EL 6264 "Bill's Lookout" Annual Technical Report

for the period

5th October 2021 to 4th October 2022

Tenement Holder:	Resource Holdings No1 Pty Ltd
Operator:	Stelar Metals Limited
Author:	Colin Skidmore
Date:	26th November 2022
Mapsheets:	250K: SH5312 "Andamooka"
	100K: 6437 "Ediacara"; 6436 "Scott"; 6337 "Yarra Wurta"
Keywords:	Copper, IOCG, Gravity, Magnetics,

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Appendix 2: Regional and Detailed Magnetic and Radiometric Image Processing Report – Montana Geoscience

EXECUTIVE SUMMARY

EL 6264 “Bill’s Lookout” was transferred from Resource Holdings Pty Ltd to Resource Holdings No 1 Pty Ltd on 26th November 2021. Stelar Metals Limited following its successful Initial Placement Offer and listing on the Australia Stockmarket (ASX:SLB) in April 2022 acquired all of the shares of Resource Holdings No 1 Pty Ltd which it retains as a wholly owned subsidiary. Bill’s Lookout mostly extends over the northern portion of Lake Torrens. This technical report covers the fourth year of tenure for EL 6264.

The tenement is considered prospective for Iron-oxide copper gold mineralisation at depth and sediment hosted copper associated with the overlying younger sediments.

Exploration work undertaken during the reporting period includes:

- Technical review by GSA Global
- Compilation and reprocessing of historic geophysical datasets including image processing and 3D Inversion modelling.

An information memorandum has been prepared and circulated to various companies as Stelar Metals is keen to find a joint venture partner before proceeding with further work due to access issues and the perceived depth of targets.

1 LOCATION & ACCESS

Bill's Lookout is part of Stelar Metals' Torrens Project which comprises two granted exploration licences forms a contiguous block which is located between 15 km and 60 km from Andamooka at the northern end of Lake Torrens in South Australia (Figure 1-1). Andamooka is about 20 km east of Olympic Dam and Roxby Downs which are accessed from the Stuart Highway. Regular scheduled flights are available at Roxby Downs.

The western and northern parts of the licence block are accessed by unsurfaced roads from Andamooka. The eastern parts of the licences can be accessed using unsurfaced roads from Myrtle Springs near Leigh Creek.

Access to parts of the licence block within Lake Torrens is not currently established and may require additional permitting. Stelar notes that drilling has recently been permitted and completed by Argonaut Resources on Lake Torrens. Lake Torrens is an ephemeral lake and is normally dry.

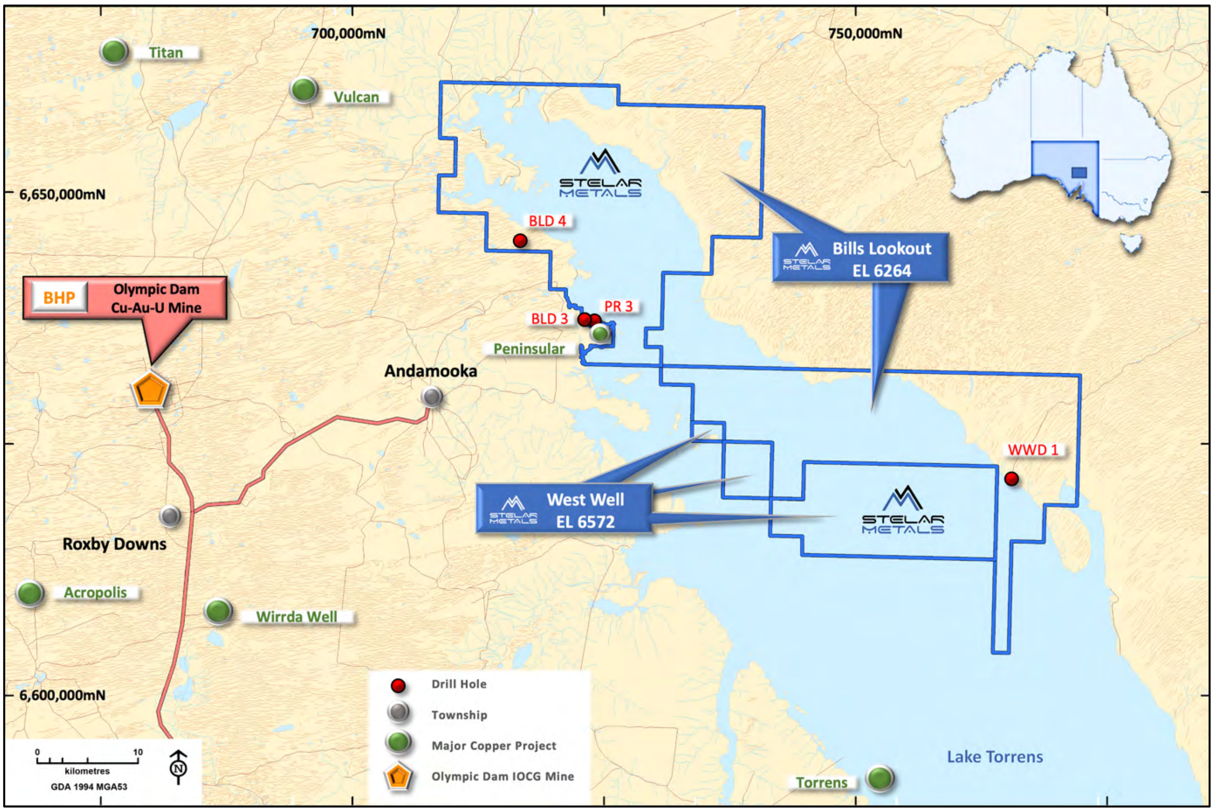


Figure 1-1 – Torrens Project location

BHP's Olympic Dam mine and associated infrastructure is located about 40 km east of Stelar's ground.

The project lies entirely outside the Woomera Prohibited Zone.

The area of Lake Torrens is covered by the Lake Torrens National Park. Areas outside of Lake Torrens are mostly utilised for low-density livestock grazing.

1.1 Climate, Topography and Landforms

The Torrens Project area has a warm and dry climate. While summer daytime temperatures can frequently exceed 40°C, night-time temperatures in winter can fall below freezing. Annual average rainfall is low at about 140 mm. The closest weather station is at Roxby Downs (Table 1).

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Temperature													
Mean maximum temperature (°C)	37.1	35.7	32.2	27.3	22.3	18.5	18.7	20.8	25.3	28.7	32.2	34.7	27.8
Mean minimum temperature (°C)	21.3	20.2	17.2	12.8	8.1	5.0	4.2	5.5	9.3	12.8	16.5	19.0	12.7
Rainfall													
Mean rainfall (mm)	13.0	16.5	7.9	16.5	8.8	14.8	5.9	9.4	9.9	11.9	12.8	15.9	139.0
Decile 5 (median) rainfall (mm)	3.2	6.8	2.8	4.8	9.6	4.2	1.4	5.2	6.0	4.4	9.7	10.8	131.0
Mean number of days of rain ≥ 1 mm	1.7	1.6	1.4	1.7	1.7	1.9	1.5	1.9	1.9	1.7	2.0	2.3	21.3

Table 1: Roxby Downs climate data
Source: Australian Bureau of Meteorology

The project has low relief with topography ranging from about 30m on Take Torrens to maximum elevations of about 70m.

Much of the project area occurs over Lake Torrens. Lake Torrens is a large, normally dry, endorheic salt-lake in central South Australia. After sufficiently extreme rainfall events, the lake flows out through the Pirie-Torrens corridor to the Spencer Gulf. Other landforms include shallowly incised ephemeral drainage, low dunes and ridges. Vegetation is sparse throughout.

The central portion of the tenement overlaps the Lake Torrens National Park. All exploration activity on the lake requires an approved program for environment protection and rehabilitation (PEPR).

The areas not covered by National Parks are covered by Native Title Determinations:

- SCD2014/004: Kokatha People (Part A) – western shore.
- SCD2009/003: Adnyamatharha People No 1 (Stage 1) – eastern shore.

2 TENURE

EL 6264 "Bill's Lookout" was granted to Resource Holdings Pty Ltd (RH) on 5th October 2018 to explore for All Minerals except extractive minerals or precious stones.

EL 6264 (Figure 1.1) covers an area of 992km^2.

On 26th November 2021, RH transferred EL 6264 to Resource Holdings No 1 Pty Ltd (RH1). On the successful completion of Stelar Metals Limited's IPO and ASX listing (ASX:SLB), Stelar Metals acquired all of the shares of RH1 and took over 100% ownership of EL 6264.

On 29th August 2022, due to under expenditure in previous years a 13% reduction (125km2) was requested by the South Australian Department of Mines and Energy which reduced the tenement to 867km^2. As illustrated in Figure 2-1 the northern portion was relinquished.

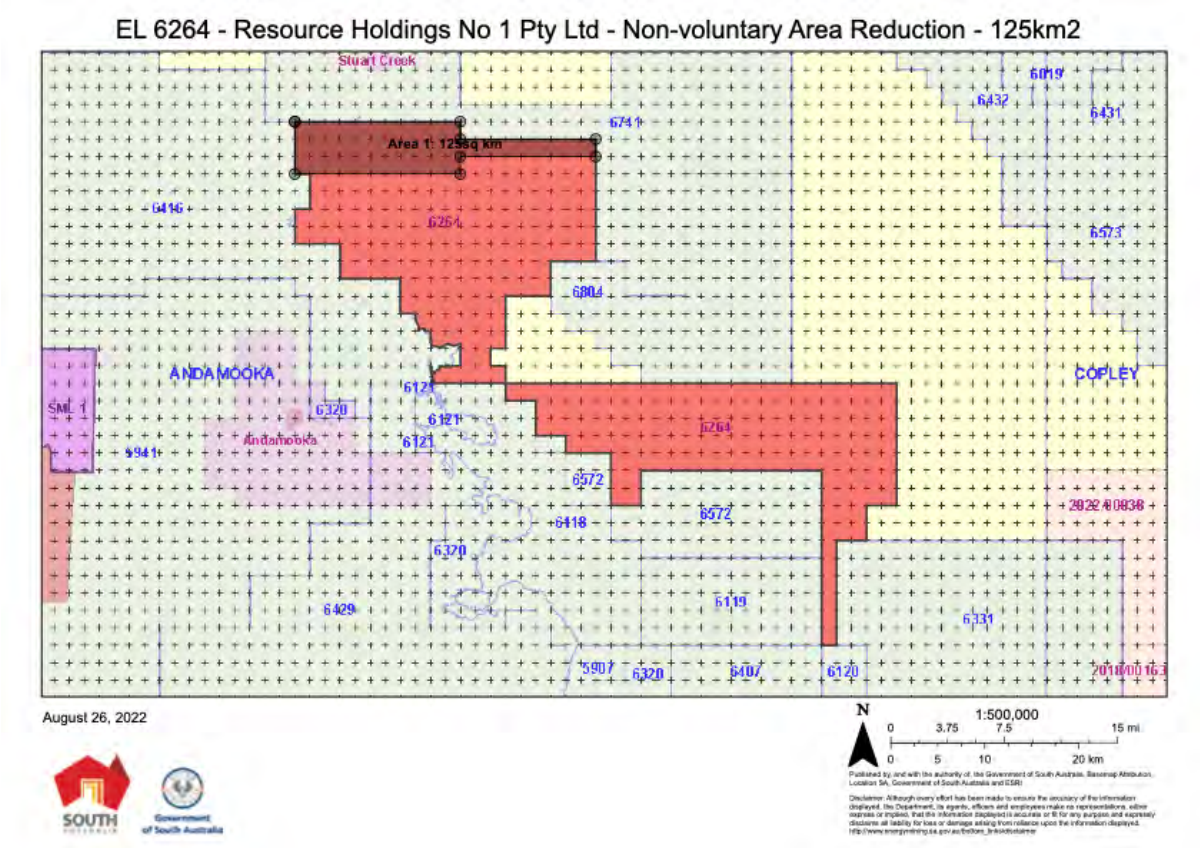


Figure 2-1 – EL 6264 area reduction – August 2022.

3 GEOLOGICAL SETTING

The Torrens Project is located on the Torrens Hinge Zone, an Adelaidean structure which marks the boundary between thick rift fill sedimentary rock of the Adelaide Fold Belt and a relatively thin sedimentary succession of the Stuart Shelf which was deposited on the margin of the rift.

The project lies within the Andamooka map sheet. The geological map shows thin Cainozoic cover in the region. Rocks of the Mesozoic Eromanga Basin outcrop to the north and west of the project. The Eromanga basin is represented by sandstone of the Cadna-owie Formation and carbonaceous shale of the Bulldog Shale (Figure 3-1).

The Mesozoic succession unconformably overlies a thick sequence of Adelaidean to Lower Cambrian sedimentary rock. Outcropping rocks from this sequence sit mainly in the northwest and are predominantly Early Cambrian Andamooka Limestone with lesser Yarrawurta Shale, and minor Neoproterozoic Wilpena Group.

The depth to Mesoproterozoic basement is not well constrained in the project area. Geological Survey of South Australia (GSSA) estimates, based on geophysical data, range between 600m in the southeast to 1,200m in the northwest. Similarly, the nature of basement is not well understood and is interpreted from geophysical data.

Hole BLD3 was drilled by Western Mining Corporation (WMC) to a depth of 1,024m and intersected Mesoproterozoic basement at 872m, Hole BLD4 was drilled to 1,037m and did not reach basement. Hole WWD1 was drilled to 762m and failed intersect basement.

Several minor copper occurrences with limited mining histories occur within the Lower Cambrian Andamooka Limestone located just outside of Stelar's tenure. These appear to be predominantly associated with vein and fracture networks within the limestone.

The Peninsular prospect lies on the margin of EL6264 but is largely outside the tenement. Drilling on this prospect returned copper mineralisation hosted in Cambrian limestone. Hole PR3 intersected 30m at 0.20% Cu to end-of-hole at 108 feet (32m).

Geology, magnetic and gravity images are presented as maps in Figure 3-2.

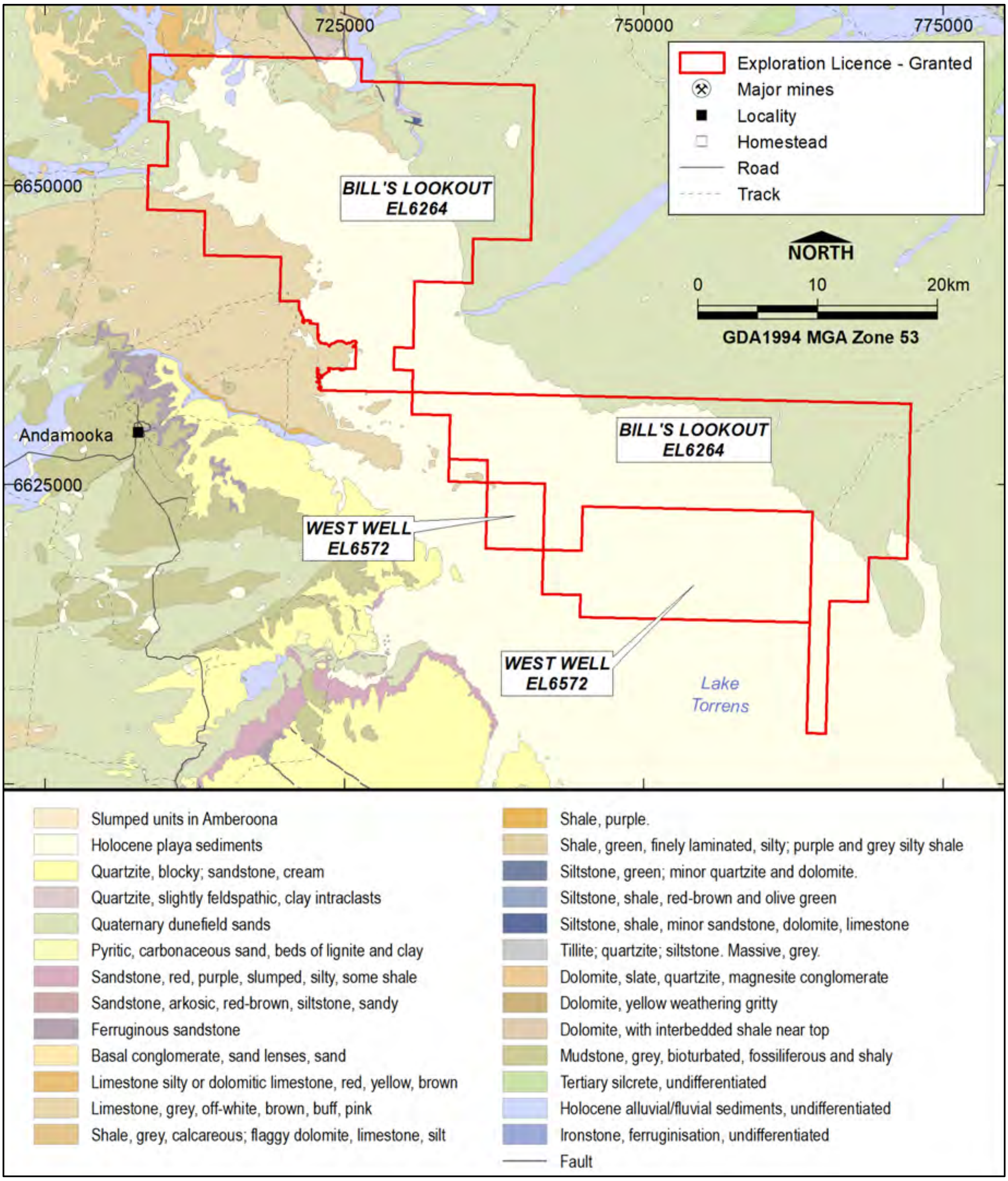
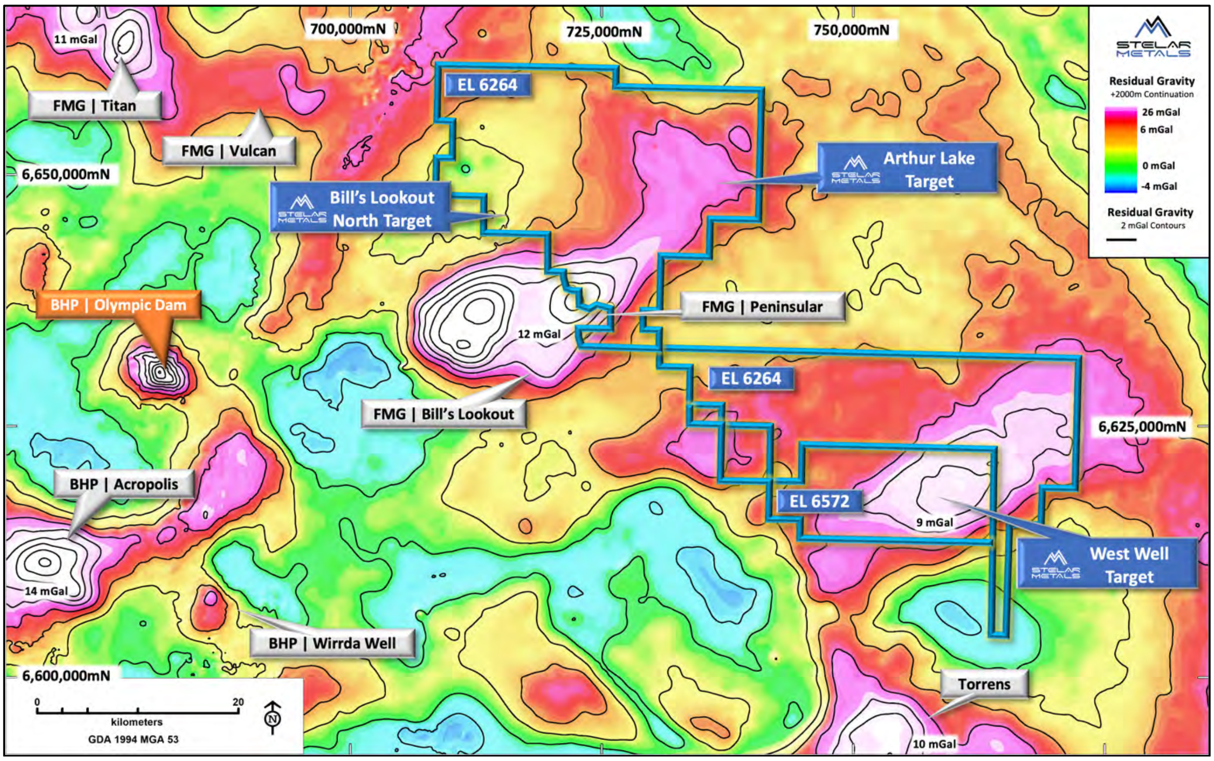


Figure 3-1: Geology of the Torrens Project tenements



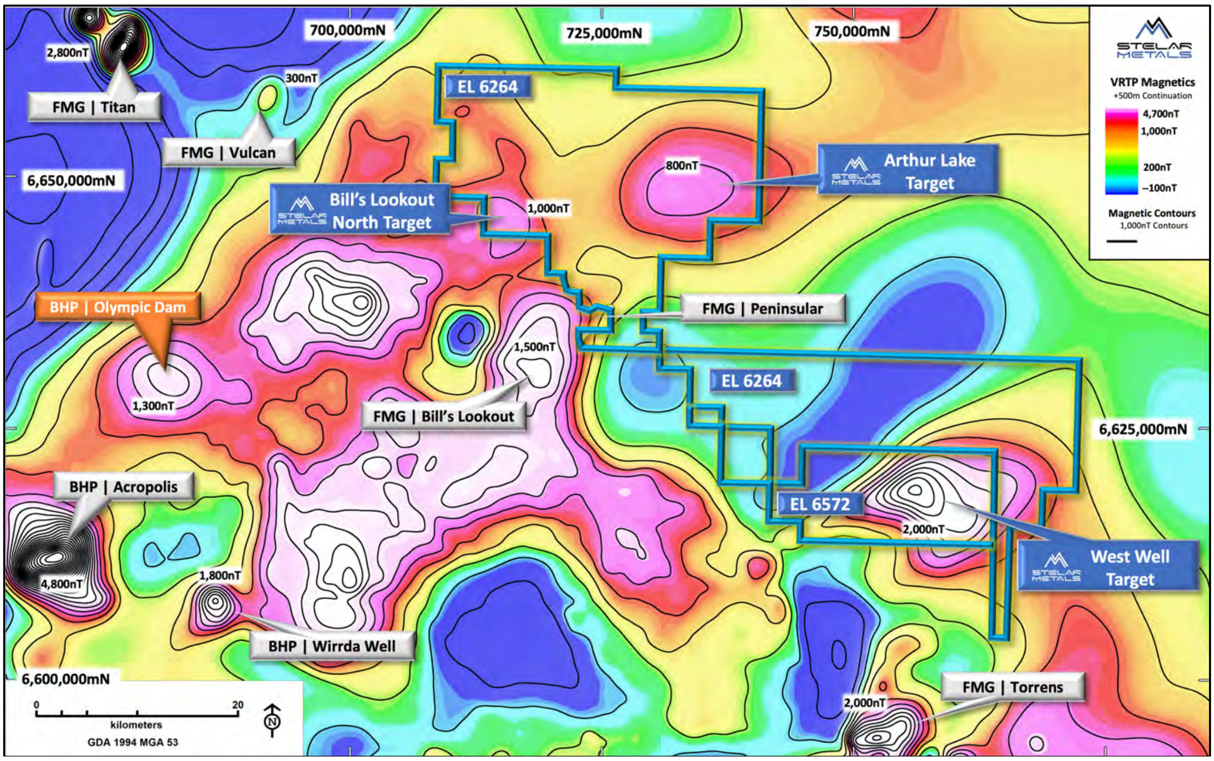


Figure 3-2 Geophysical Images of the Torrens Project. Top: Residual Gravity, Bottom: VRTP Magnetics

4 HISTORICAL EXPLORATION

The only significant phase of exploration over these tenements occurred in the 1970s to mid-1980s when WMC tested several magnetics-gravity features exploring for Olympic Dam style IOCG mineralisation.

4.1.1 ENV01366 – 1970 to 1971, SML369, Asarko (Aust.) Pty Ltd

This project targeted base metals in the Cambrian Andamooka Limestone. Target analogues cited are copper in thin veins at the O.K. Copper Mines to the north of the ELs, and secondary base metals in limestones of the same age in the Flinders Ranges and at the nearby Ediacara Mine.

Exploration included rock-chip sampling, IP surveys and finally drilling of “Anomaly C”, Peninsular prospect. This prospect is just outside the margin of the ELs such that only one of the 12 rotary percussion holes testing the Peninsular prospect (ANDRP7 in the series ANDRP1–ANDRP12) is recorded within the ELs. Copper mineralisation of 0.1–1.1% was intersected in a thin layer of weathered limestone.

4.1.2 ENV06562 – 1975 to 1986, EL1316, Western Mining Corporation

In 1979, the project-scale “Andamooka (Stuart Shelf) – Project 764” airborne magnetics/radiometric survey was undertaken. The survey was completed with 400m north-south line spacing at a flight height of 100m.

During 1981 to 1982, a project-scale ground gravity survey was undertaken with a nominal station spacing of 1km.

Over 20 local grids were established across the course of WMC’s exploration program. These grids were designed based on the geometry of geophysical features identified using WMC’s project-scale datasets and government regional-scale datasets, so they are not consistently orientated. Detailed ground magnetics and gravity surveys were completed over each of the grids. Note that several of these surveys were completed prior to the 1979 airborne magnetics survey. Later, CSAMT and IP surveys were also completed over several of the grids. The grids in this report that overlap with the ELs are Bill’s Lookout North, Lake Arthur, and West Well.

The West Well grid covers broadly coincident magnetic (25km, 2000nT) and gravity (35km, 10mGal) features defined in regional geophysical surveys. Both anomalies are elongate in the northeast direction. The detailed local surveys did not alter the nature of these anomalies except to define the gravity anomaly more precisely. Modelling by WMC suggested the source for the anomalies occurs at a depth of roughly 1,000–1,200m. In June 1978, diamond hole WWD1 was drilled to 762m to test the target. WWD1 failed to intersect Pre-Adelaidean basement. It was terminated in Bayley Range Siltstone, stratigraphically late in the Adelaidean sequence and is likely underlain by a further thick succession of Adelaidean sediments. Downhole temperature, gamma, and electrical logging was completed on the drillhole.

The Bill's Hill North grid covers a northwest trending magnetic anomaly (400nT) with a sharp truncation on its southern margin identified in regional magnetics data. This is coincident with the north flank of the Bill's Lookout gravity high. In June 1984, diamond hole BLD-4 was drilled to 1,037m to test the target. WMC felt that based on the drillhole position's proximity to the eastern edge of the Stuart Shelf, there may exist block-faulted remnants of Callanan Beds prospective for stratiform copper mineralisation. The drillhole was not ideally located due to access issues. BLD-4 failed to intersect Pre-Adelaidean basement and was terminated still within Adelaidean sediments (possibly Burra Group?). The Tapley Hill Formation was intersected between 818.67m and 957.68m depth.

The Lake Arthur grid covers a broad magnetic anomaly coincident with a weak gravity high on the flanks of the much larger Bill's Lookout gravity high. Modelling by WMC suggested the source for the anomaly occurs at a depth of ~2,000m and the anomaly was not drill tested.

4.1.3 ENV08482 – 1975 to 1991, EL1338, Western Mining Corporation

EL1338 is a reduced version of EL1316 following re-application. All WMC exploration data over this area is reported in the open file envelope for EL1338, even when it occurred while EL1316 was active.

EL1338 was therefore incorporated into the same project-scale airborne magnetics/radiometrics and ground gravity surveys described in ENV06562.

Six local grids for detailed ground gravity and magnetics were established on EL1338. Only the Bill's Lookout grid overlaps the current tenure.

The Bill's Lookout grid is contiguous with the Bill's Lookout North grid. It covers a large gravity anomaly flanking a magnetic high.

In 1981, diamond holes BLD1–BLD3 were drilled to test the anomaly. Only BLD3 is within the Bill's Lookout tenement (Figure 4-1). BLD3 was drilled to 1,024 m. Basement of gabbro, dolerite, and minor granitoids was intersected at 872 m. The cause of the gravity anomaly was interpreted to be a gabbroic body with a remnantly magnetised core. Downhole temperature and gamma logging was completed on this drillhole. Bill's Lookout grid was further tested by complex resistivity, a dipole-dipole IP technique, but no significant anomalies were detected.

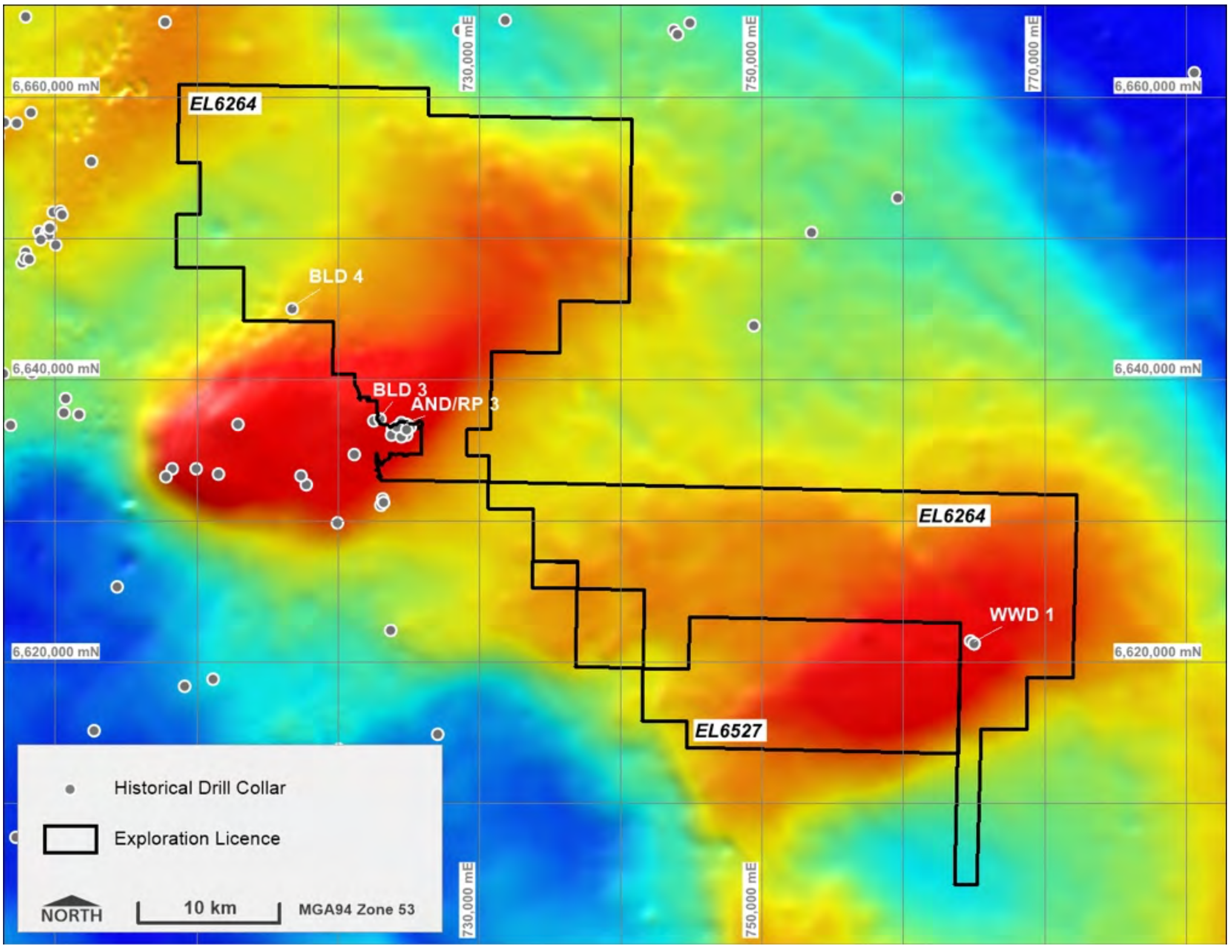


Figure 4-1: Torrens Project historical drilling on magnetic imagery

5 EXPLORATION ACTIVITIES 2021-2022

The following activities were undertaken in the reporting period.

5.1 Technical Review

As part of the IPO prospectus Mark Allen of CSA Global was contracted to provide a detailed independent assessment of the Torrens Project.

5.2 Geophysical Reprocessing

David McInnes of Montana Geoscience was contracted to collate and reprocess the open file geophysical coverage over the Torrens Project including EL 6264. Detailed reports of his work are included as Appendices 1 and 2 with a set of deliverable products including 3D inversion models, processed and hybrid registered images and grids attached with this report.

6 DISCUSSION & RECOMMENDATIONS

Several geophysical (magnetic and gravity) anomalies have been recognised within EL 6264 (Figures 6-1 and 6-2). The targets are however deep and Stelar Metals has decided to seek a joint venture partner to assist funding further exploration on its Torrens Project. Further complicating exploration on this project is land access as the targets are situated under Lake Torrens which is a registered National Park. Should a partner be found Stelar recommends the acquisition of higher resolution gravity (airborne) to refine the known geophysical targets.

The merits of the project include:

- Principle exploration target: Iron-oxide Copper Gold in Mesoproterozoic basement associated with modelled gravity and magnetic anomalies.
- Secondary exploration target: Sediment-hosted Copper in the Adelaidean. This is supported by shallow historic copper anomalies at the Peninsular Prospect on the boundary of EL 6264.
- Overlies the Torrens Hinge Zone.
- Depth to Mesoproterozoic basement poorly constrained but GSSA estimates depths of 600m in southeast and 1,200m in the northwest.
- Several large discrete magnetic and gravity anomalies modelled from historic geophysical datasets.
- Very limited historic drilling with only four holes drilled on the tenure.

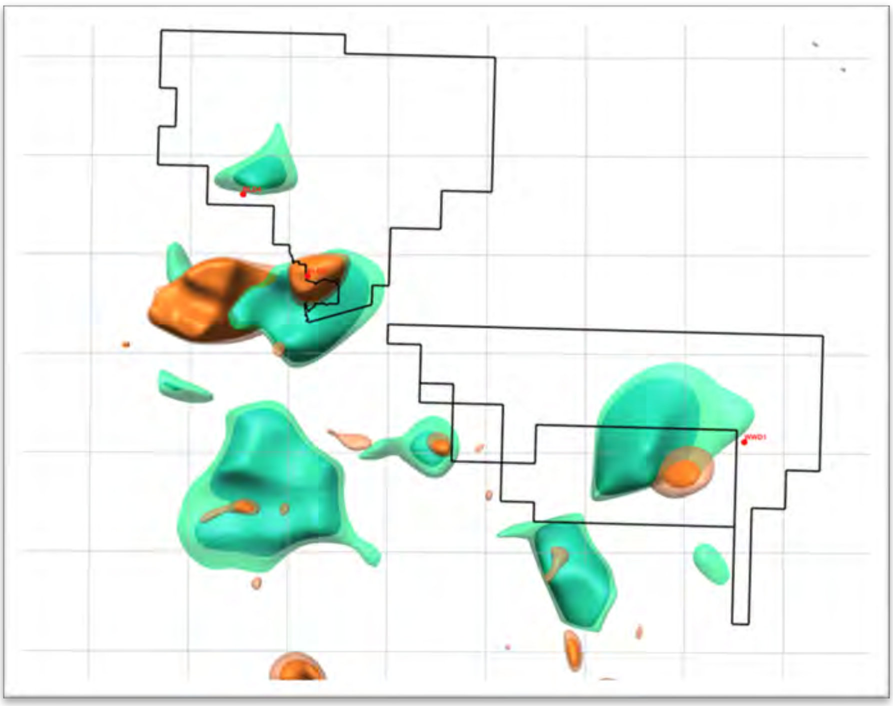


Figure 6-1: 3D views of Inversion Modelled Magnetics (green) and Gravity (orange) showing tenement outlines on surface and historic drill hole traces.

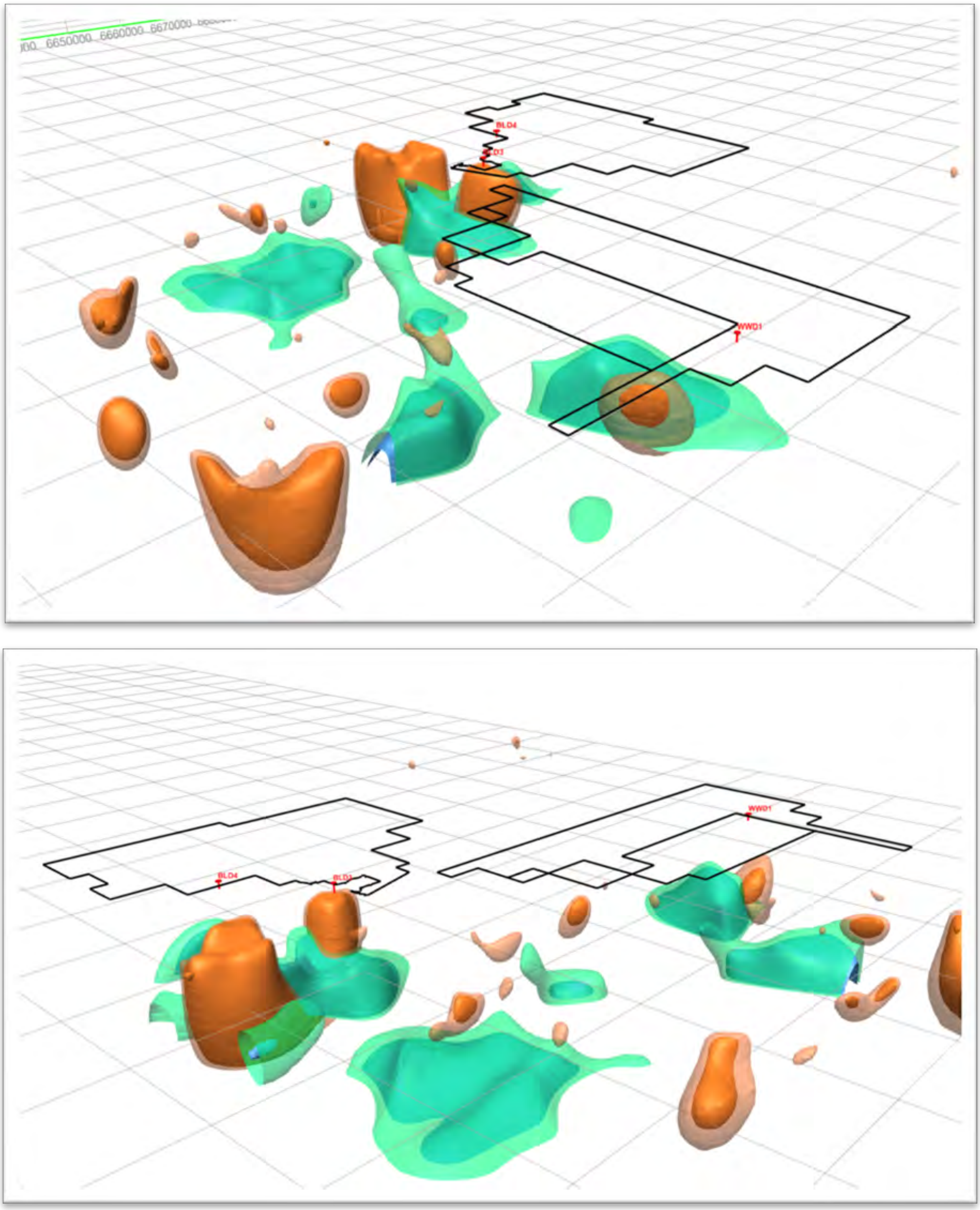


Figure 6-2: 3D views of Inversion Modelled Magnetics (green) and Gravity (orange) showing tenement outlines on surface and historic drill hole traces. Top (viewed towards the NE) and Bottom (viewed towards the NW).

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7 EXPENDITURE

A detailed Annual Activity Report has been submitted separately to the South Australian Department of Energy and Mining.

8 REFERENCES

Allen, M., Gianfriddo, C, Chen, I, 2022. Mineral Assessment of Stelar Metals Limited – Independent Technical Assessment Report. CSA Global Report No. R50502021. *Unpublished*.

Hetherington Legal, 2022. Independent Tenement Report – SA for Stelar Metals Limited. *Unpublished*

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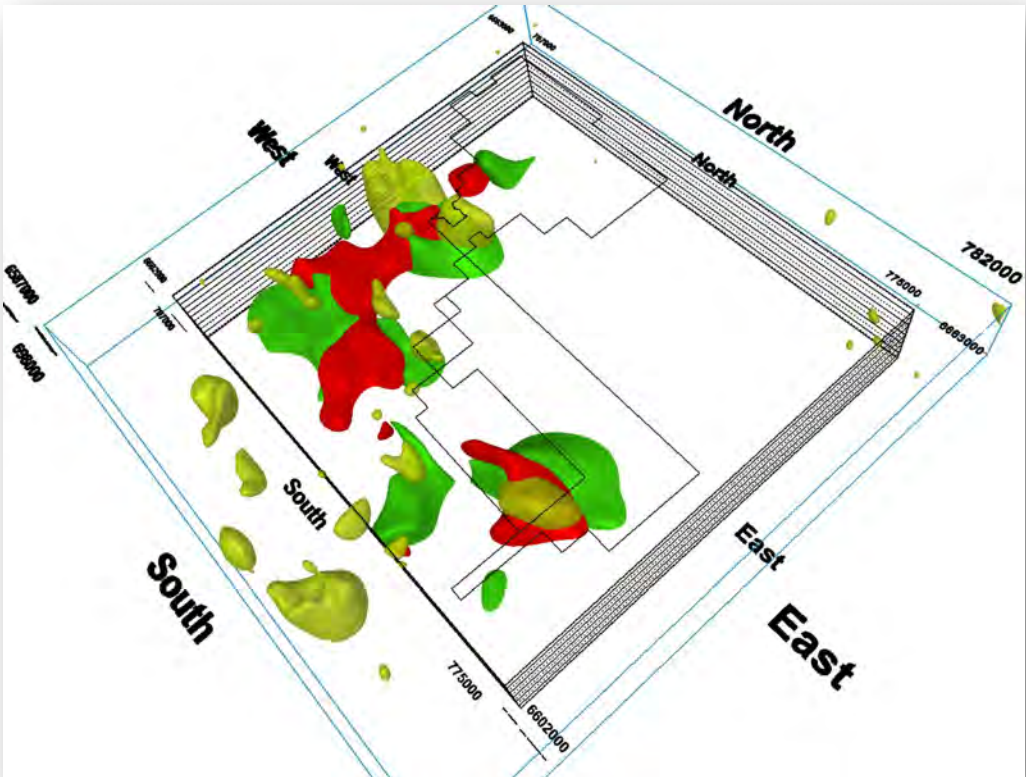
Stelar Metals: Torrens Project

Airborne Magnetic & Ground Gravity

3D Inversion Models



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David McInnes

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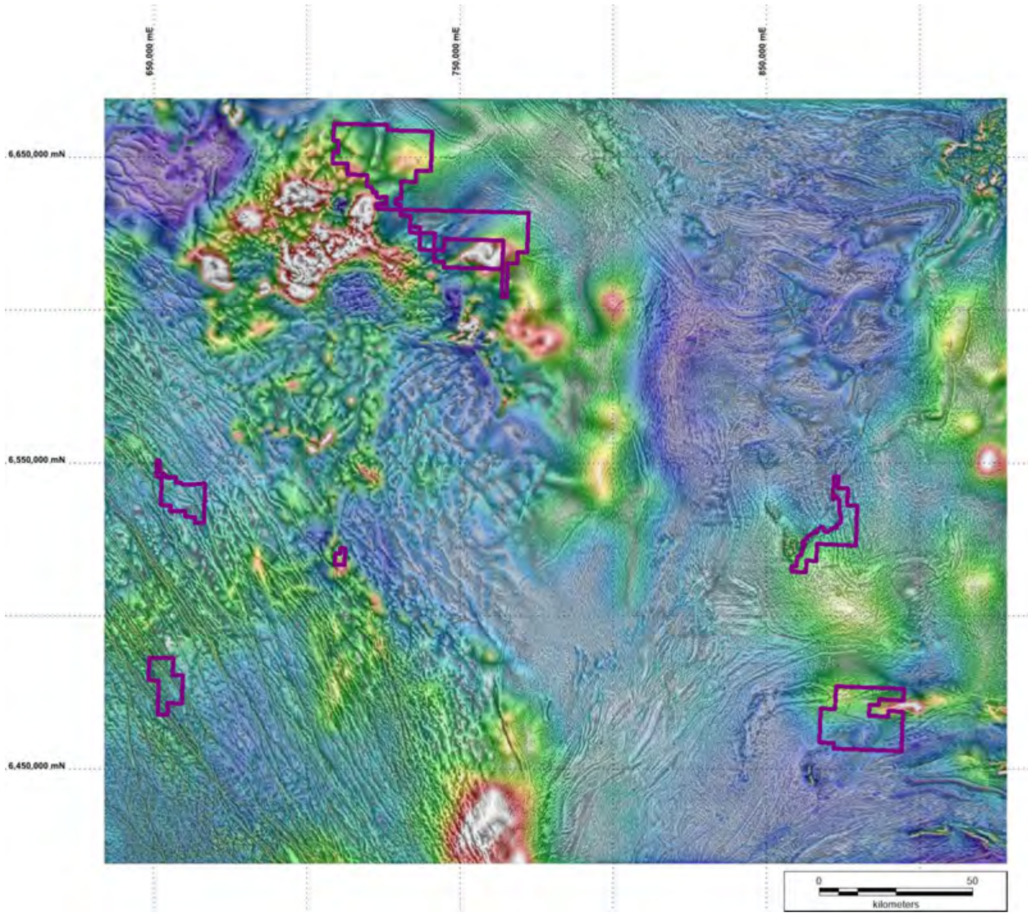
Stelar Metals: Torrens Project

Regional & Detailed Airborne

Magnetic and Radiometric

Image Processing



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Ref: R22010

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1. **Summary**

The following summarises the airborne magnetic and radiometric data processing over Stella's Torrens Project area (Fig 1.1). Regional data was processed to cover Exploration Licences: EL6264, EL6572, EL6263, EL792, ELA2021/00073 and ELA2021/00037. More detailed data images have been processed for the area that covers the Torrens Project (EL6264 & EL6572).

Interpretation and modelling of the data is in progress.

All images are presented in GDA94 Zone 53 South.

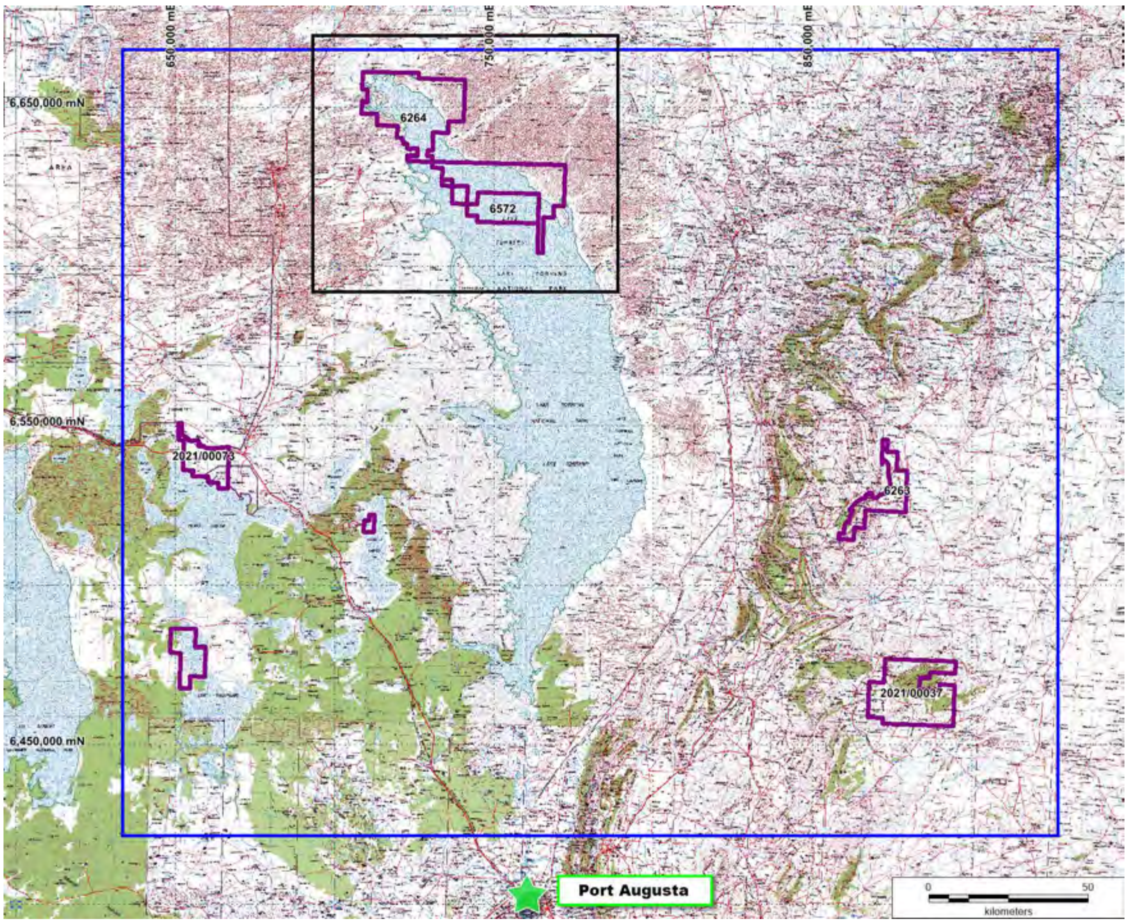

Figure 1.1: Location Diagram
Purple: ELs
Black: Detail processed area
Blue: Regional processed area RTP image

2. Airborne Magnetic Data Collection & Processing

The regional data was extracted from the National Airborne Geophysical Survey, "AWAGS_MAG_2019" with 200m line spacing. The detailed data was extracted from the Gawler Craton Airborne Survey (GCAS) that was completed in February 2020, also with 200m line spacing.

Both the Regional and Detailed airborne TMI (Total Magnetic Intensity) data have been processed to produce RTP, VRMI and VIAS first order reduction images (Figs. 2.1 & 2.2) (Regional & Detailed respectively). Filters and derivatives were then applied to this data to create band pass, tilt and first vertical derivative images and combinations thereof (Appendix A: Image Processing) (Figs. 2.3 to 2.6) (Regional & Detailed respectively).

Hybrid images can be constructed by combining the three first order reduction images in RGB colour space to create images of combined similar filtered data (R:G:B RTP:VIAS:VRMI respectively) (Figs.2.7 & 2.8). The colour hues of the resultant imagery are indicative of the relationship between current day magnetic field and any potential remanent magnetism, therefor features with similar colour characteristics can be inferred to have formed at the same geo-magnetic time.

All the imagery displays the complex magnetism in the area.

3. Airborne Detailed Radiometric Data

Radiometric data images have been constructed for the same regional area as the magnetic and gravity data (Figs.4.1 to 4.3). The regional images were constructed from data extracted from Geoscience Australia's National radiometric grids (2019 release).

The grids were reprojected (from lat/long to UTM GDA94 Zone 53) and checked for any negative values in the data. All grids have been adjusted to a zero value before squaring data to nullify any small values. A comparison of the squared data is displayed in linear, and histogram stretch (Fig.3.1).

Image processing was then undertaken to construct Ratio calculations (Fig 3.2) and Ternary RGB images (Fig 3.3).

The value of the radiometric data images is limited, the general trends in the data define the larger geological domains and have a broad correlation with magnetic data. The lakes display no response

4. 3D Inversion Modelling

A 3D inversion model of the airborne magnetic data over the Torens Els (6264 & 6572) is in progress (McInnes 2022). Coupled with this is a 3D inversion model of the open file gravity data.

5. Deliverables

All deliverables have been packaged in Self-extracting archive files:

File	Description
Detailed Area Files	
Torens_Det_Mag_Geotiffs.exe	Magnetic Images Geotiffs
Torrens_Det_Mag_PDFs.exe	PDFs of the Magnetic Images
Regional Area Files	
Torrens_Reg_Hybrids_Geotiffs.exe	Hybrid magnetic Geotiffs
Torrens_Reg_RTP_Geotiffs.exe	RTP magnetic Geotiffs
Torrens_Reg_VRMI_Geotiffs.exe	VRMI magnetic Geotiffs
Torrens_Reg_VIAS_Geotiffs.exe	VIAS magnetic Geotiffs
Torens_Reg_Rads_Geotiffs.exe	radiometric Geotiffs
TOR_Reg_RTP_Grids.exe	RTP magnetic Grids
TOR_Reg_VRMI_Grids.exe	VRMI magnetic Grids

Download Data Directory

https://1drv.ms/u/s!Ati8uaTGucJ_g9h18NJ9fXIlAI_twA?e=ZGIcNm

6. Reference

McInnes, D., 2022, *Stelar Metals: Torrens Project, Airborne Magnetic & Ground Gravity Inversion Models"*. Attn. Colin Skidmore, internal report R22008

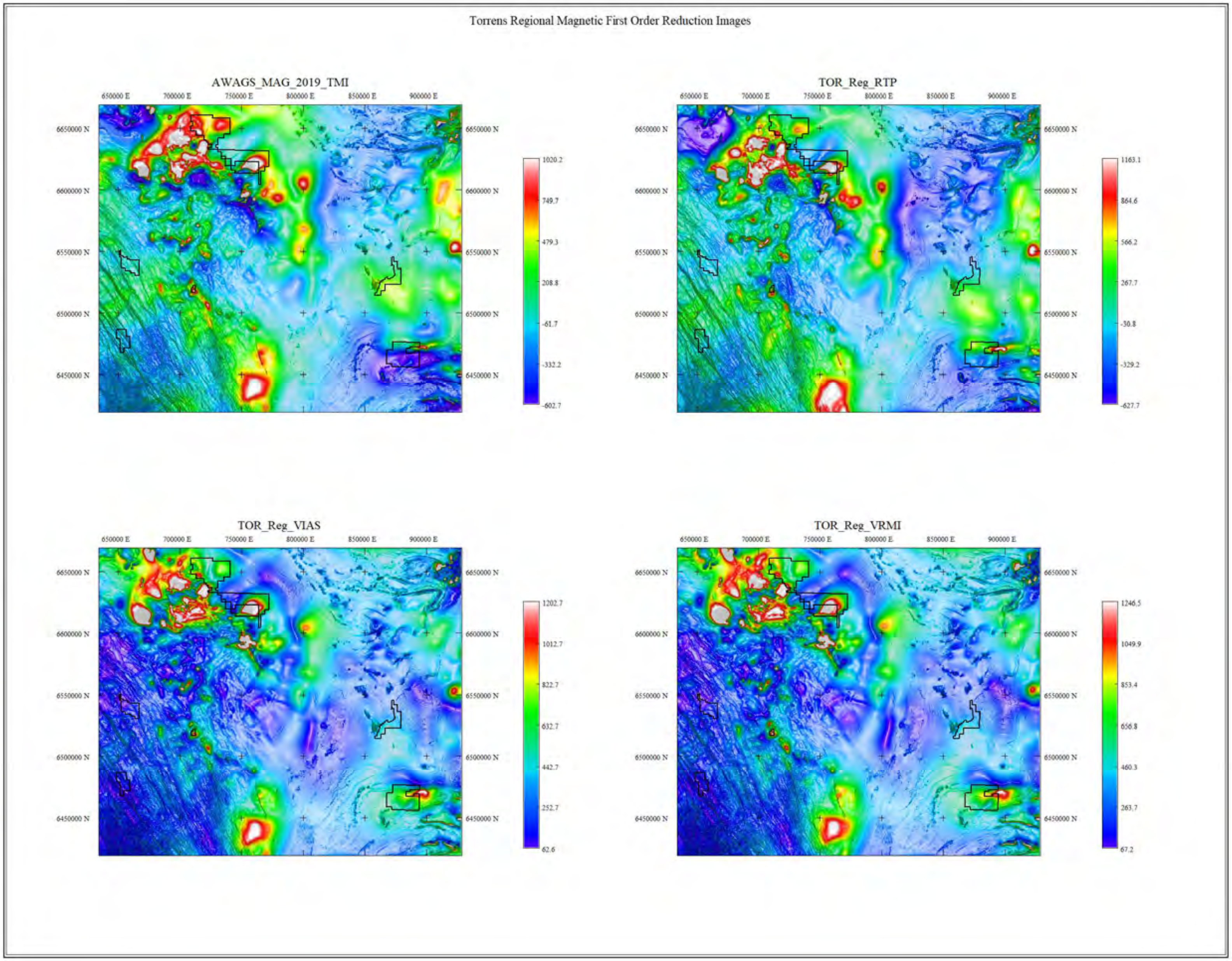

Figure 2.1: Regional TMI, RTP, VIAS & VRMI images
(first order reductions)

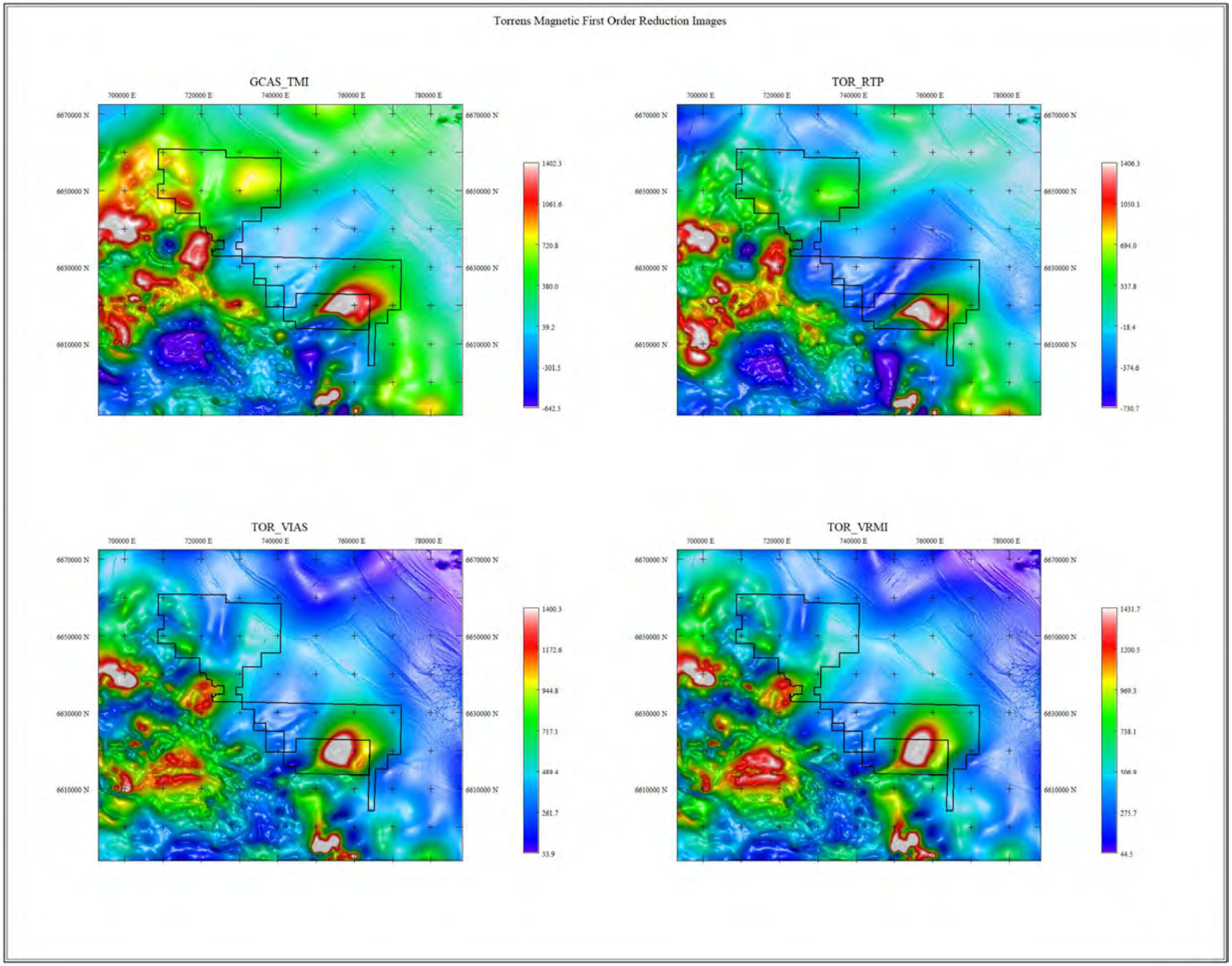

Figure 2.2: Detailed TMI, RTP, VIAS & VRMI images

(first order reductions)

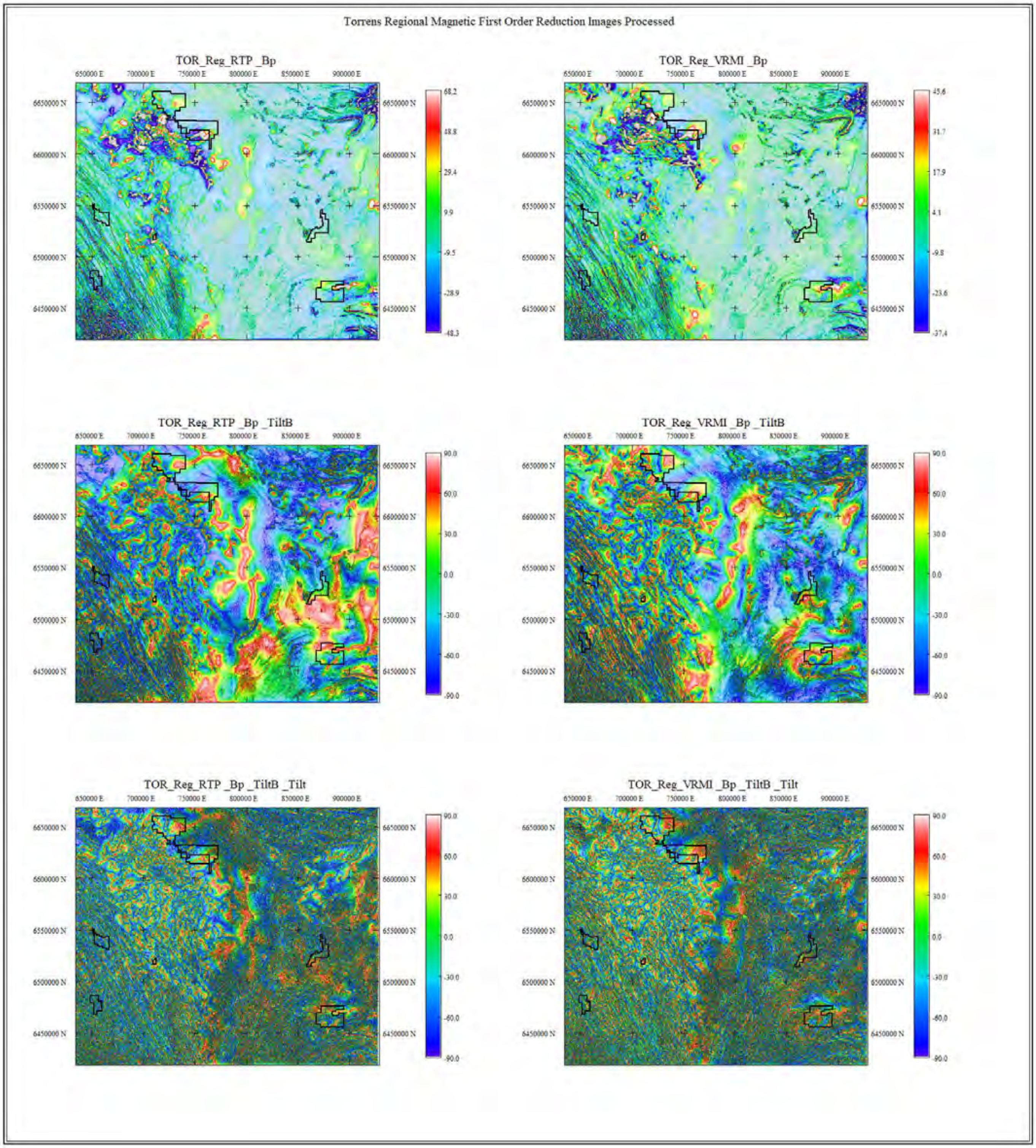

Figure 2.3: Regional Processed Data Image Stack
(RTP & VRMI)

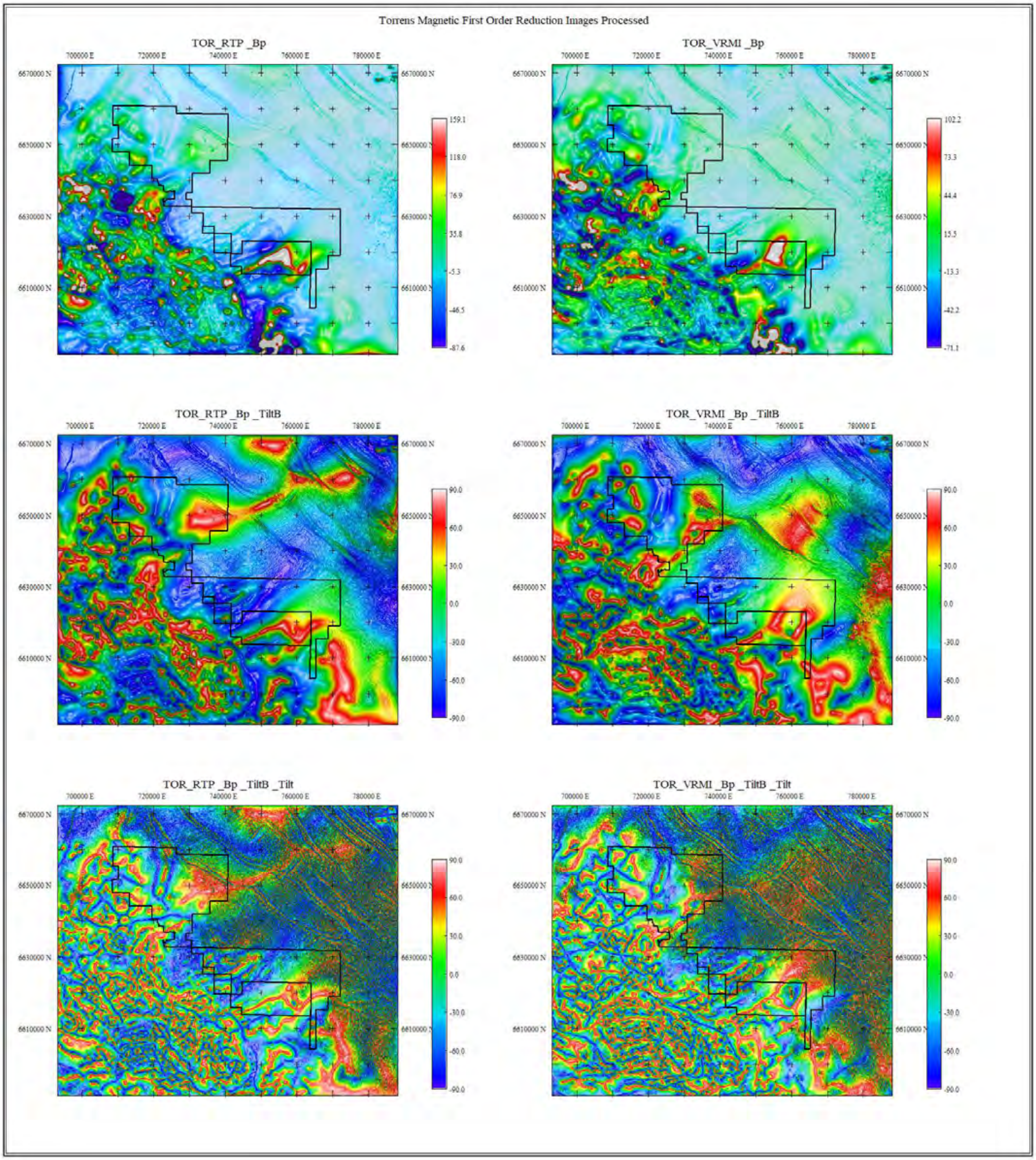

Figure 2.4: Detailed Processed Data Image Stack
(RTP & VRMI)

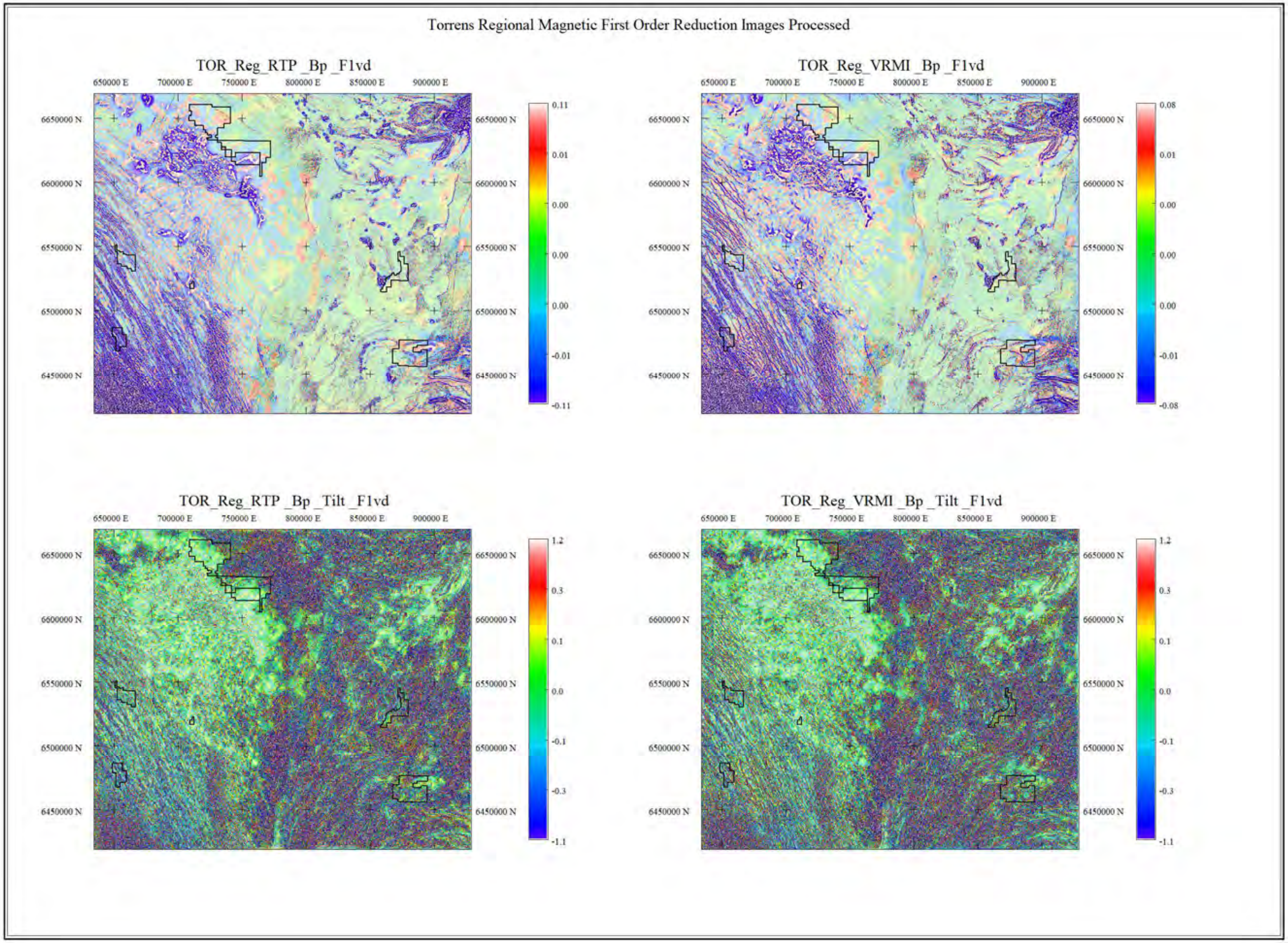

Figure 2.5: Regional Processed Data Image Stack (F1vd)

(RTP & VRMI)

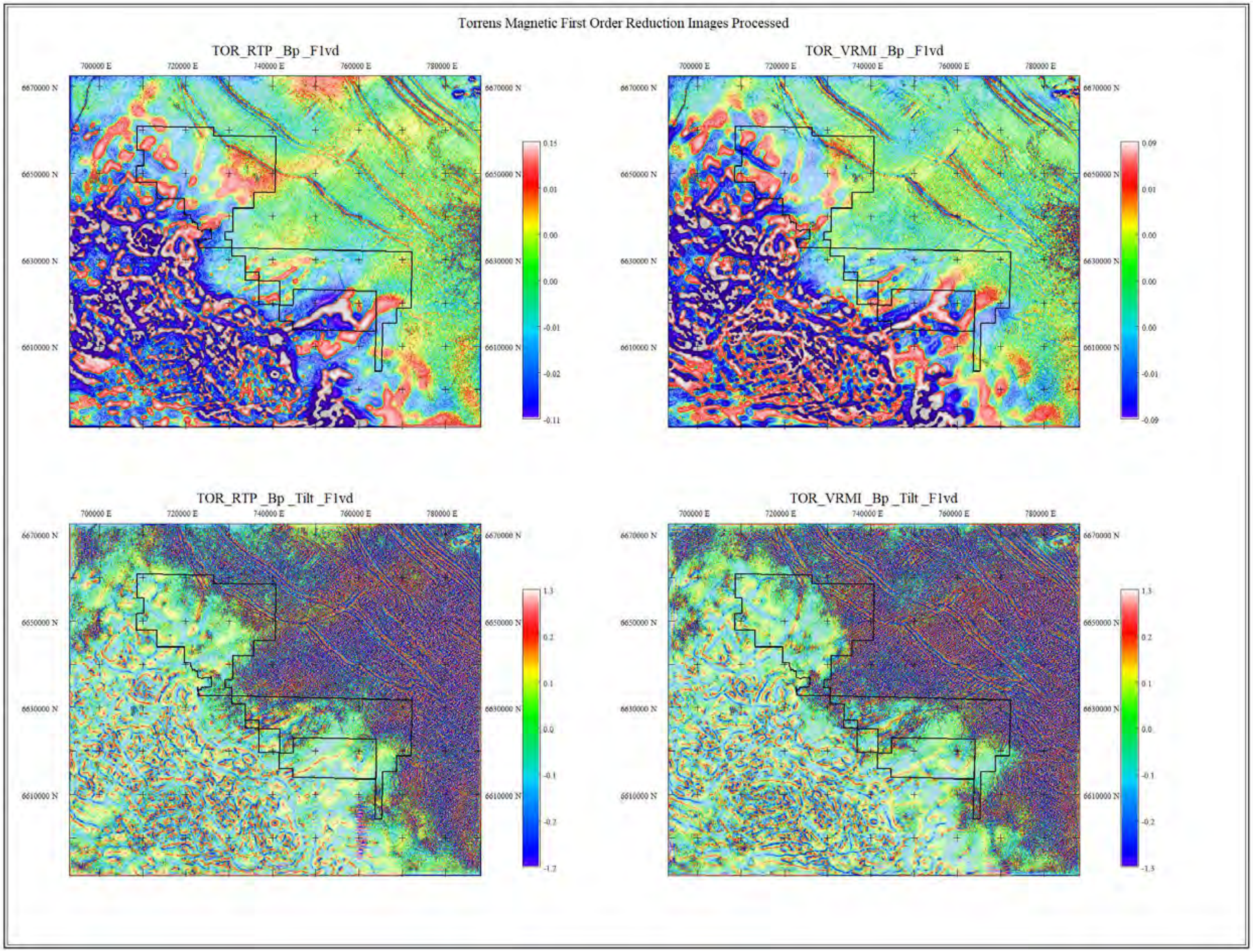

Figure 2.6: Detailed Processed Data Image Stack (F1vd)
(RTP & VRMI)

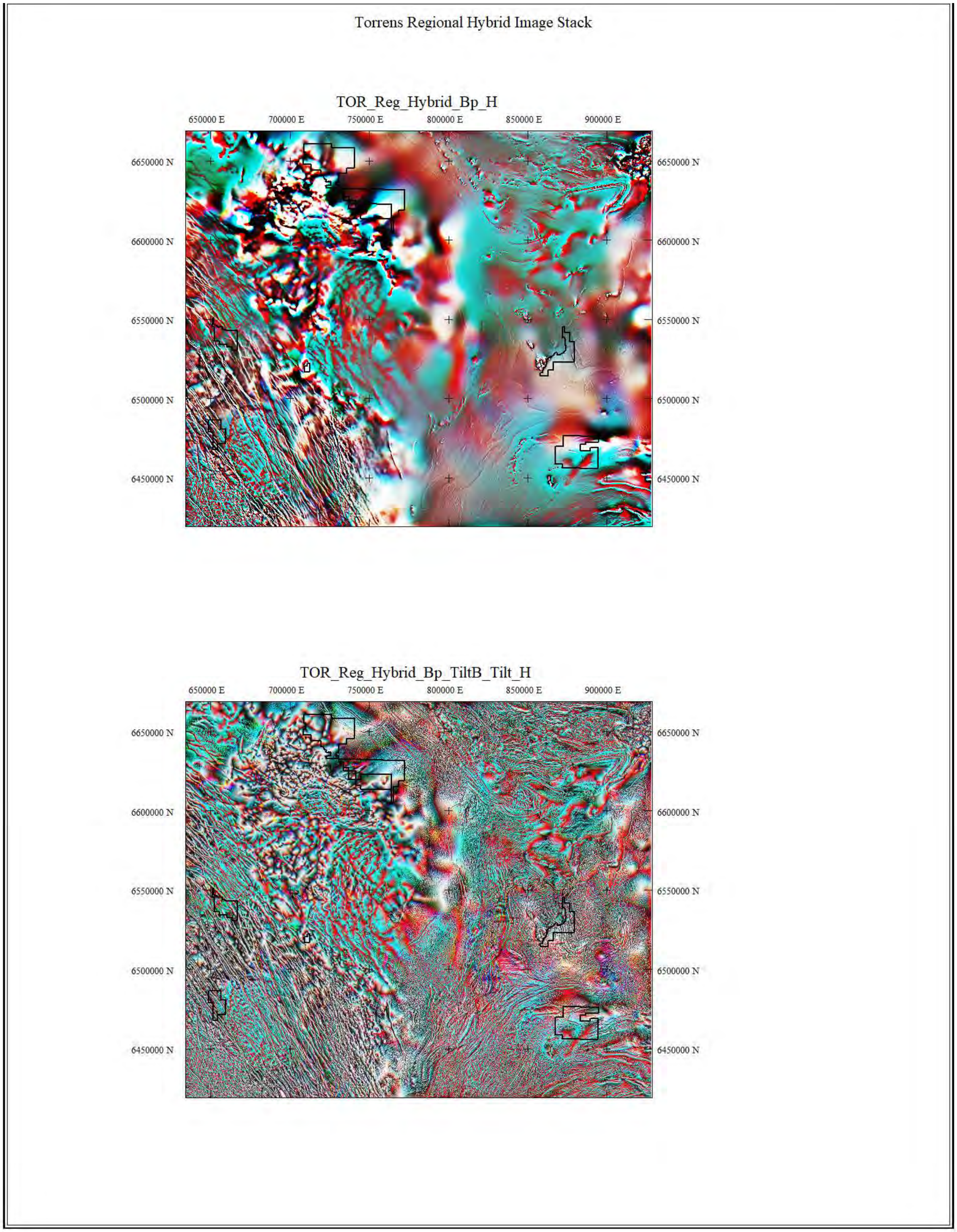

Figure 2.7: Regional Hybrid Processed Images
(TOR_Reg_Hybrid_Bp_H & TOR_Hybrid_Reg_Bp_TiltB_Tilt_H)

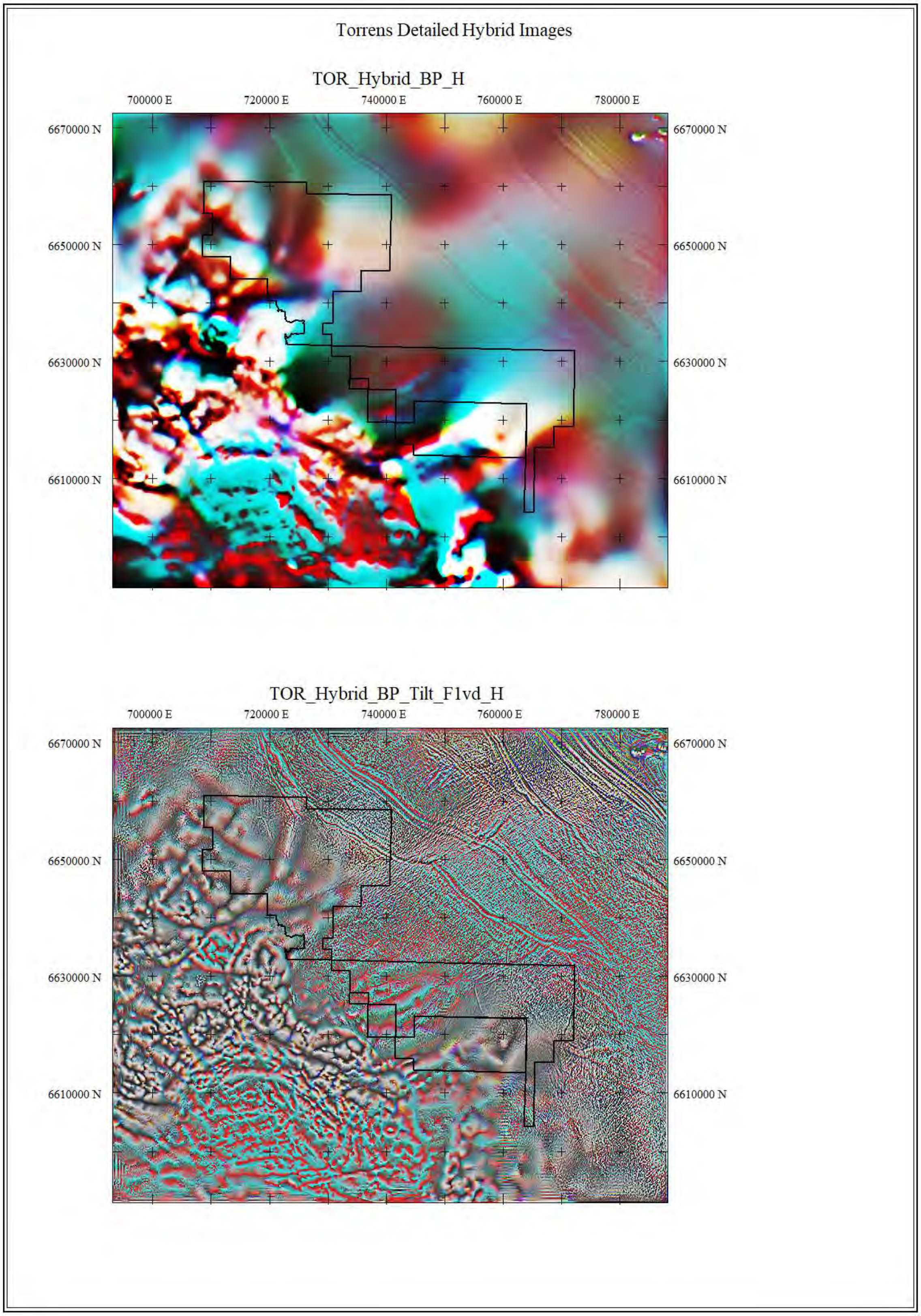

Figure 2.4: Detailed Hybrid Processed Images
(TOR_Hybrid_BP_H & TOR_Hybrid_BP_Tilt_F1vd_H)

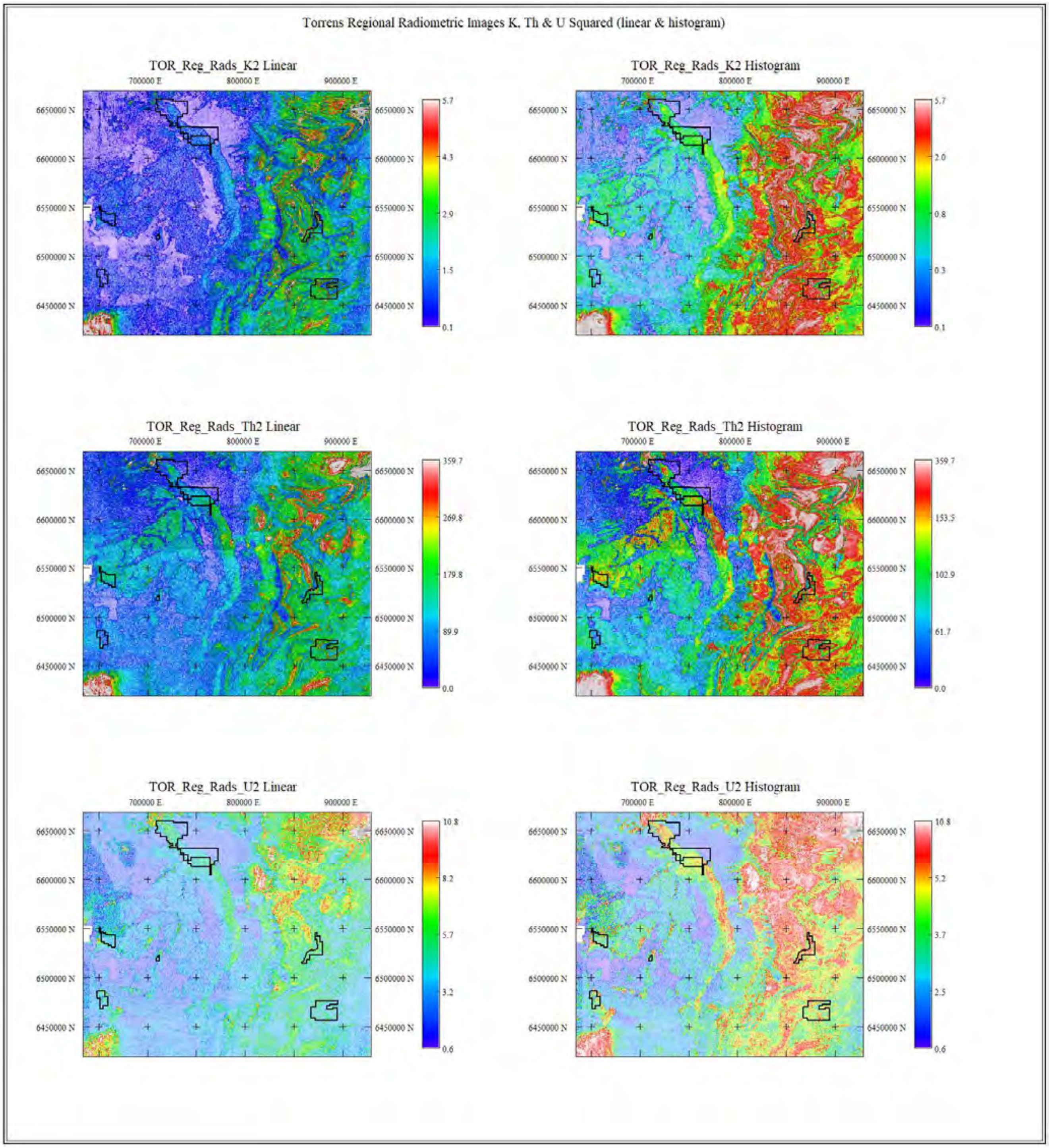

Figure 4.1: Regional Radiometric Squared Images
(linear & histogram stretched)

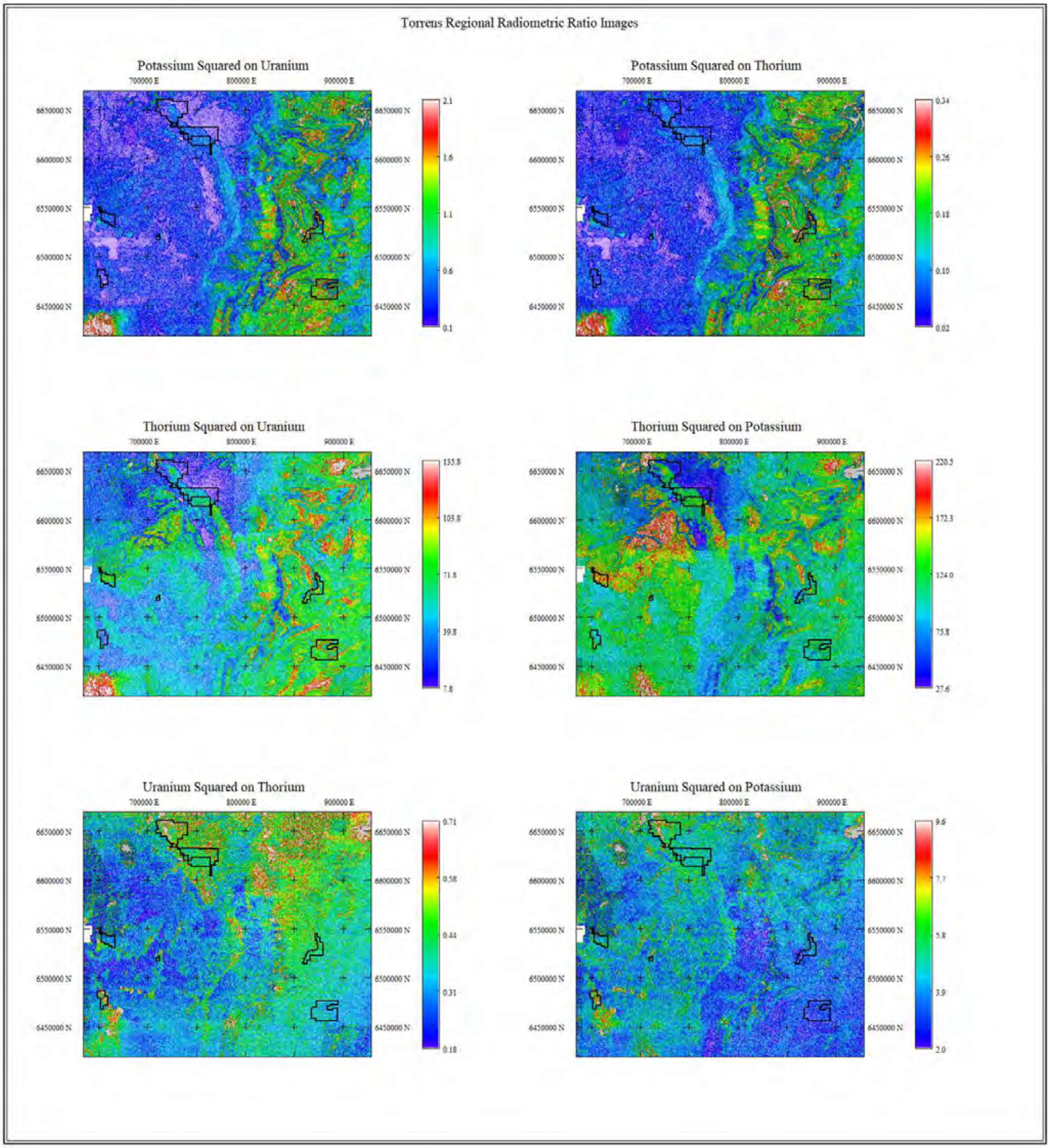

Figure 4.2: Regional Radiometric Ratio Images

Torrens Regional Radiometric Images (linear & histogram)

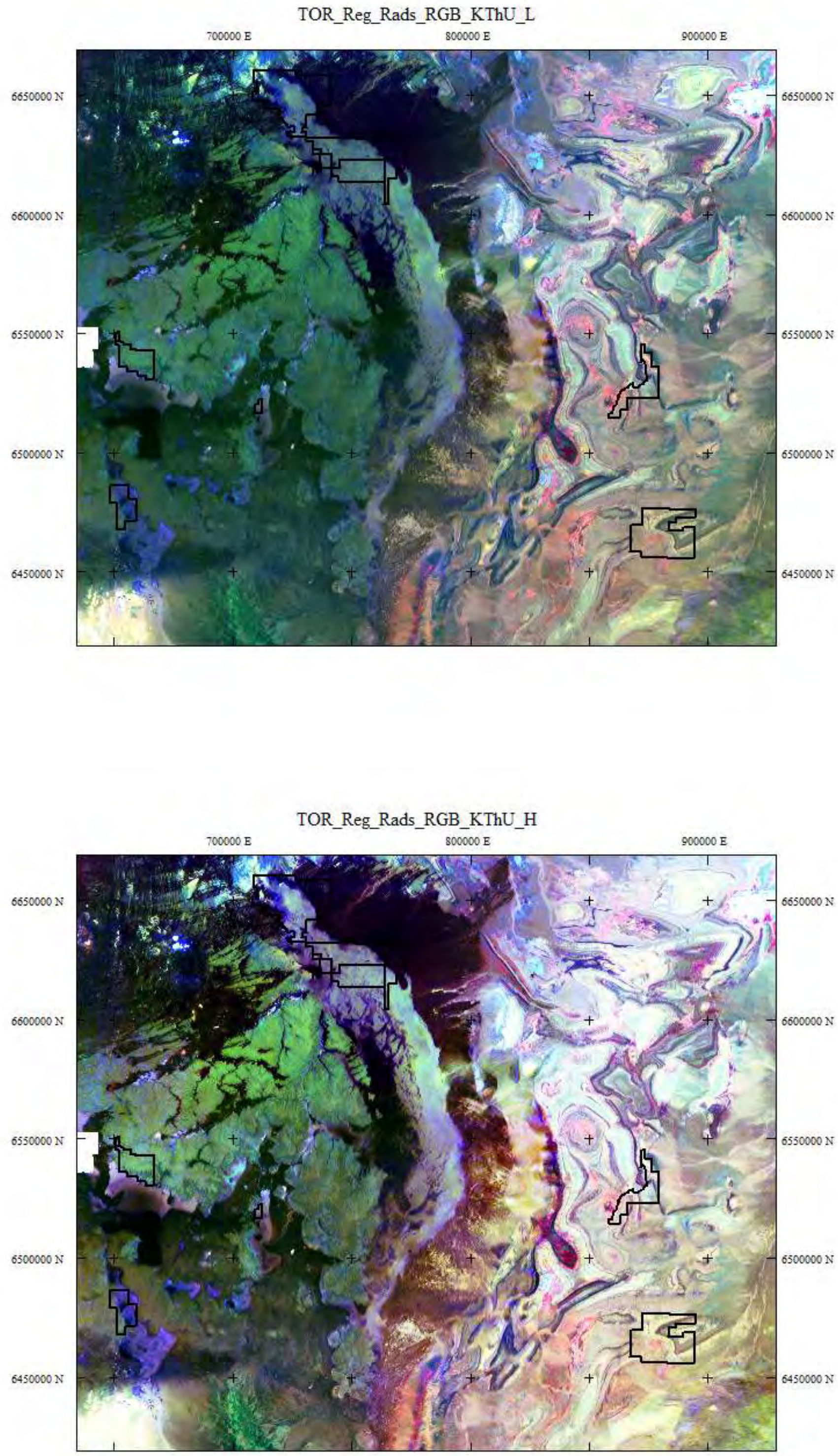

Figure 4.3: Regional R:G:B Radiometric Images
(Potassium: Thorium: Uranium - linear & histogram stretched)

Appendix A: Image Processing

- RTP = Reduction to the Pole (note not applicable to data within +/- 20 degrees magnetic field inclination I.e., areas of low magnetic latitude). It transforms the data to look as if it was acquired at the magnetic poles, placing the centre of the anomaly high over the top of the magnetic bodies/source.

- VRMI = Vector Residual Magnetic Intensity - good for removing the effects of remanence for and in areas of low magnetic latitude. The filter uses the current day inclination and declination to ascertain where the anomaly gradients are not compatible and corrects for these assuming remanent sources.

- VIAS = Vertical Integration of the Analytical Signal: Analytical Signal (AS) is square root of the sum of the square of the three directional derivatives (vertical, horizontal X & Y). It was specifically developed for areas with low latitude (magnetic equatorial zones). However, as it is derivative the amplitude information is "lost"; hence undertaking a Vertical integration the volume under the anomaly is integrated to retrieve amplitude information.

- F1vd = Fourier 1st vertical derivative. This filter sharpens the magnetic features, removing the regional trend (background). You can have any order of derivative, the higher the number the more intense the filter is applied. i.e., F1p5vd = Fourier 1.5 vertical derivative. The "p" signifies the decimal position used in transform. F2vd = Fourier 2nd vertical derivative. This filter further sharpens the magnetic feature.
- Note: that the higher the order of the derivative the more "noise" in the data will be amplified (because noise is a high frequency feature and derivative filters are enhancing the high frequency component of the data).

- Bp/Lp/Hp = This is a Band Pass/Low Pass/High Pass filtered or magnetic layer extracted image where the potential field sources outside the depth/frequency stipulated have been removed f(r, s) = Exp(-h * A) * (1 - Exp(-e * A)) where: A = 2 * Pi * sqrt(r ^ 2 + s ^ 2).

- Tilt = is a filter for displaying source trends and structure. It is a calculation of the difference between the vertical derivative and the magnitude of the horizontal derivatives. T=arctan(dM/dz / sqrt(dM/dx ^2 + dM/dy ^2)). The tilt-filter is a variety of phase filter which, like the more familiar first vertical derivative (1VD), traces geological structures. Unlike 1VD however, the tilt-filter is relatively insensitive to the depth of the source geology below the ground, making tilt-filtered image a useful tool for tracing geological structure below variable depths of cover.

- TiltB = A tilt filter calculated using the X,Y,Z components (instead of gradients).

- Hybrids = RGB images of RTP, VIAS & VRMI with common processing. Where features are most intense (white) it indicates that it is represented in all the processed images (so highly robust), when dominated by the red band the RTP response is dominating, cyan features are dominated by the combination of the VRMI and VIAS; these areas represent areas where remanence must be considered. Dark features represent no magnetic response in any of the first order reduction images. These images define the geomagnetic domains (TOR_Hybrid_BP_H & TOR_Reg_Hybrid_Bp_H) and the structure (TOR_Hybrid_BP_Tilt_F1vd_H & TOR_Reg_Hybrid_Bp_TiltB_Tilt_H).

- UC = Upward continuation

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Table of Figures

1. Summary

The following summarises the inversion modelling of airborne magnetic and ground gravity data over Stelar Metal's Torrens project (ELs 6264 & 6572) approximately 100km Northeast of Woomera, South Australia (Fig.1.1).

The project area is covered by 200m flightline spaced 60m flying height GCAS magnetic data released in 2020 (McInnes 2022). The gravity data coverage is coherent with the ELs having predominately 1km and 750m spaced stations.

The Total Magnetic Intensity (TMI) models display characteristics that suggest remanent magnetism is overprinting the magnetic response. This resulted in differences between the VRMI and TMI models, although the sources are generally spatially coincident. The modelling suggests the sources of the magnetic anomalies are high susceptibility bodies with depths to top that exceed 500m southwest of the ELs and greater than 1km within the ELs.

The gravity modelling defines several large bodies with depth extent that have a high-density contrast. In EL6572 there is a large body that is coincident with a high magnetic susceptibility body at depth. A second significant body of elevated density contrast is on the western edge in the neck of EL6264. The body in EL6264 is part of a larger complex and associated with a strong basement magnetic body (Figs. 1.2, 1.3 & 1.4).

Better definition of the bodies that source the gravity anomalies could be achieved with tighter spaced gravity stations (250 to 400m), or a 200m flight line airborne gravity gradiometer survey.

All subsequent images are presented in GDA94 Zone 53 South.

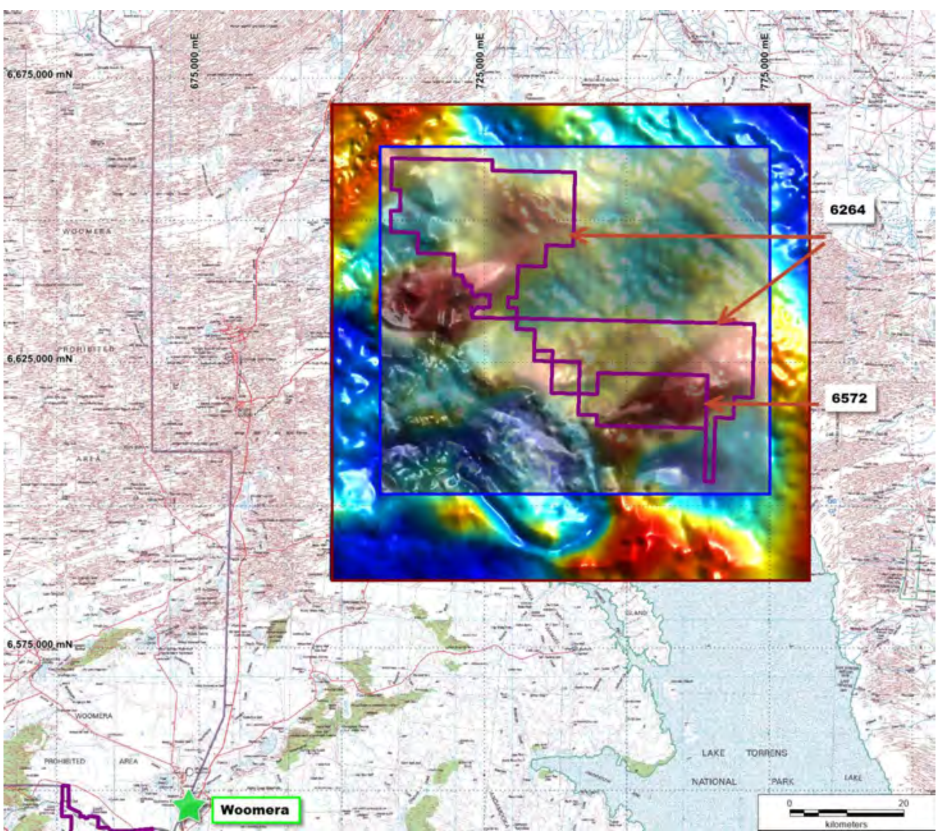

Figure 1.1: Location Diagram

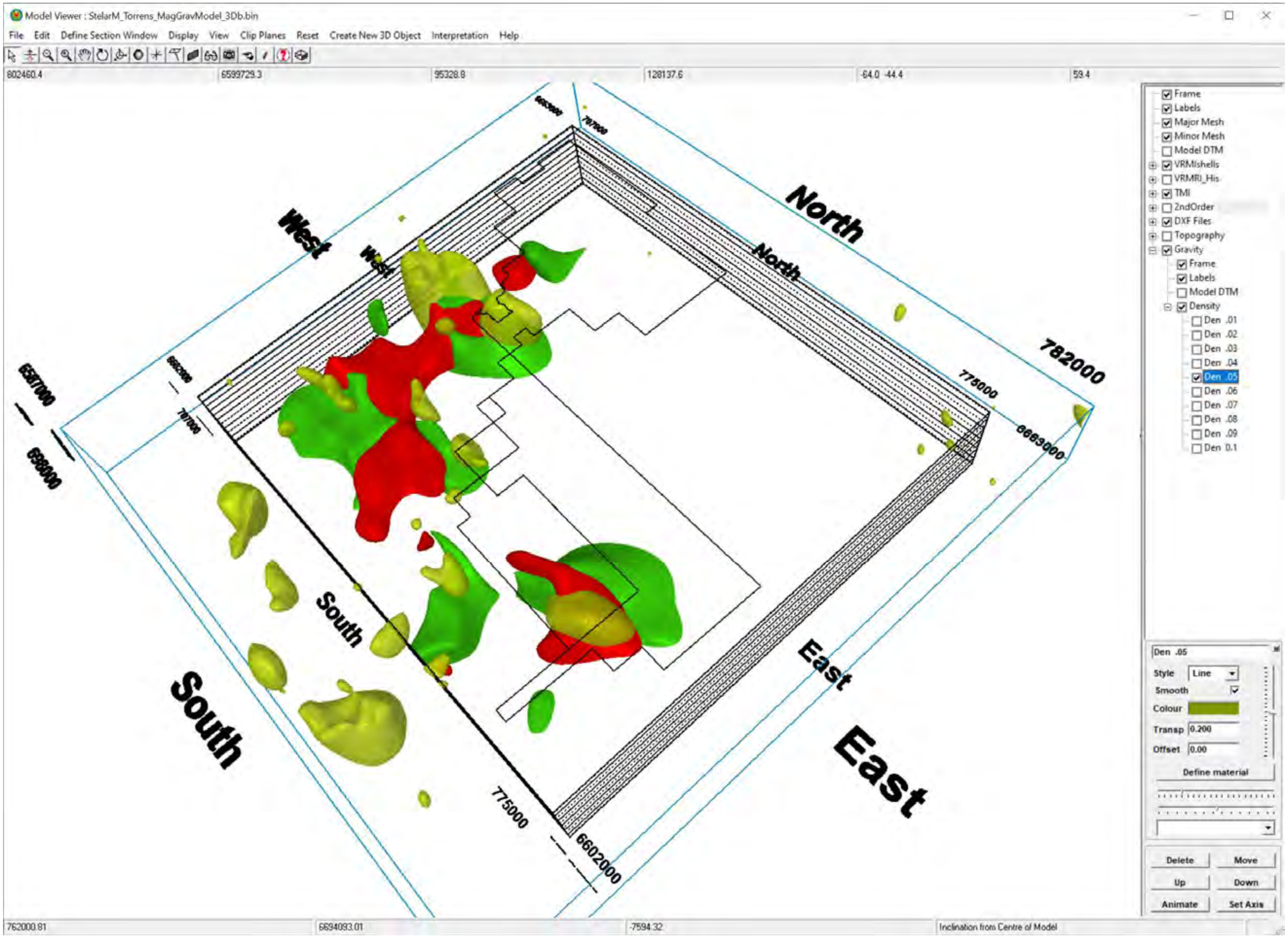

Figure 1.2: Gravity Density Shells 0p05

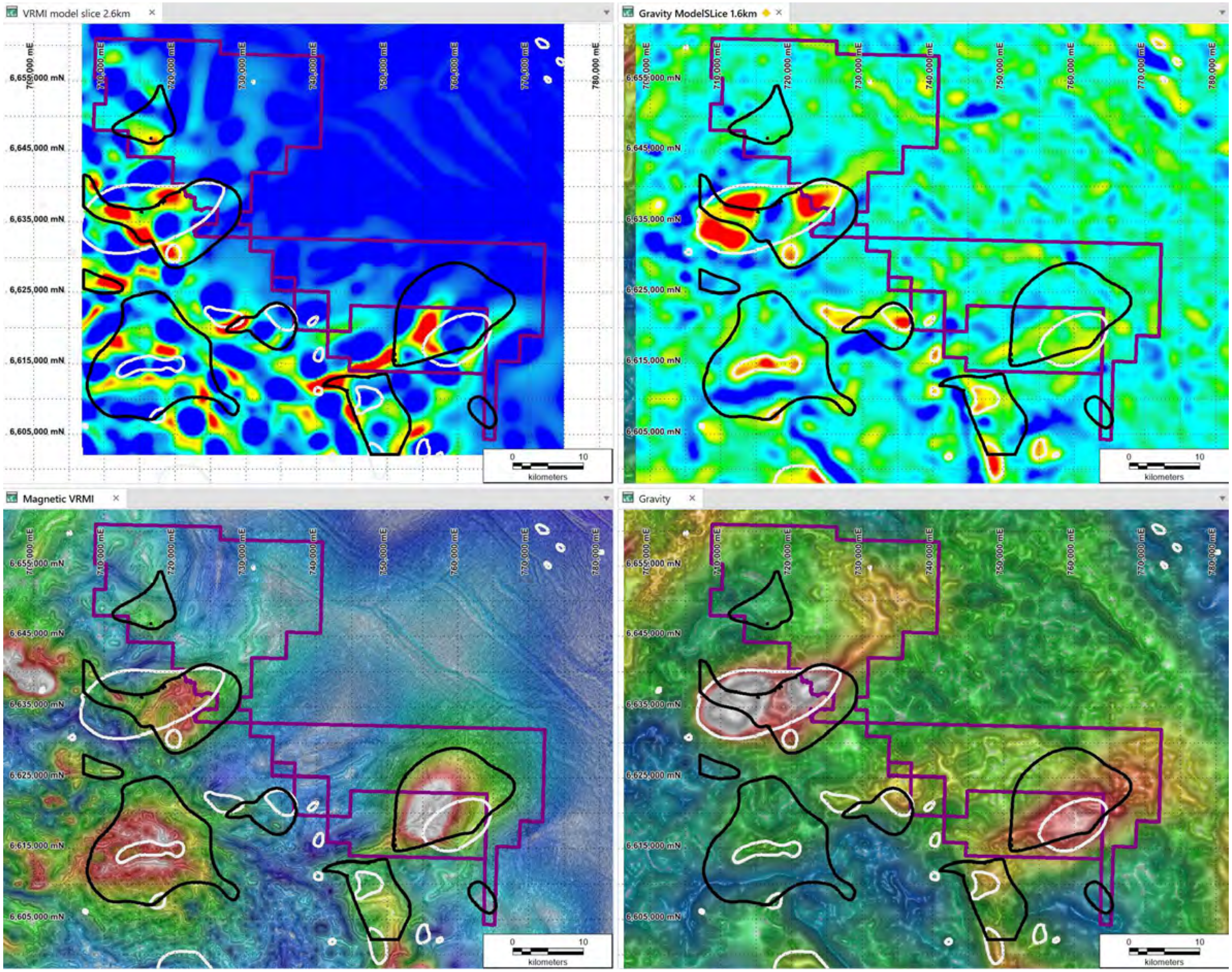

Figure 1.3: Comparison of VRMI & Gravity Model Slices & Images
***Left:** VRMI – **Right:** Gravity*

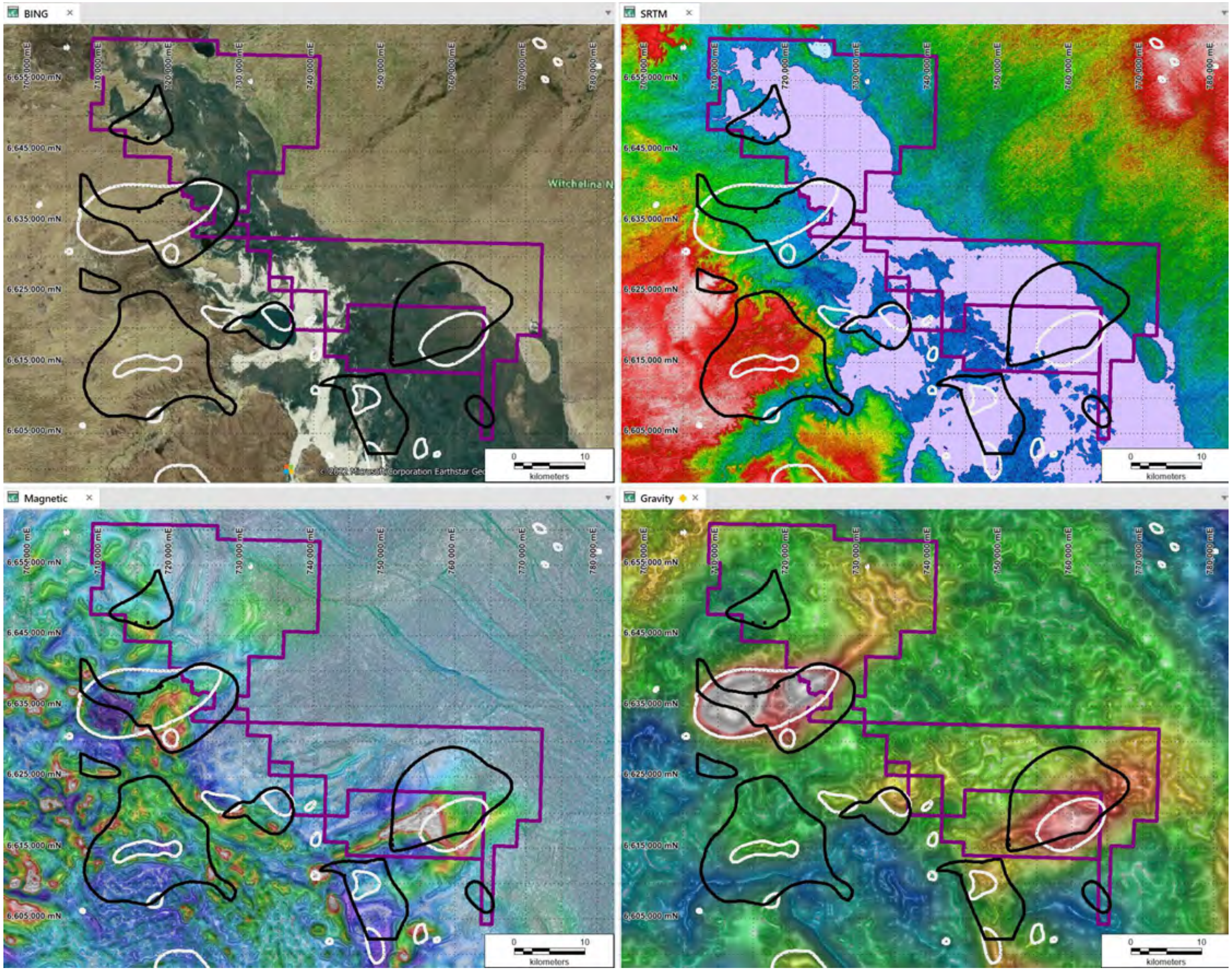

Figure 1.4: Comparison of BING, SRTM, Magnetic & Gravity Images

Top Left: *BING -* ***Top Right:*** *SRTM –* ***Bottom Left:*** *Magnetic Image –* ***Bottom Right:*** *Gravity Image*

2. Airborne Magnetic Data

The Airborne Magnetic data is sourced from the Gawler Craton Airborne Survey (GCAS), completed/released in 2020 (Fig 2.1). The processing of the magnetic grids is documented in "*Stelar Metals: Torrens Project, Regional & Detailed Airborne Magnetic and Radiometric Image Processing"* (McInnes 2022).

3. 3D Magnetic Modelling

The 3D magnetic model inversions were completed using 3DMGinv developed by John Paine of scientific computing. Three models were undertaken, inversion descriptions are in Appendix A. There is little difference in the 1st and second order TMI inversions, consequently the Total Magnetic Intensity (TMI) first order residual and VRMI inversion models are considered herein.

The modelling demonstrates that the shallow magnetic material is in the south-west of the project area outside the ELs. The tops of the sources appear to develop at approximately 500m. Within the ELs the magnetic bodies appear deeper with tops developing at around 750m to 1km.

The TMI model displays a large dynamic range with high level magnetic susceptibility (mag-sus) being developed in the deeper part of the model. These extremely high values, especially when compared to the VRMI model indicate that there may be some remanent magnetism in the area. These are potentially observed as the difference in the TMI and VRMI images in the south-west of the model area. The remanence or poor regional removal has resulted in a strip of moderate susceptibility developing in the model at depth.

The VRMI model displays similar structure to the TMI model, with sources developing at 600m in the south-west of the model area and at greater than a km within the ELs. The dynamic range of the mag-sus is less, with a much lower maximum and more character in the lower mag-sus.

The magnetic models define a body with elevated mag-sus deep within EL6572. The TMI and VRMI inversion define the geometry of the source differently, this magnetic body is coincident with a large regional positive gravity anomaly (details below). There are also strong deep magnetic bodies on the north-western boundary of EL6264.

4. Gravity Data

The area is covered by a regular 1km offset and 750m square grid data stations (Fig 4.1). The Bouguer Anomaly grid for the area was extracted from the South Australian Geological Survey SA_GRAV.ers (Katona 2016). This variably gridded 100m cell size grid honours the data collection spacing.

The gravity data Bouguer Anomaly image defines a series of gravity highs with a north-easterly strike. They are sharply truncated in the south-west (structures?).

Standard transforms have been applied to enhance the anomalies and structure (Fig 4.2). The derivative filtered (HP & Tilt) images indicate that the broad anomalies have little high frequency content (shallow material). The images delineate circular boundaries and zones of different frequency content and orientations.

Image transform descriptions are in Appendix B.

5. 3D Gravity Inversion Model

A 3D inversion model of the gravity data has been undertaken using 3DMGInv, developed by John Paine of scientific computing. The model was undertaken on the residual of the Bouguer Anomaly (2.4 g/cc) ground gravity data.

The 3D inversion model process is summarised in Appendix C.

The inversion converged well indicating the model is a good representation of the subsurface density distribution. However, it must be noted that no dataset has a unique model solution.

The gravity model, like the magnetic model, indicates that the depth to the top of the sources is greater than 600m, however the station spacing (750m to 1km) does not resolve wavelengths of features shallower than this (Fig 5.1). Tighter spaced gravity stations are required to identify if the sources of the gravity anomalies are shallower.

The gravity modelling delineates the development of the dense body (>0.1) in EL 6572, associated with the aforementioned magnetic body. It also highlights the development of the dense complex on the western margin of EL6264, also associated with strong magnetism (Fig 5.2).

6. Deliverables

Self-extracting archive supplied below:

File	Description
Tor_Gravity_grids.exe	Gravity grids
Tor_GravMag_PDFs.exe	Magnetic & Gravity PDFs
Tor_Grav_GIS.exe	Gravity Geotiffs and vectors
Tor_mag_Inv_GIS.exe	Magnetic model Geotiffs and vectors
Tor_GravMag_Models_DXFs.exe	Magnetic & Gravity Model DFXs
Tor_GravMag_Models_XYZ.exe	Magnetic & Gravity Models in XYZ format
Tor_GravMag_Models_UBC.exe	Magnetic & Gravity Models in UBC format

Download Data Directory
https://1drv.ms/u/s!Ati8uaTGucJ_g_gO1QwPAD95GqvPFA?e=cF0cwU

https://www.scicomap.com/3Dviewer.html
link to free 3D model viewing software

7. Reference

Katona, L.F., 2017, Gridding of South Australian Ground Gravity Data, using the Supervised Variable Density Method. Report number: RB2017/00012
Affiliation: Geological Survey of South Australia

McInnes, D., 2022, "*Stelar Metals: Torrens Project, Regional & Detailed Airborne Magnetic and Radiometric Image Processing*". Attn. Colin Skidmore, internal report R22010

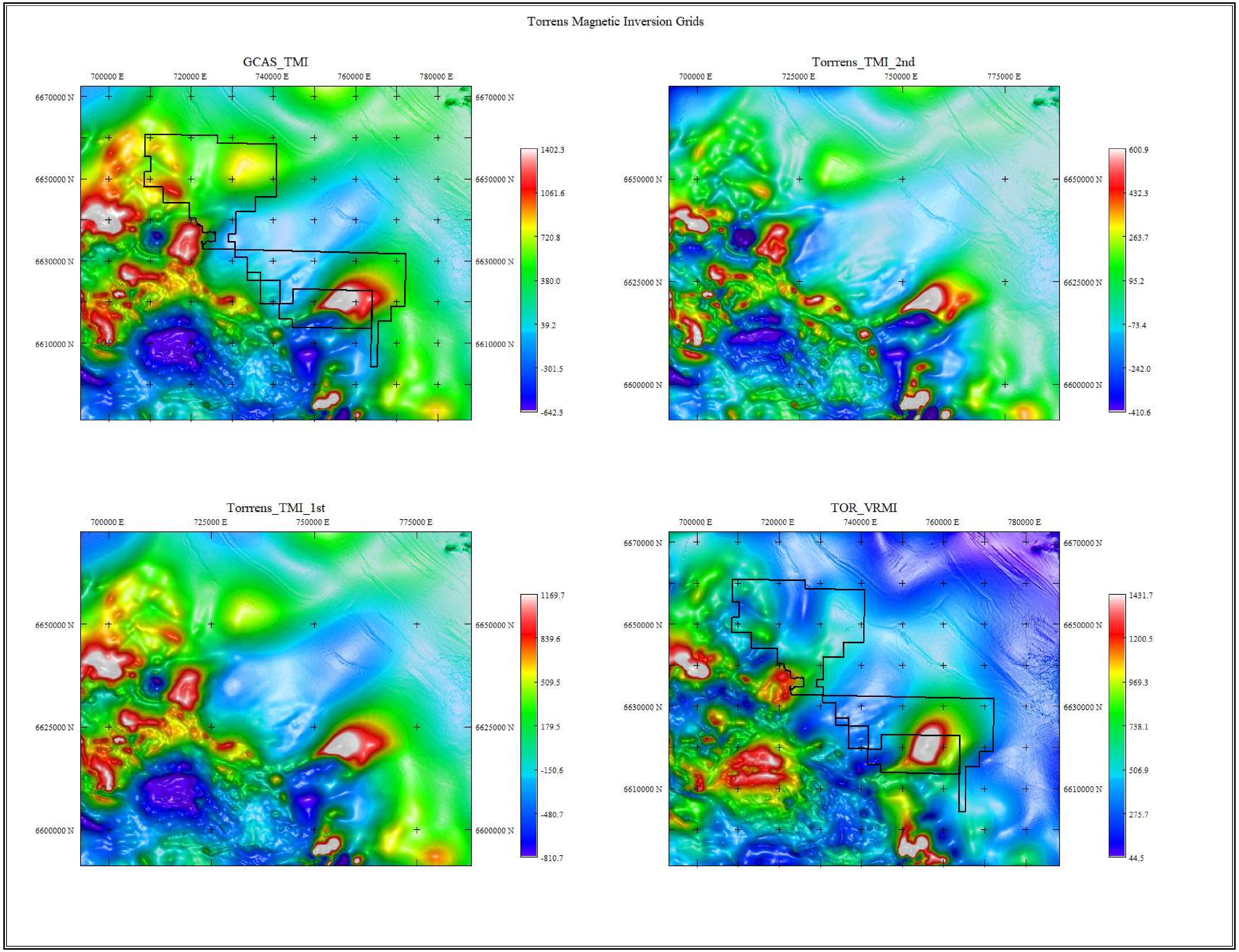

Figure 2.1: Magnetic Inversion Grids
***TL**: GCAS TMI – **TR**: TMI 2nd Model*
***BL**: TMI1st Model – **BR**: VRMI Model*

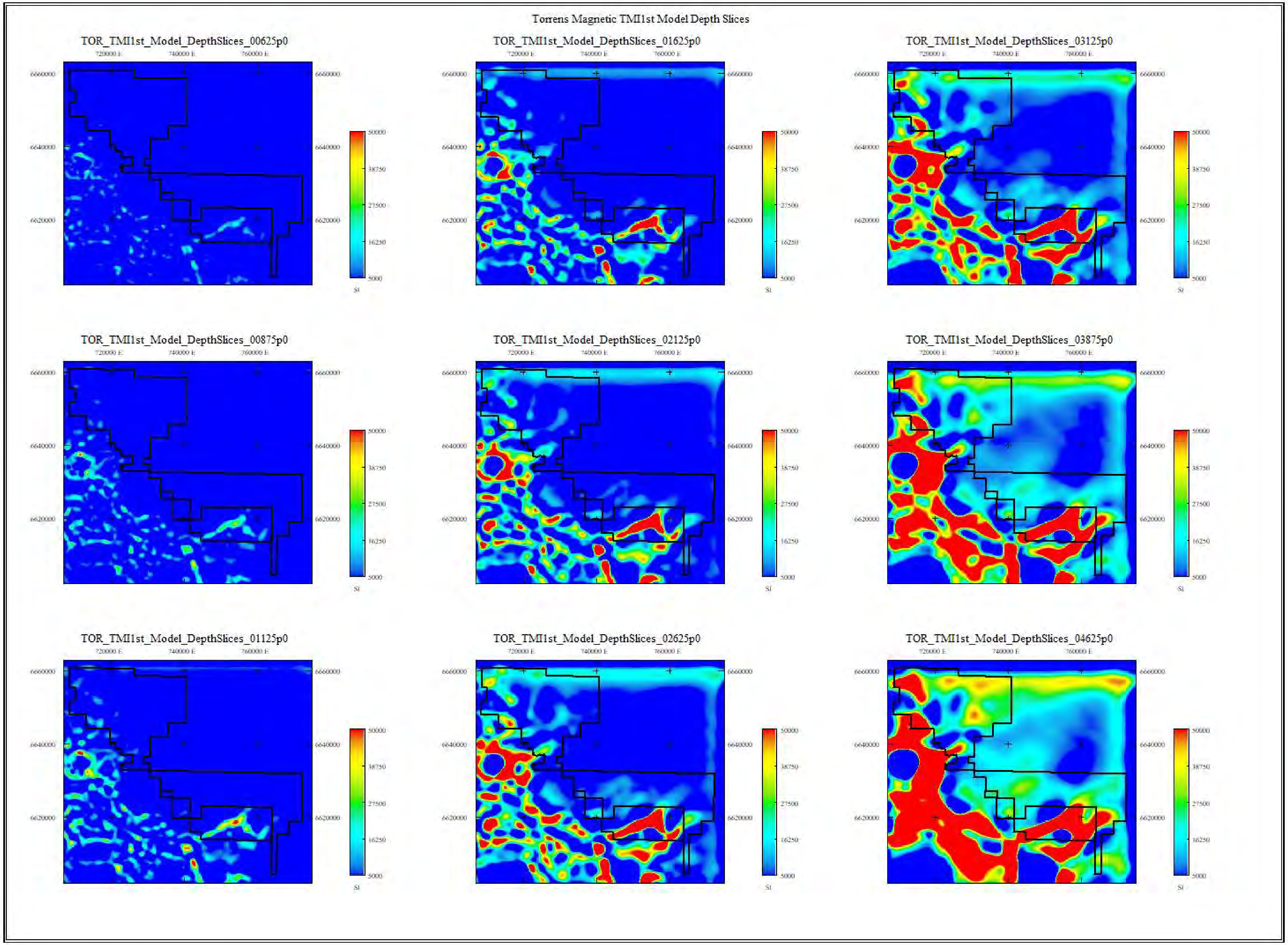

Figure 3.1: Magnetic TMI1st Model Depth Slices

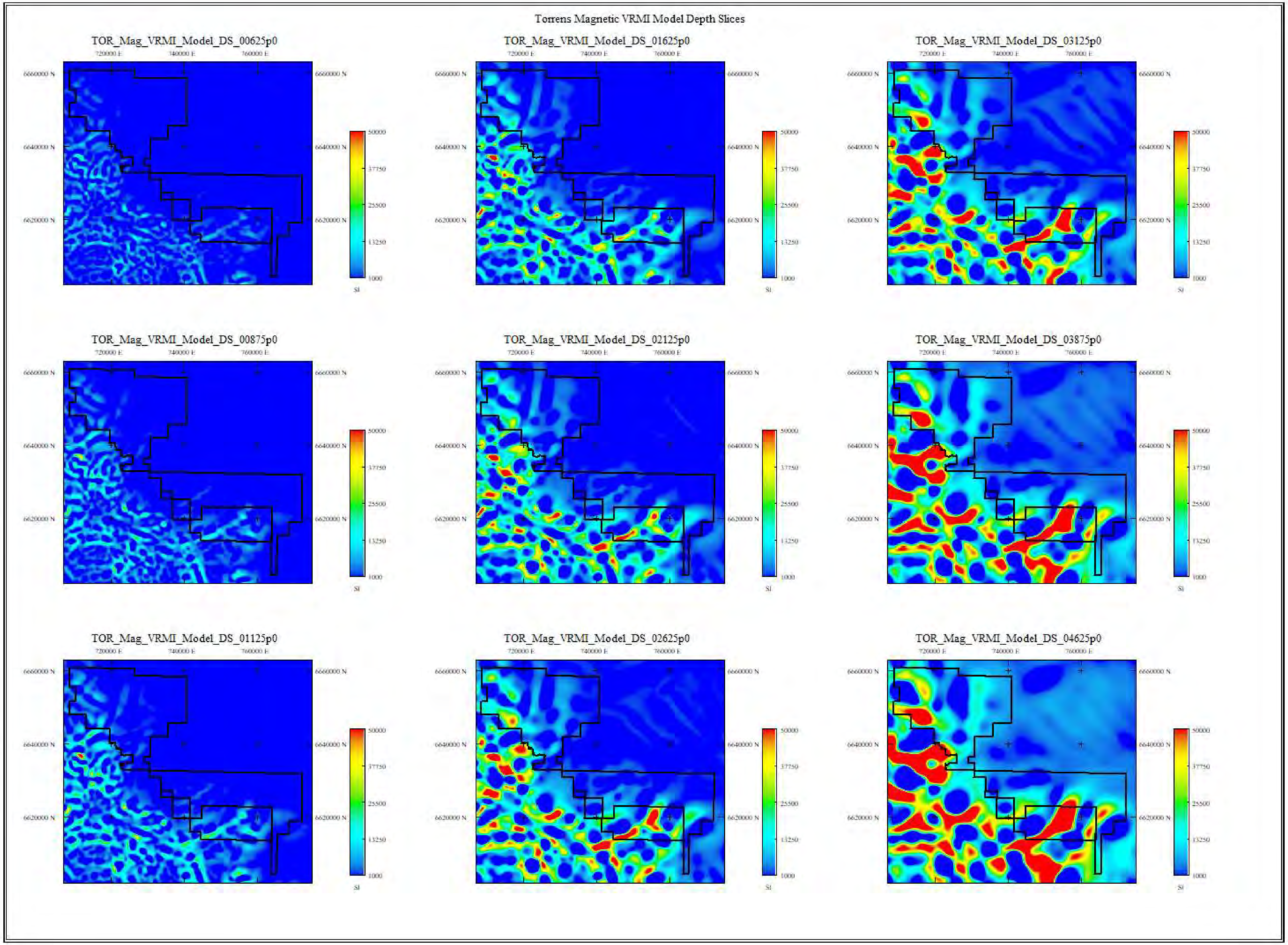

Figure 3.2: Magnetic VRMI Model Depth Slices

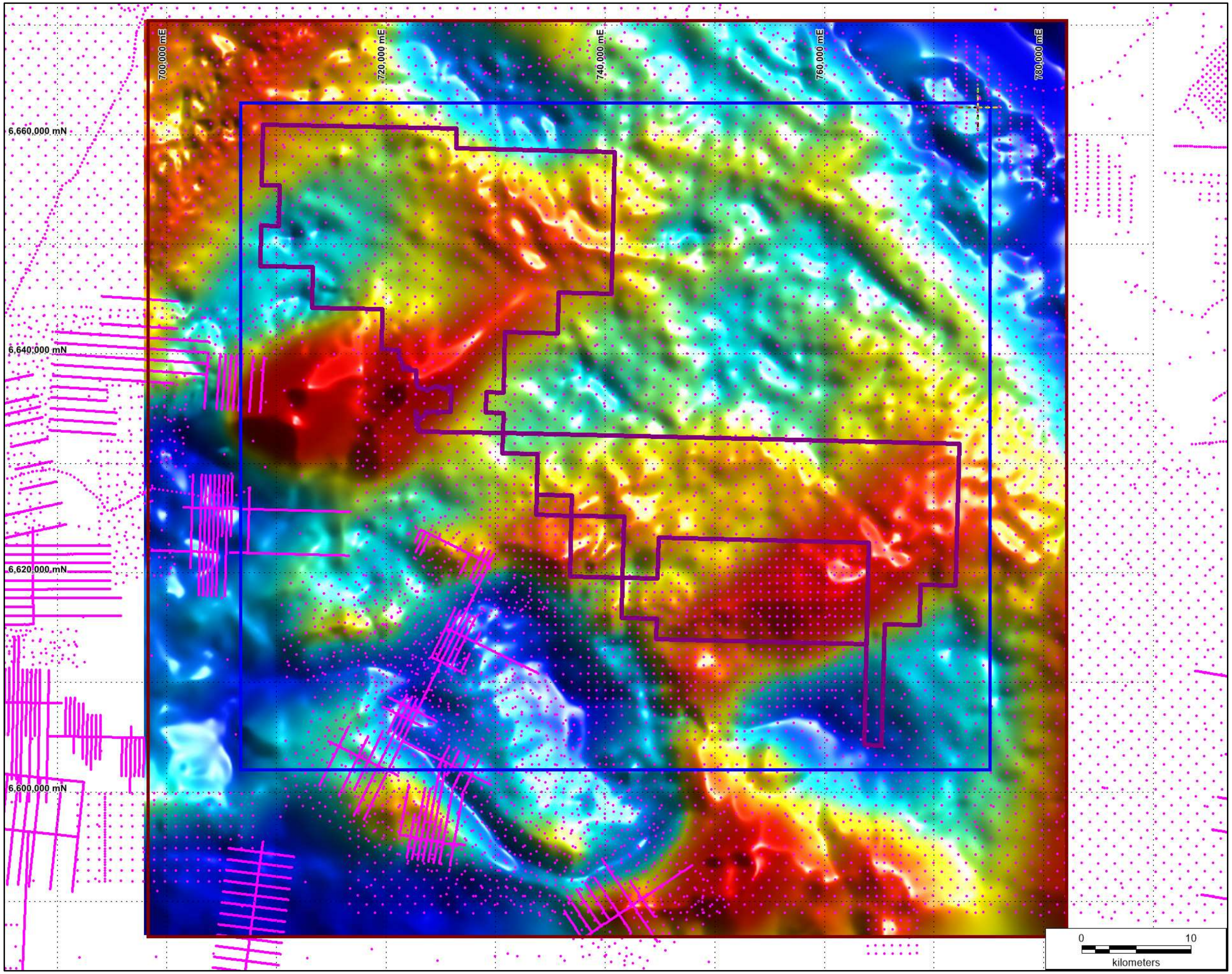

Figure 4.1: Bouguer Anomaly Grid Stations Locations

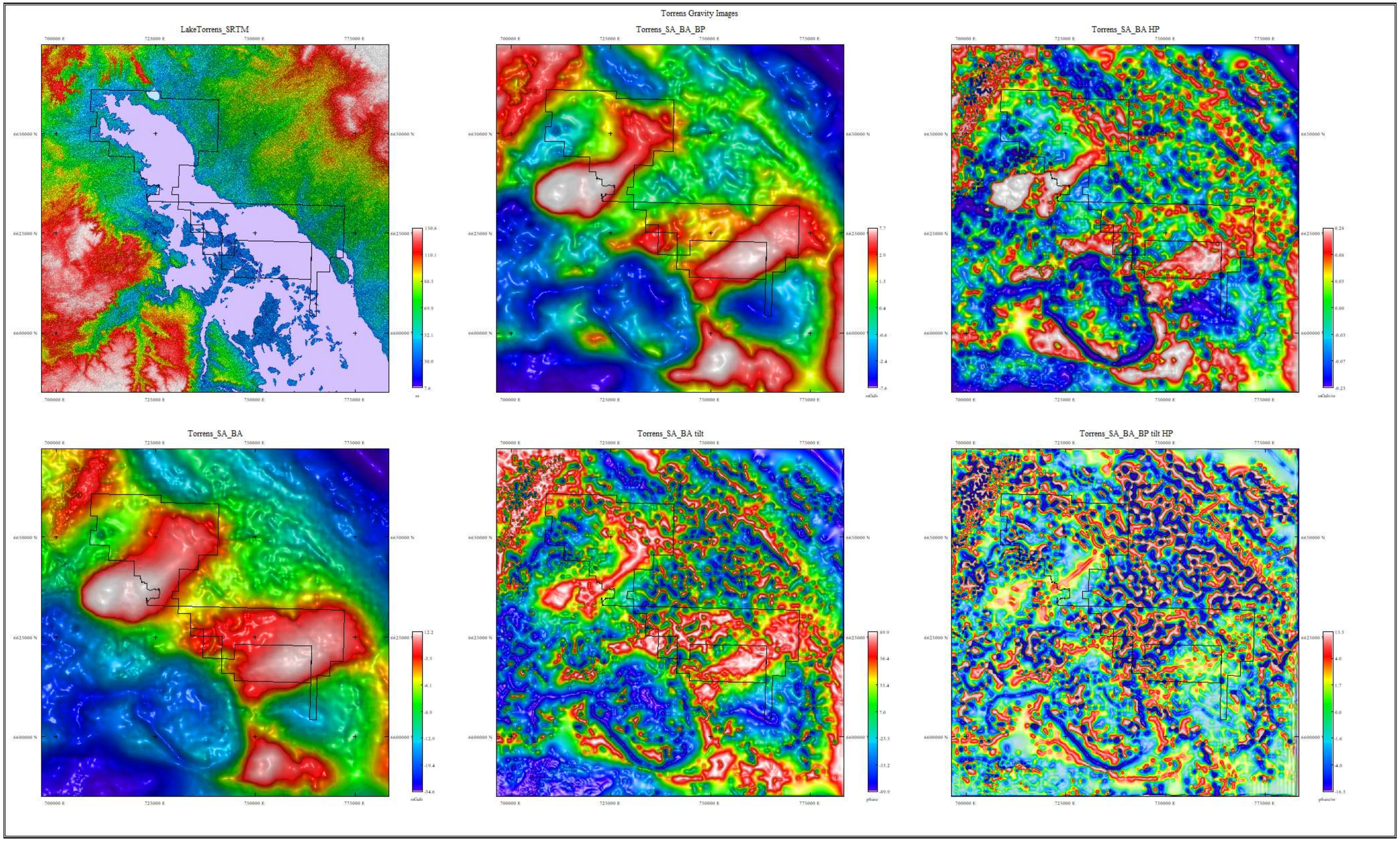

Figure 4.2: Gravity Filtered Images

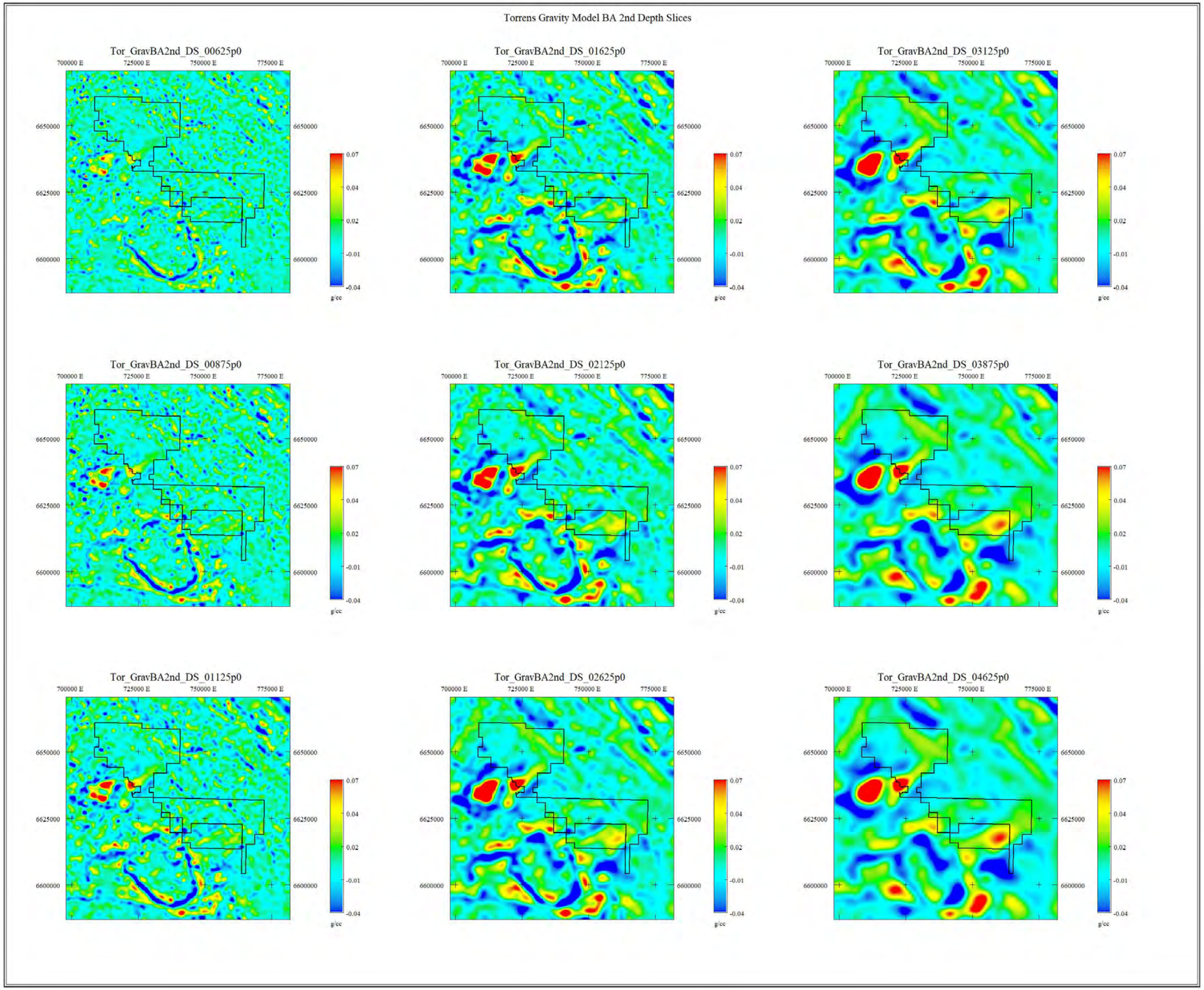

Figure 5.1: Gravity BA2nd Model Depth Slices

Figure 5.2: 3D Model Screen Shot

Gold: Gravity Density iso-surface (>0.05)

Green: Magnetic susceptibility iso-surface (VRMI 0.08 SI)

Appendix A: 3D Magnetic Inversion

The 3D magnetic modelling was undertaken using the 3DMGInv magnetic inversion modelling routine developed by John Paine of Scientific Computing.

- The 3D inversion modelling process breaks the earth up into cuboid blocks (rectangular prisms), where each cuboid is assigned a magnetic susceptibility, such that the bulk volume of the cells generates a response that replicates the observed magnetic field.
- The inversion quantifies the volume of the magnetic susceptibility for the sources of the anomalies and enables their geometry to be characterised (dimensions, depth and dip).

Three inversion models were undertaken on the airborne magnetic data. Two models were run on the TMI data and one model on the VRMI data.

- TMI First Order Residual
- TMI Second Order Residual
- VRMI Model

The inversions converge well, indicating the models are a good representation of the subsurface induced magnetic material. The 1st order and 2nd order TMI inversion models are very similar, and the 1st order appears to have better replicated the data than the 2nd order. The VRMI model has a lower error than both TMI inversion models.

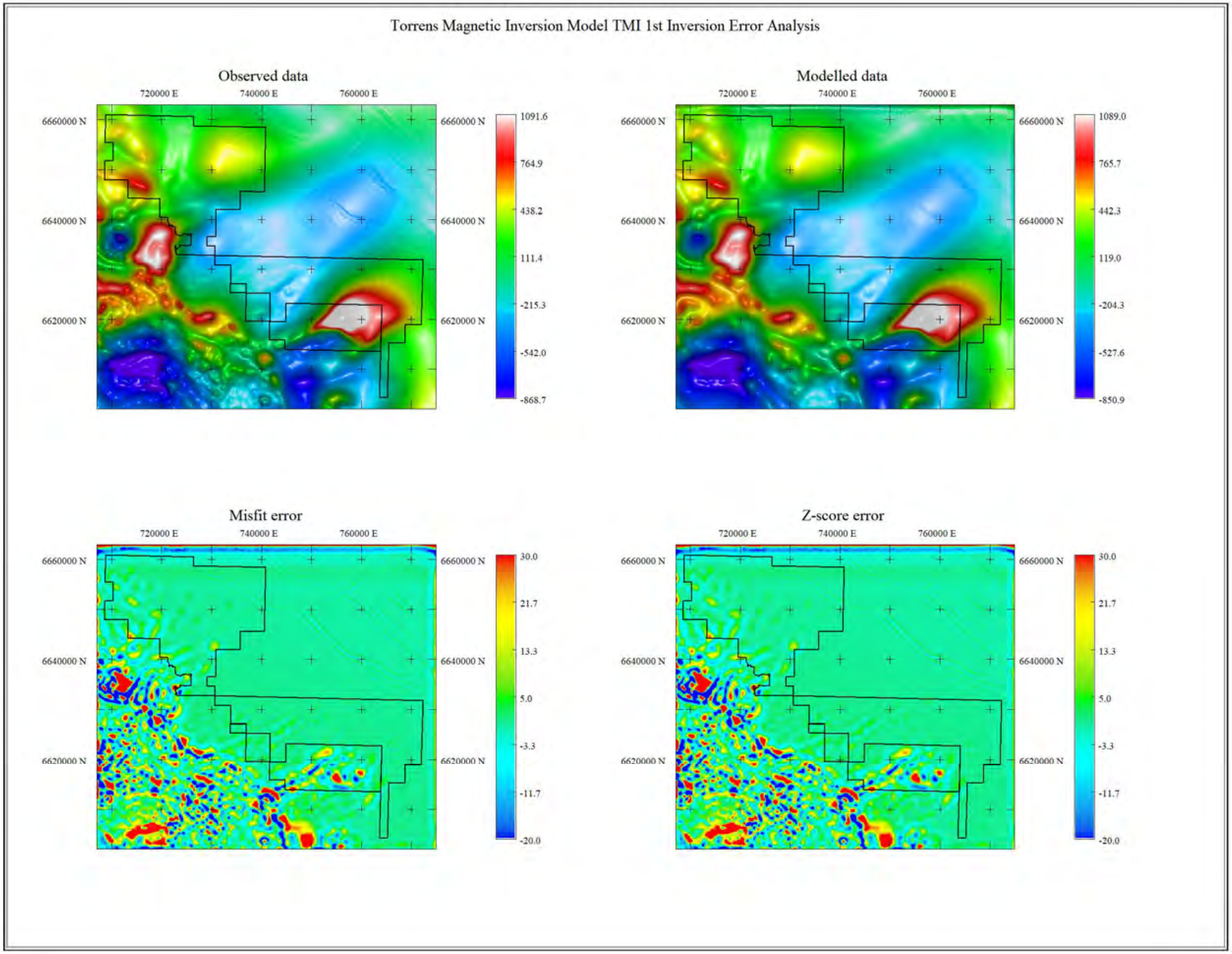

Figure A1: Airborne TMI 1st Inversion Error Analysis

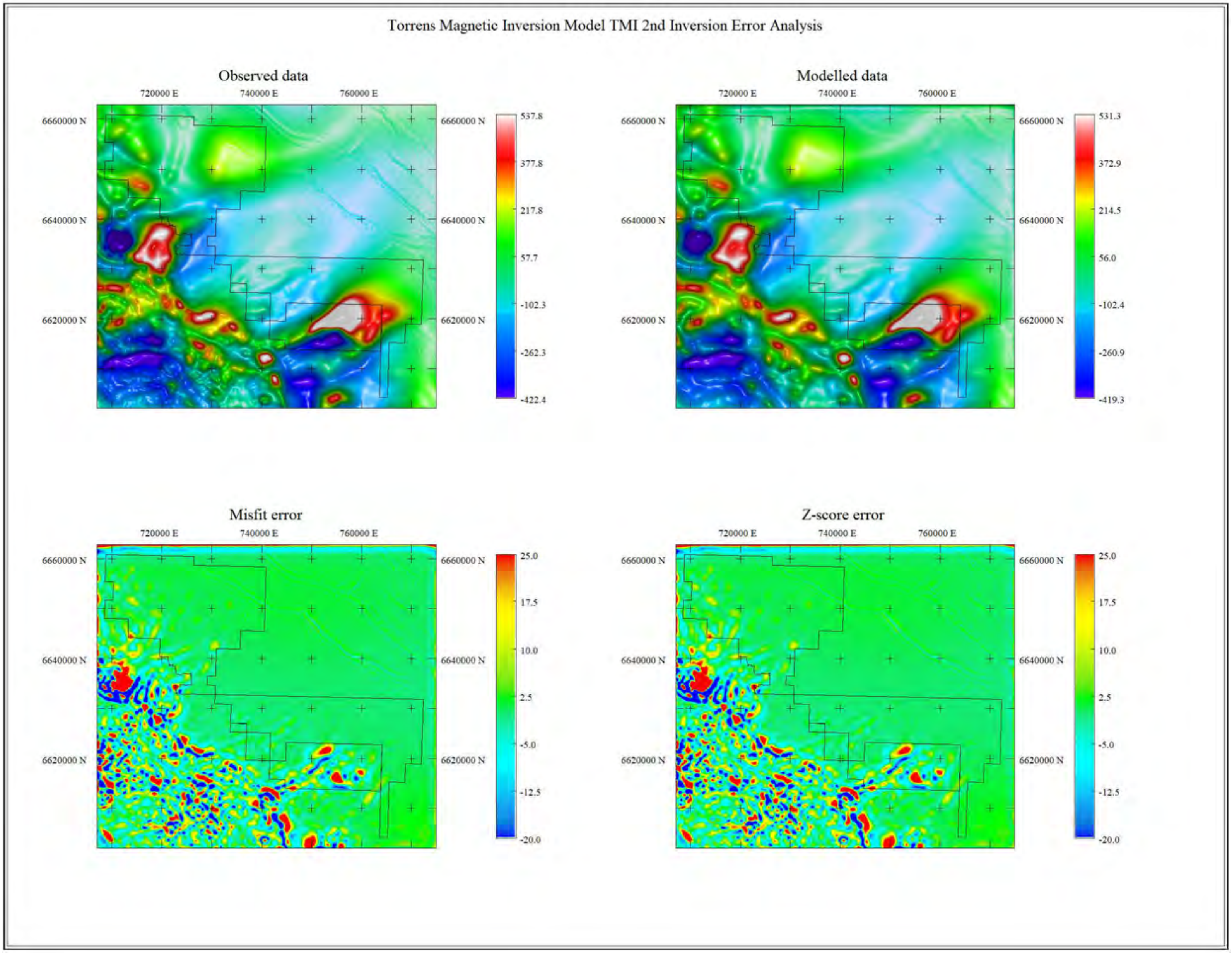

Figure A2: Airborne TMI 2nd Inversion Error Analysis

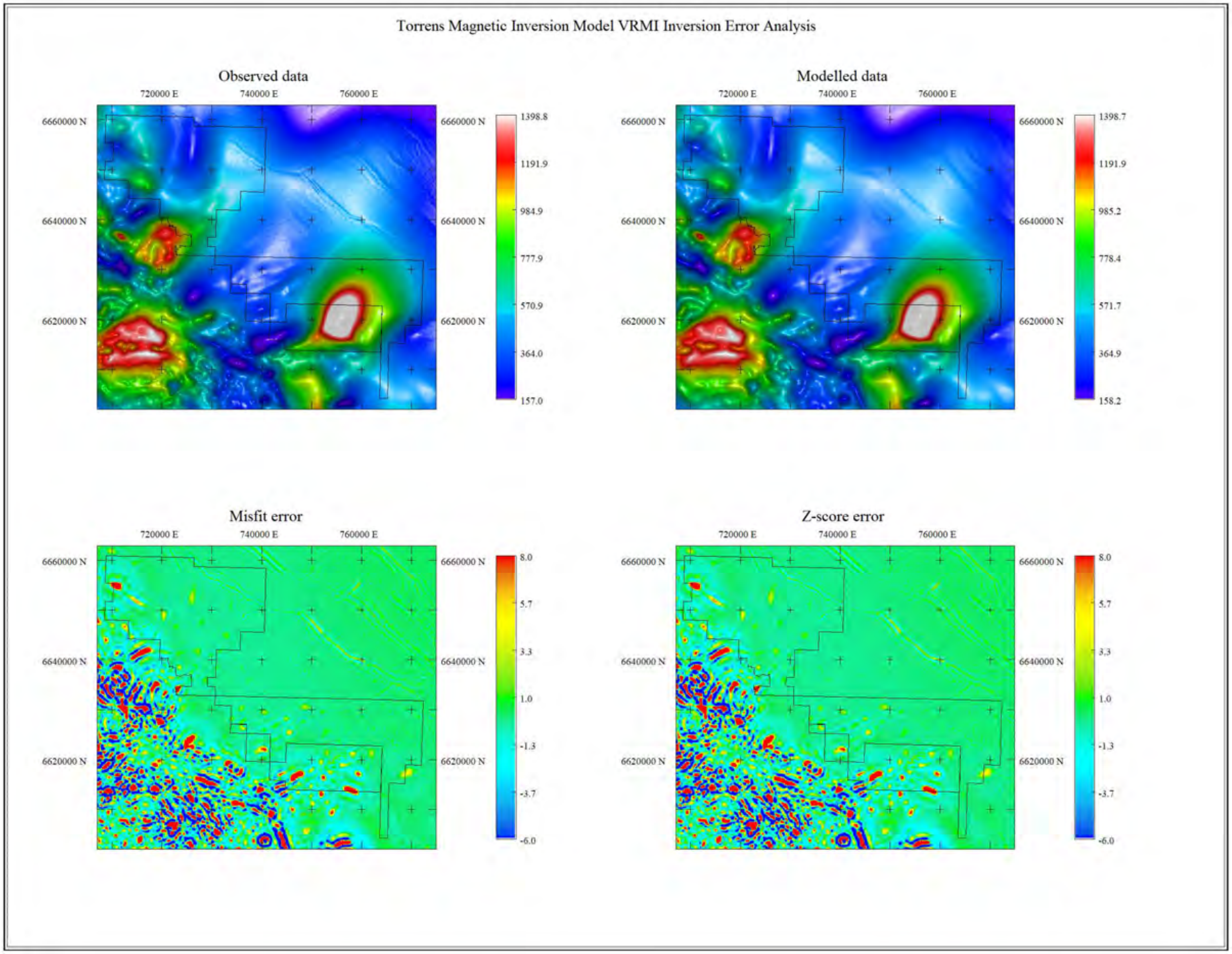

Figure A3: Airborne VRMI Inversion Error Analysis

Appendix B: Image Processing Filter Descriptions

- F1vd = Fourier 1st vertical derivative. This filter sharpens the magnetic features, removing the regional trend (background). You can have any order of derivative, the higher the number the more intense the filter is applied. i.e., F1p5vd = Fourier 1.5 vertical derivative. The "p" signifies the decimal position used in transform. F2vd = Fourier 2nd vertical derivative. This filter further sharpens the magnetic feature.

Note: that the higher the order of the derivative the more "noise" in the data will be amplified (because noise is a high frequency feature and derivative filters are enhancing the high frequency component of the data).

- Tilt = is a filter for displaying source trends and structure. It is a calculation of the difference between the vertical derivative and the magnitude of the horizontal derivatives. T=arctan(dM/dz / sqrt(dM/dx ^2 + dM/dy ^2)). The tilt-filter is a variety of phase filter which, like the more familiar first vertical derivative (1VD), traces geological structures. Unlike 1VD however, the tilt-filter is relatively insensitive to the depth of the source geology below the ground, making tilt-filtered image a useful tool for tracing geological structure below variable depths of cover.

- Bp = This is a Band Pass filtered or magnetic layer extracted image where the potential field sources outside the depth/frequency stipulated have been removed f(r, s) = Exp(-h * A) * (1 - Exp(-e * A)) where: A = 2 * Pi * sqrt(r ^ 2 + s ^ 2).

- HP = High Pass filter, similar to above but with a derivative component.

Appendix C: 3D Gravity Inversion

The 3D gravity modelling was undertaken using the 3DMGInv magnetic inversion modelling routine developed by John Paine of Scientific Computing.

- The 3D inversion modelling process breaks the earth up into cuboid blocks (rectangular prisms), where each cuboid is assigned a density such that the bulk volume of the cells generates a response that replicates the observed gravity field.
- The inversion quantifies the volume of the material required to source the anomalies and enables characterisation of their geometry (dimensions, depth and dip).

Over the area of the detailed gravity data collection, the inversion process was undertaken on the edited TB2p6BP. The semi-detailed inversion was undertaken using a 100m cubic model cell size (X,Y,Z).

The " semi-detailed " inversion converged well with predicted data replicating the observed data with low error values only recorded on the steeper gradients. This indicates the resultant model is a good reflection of the subsurface density distribution (Fig.C1).

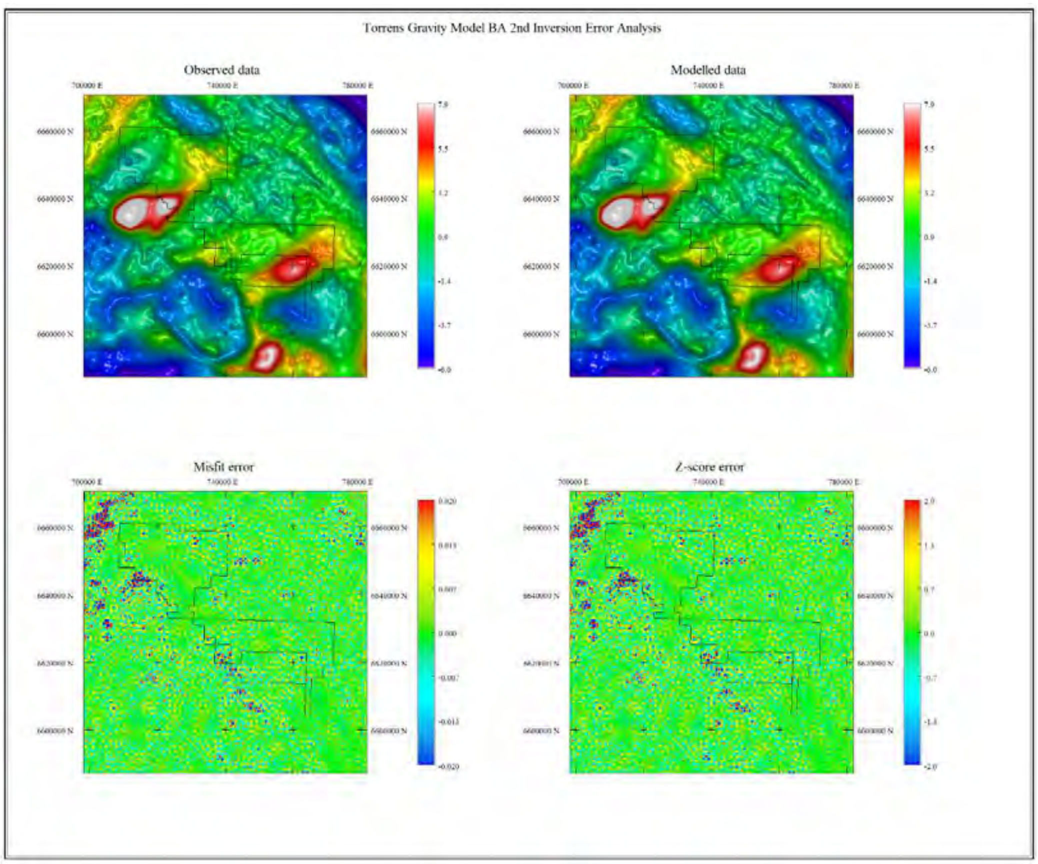

Figure C1: Ground Gravity VRMI Inversion Error Analysis