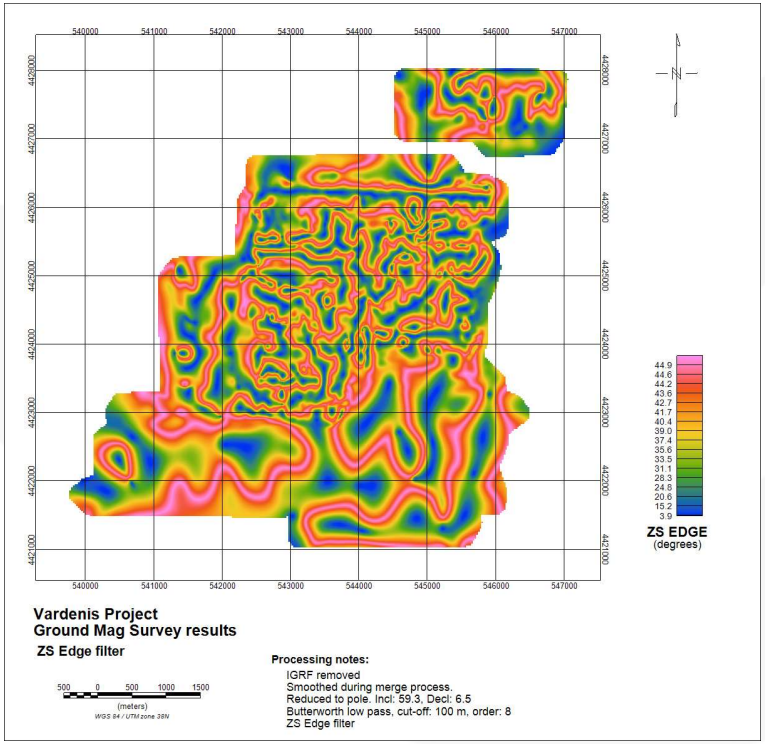
TDR RTP LP100



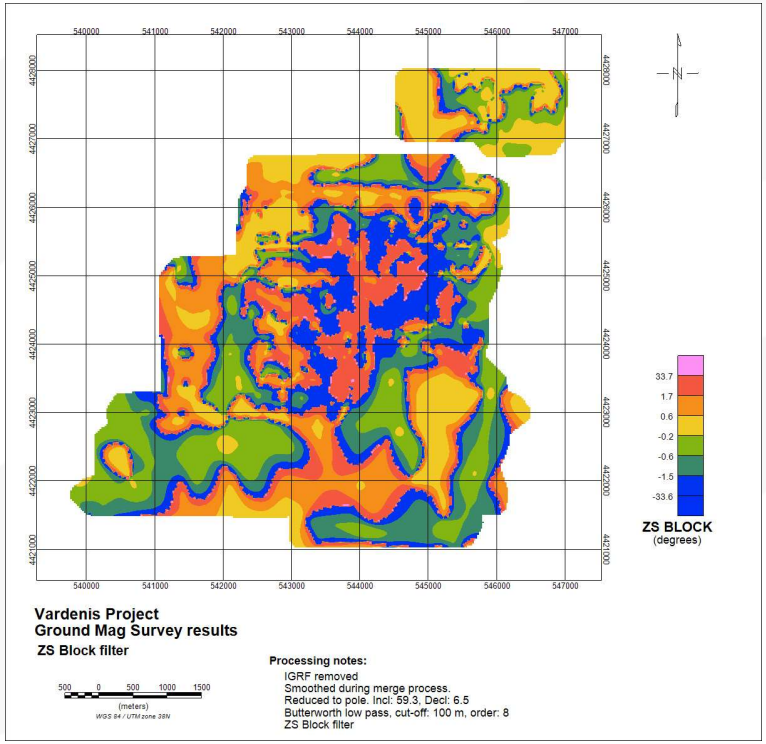
- The variation in detail is due to the variable line spacing.
- The tilt derivative (TDR) acts as an automatic gain correction. It is useful for identifying subtle trends within the data and outlining magnetic bodies. The trends should be interpreted in conjunction with the RTP image.

ZS EDGE and BLOCK (LP100)

ZS EDGE RTP LP100



ZS BLOCK RTP LP100



- The variation in detail is due to the variable line spacing.
- The ZS filters apply mathematics similar to the TDR. The edge filter highlights the edges of magnetic bodies and the block filter isolates magnetic domains. Both are useful for qualitative interpretation.

Conclusions

- The ground magnetic data collected over the Vardenis project posed some processing challenges
- The multi-scale merging procedure has produced a data set that is better than simply gridding the data
- Derivative-based products have highlighted structures within the data
- A thorough interpretation of the data alongside the mapped geology should be completed
- Infill data to improve coverage in areas of interest should be considered