Lazy Edward Bay

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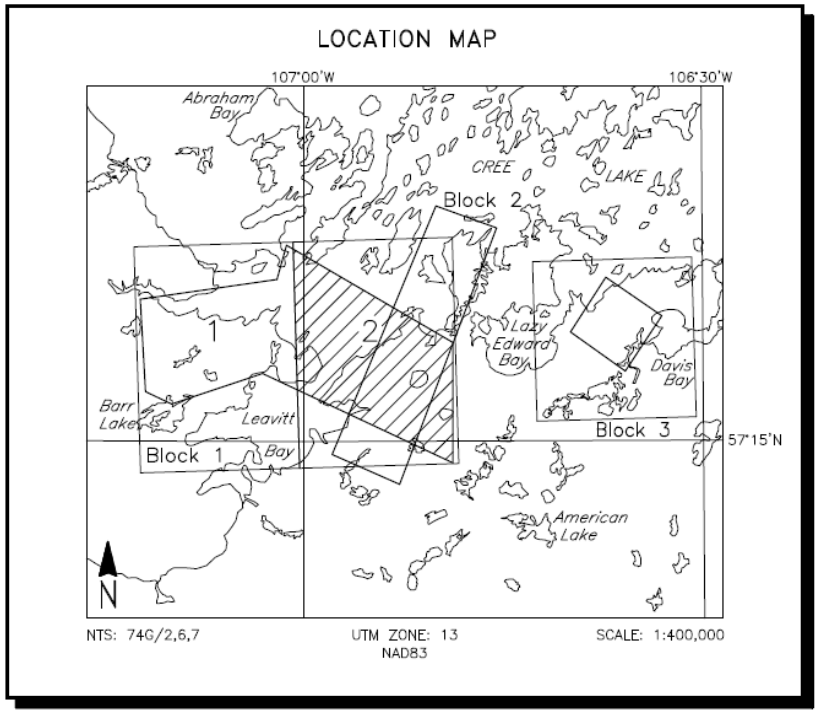
Introduction

A Dighem airborne survey was flown over the Lazy Edward Bay area to collect magnetic and frequency-domain electromagnetic data. The airborne data was collected in three blocks, as shown. (Block 3 is not discussed in this report.) Preliminary modeling results for this airborne data are presented.



EM Frequencies:

900 Hz – coplanar; 8 m spacing

1000 Hz – co-axial; 8 m spacing

5500 Hz – co-axial; 8 m spacing

7200 Hz – coplanar; 8 m spacing

56000 Hz – coplanar; 6.3 m spacing

Conclusions and Recommendations

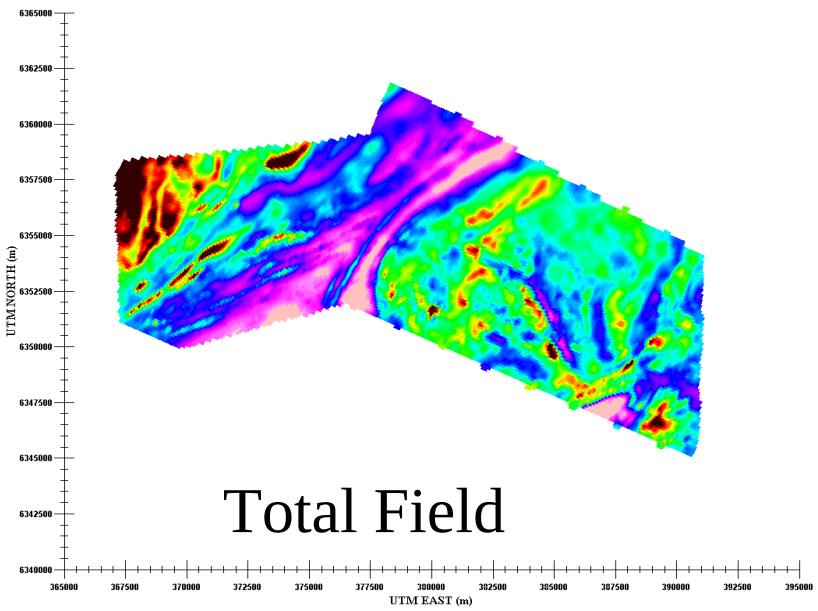
Several linear anomalies are noted in the EM and the magnetic data.

A section of the EM data in Block 1 with a large anomaly was modeled. The model contains a strong (65 S) conductor, located at 40 m depth with a near-vertical dip. The model also contains a weakly-conductive structure above this conductor, very close to the surface.

The magnetic data in this section of block 1 was also modeled. Magnetic structures have similar depths and dip to the conductor, but don’t appear to be the same target. An inversion of the magnetic data was useful for showing the trends and locations of susceptible structures.

It is recommended that the conductor be studied to see if it has properties of interest. Other sections of the EM and magnetic data may be studied to analyze other conductors in the region.

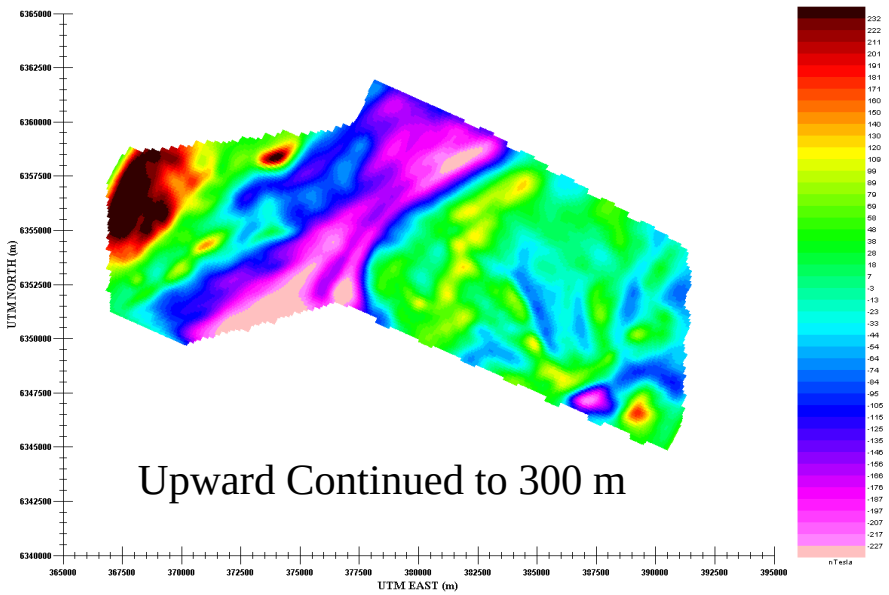
Block 1 - Magnetics



Total Field

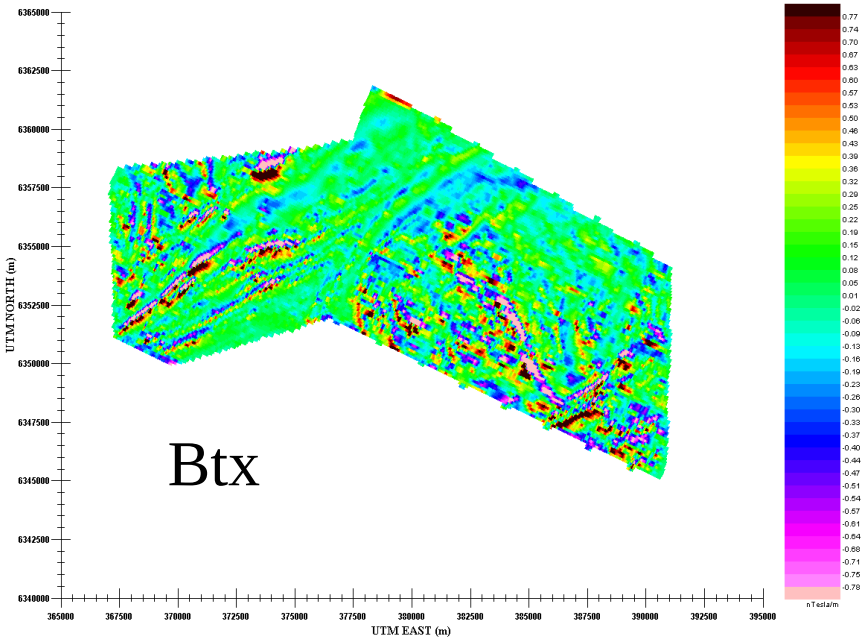
Contoured total field magnetic data. A large magnetic low is noted running northeast through the middle of Block 1. Several linear features are present across the region, many trending northeast.

Contoured data, upward continued to a height of 300 m. Many of the linear magnetic features can still be observed.



Upward Continued to 300 m

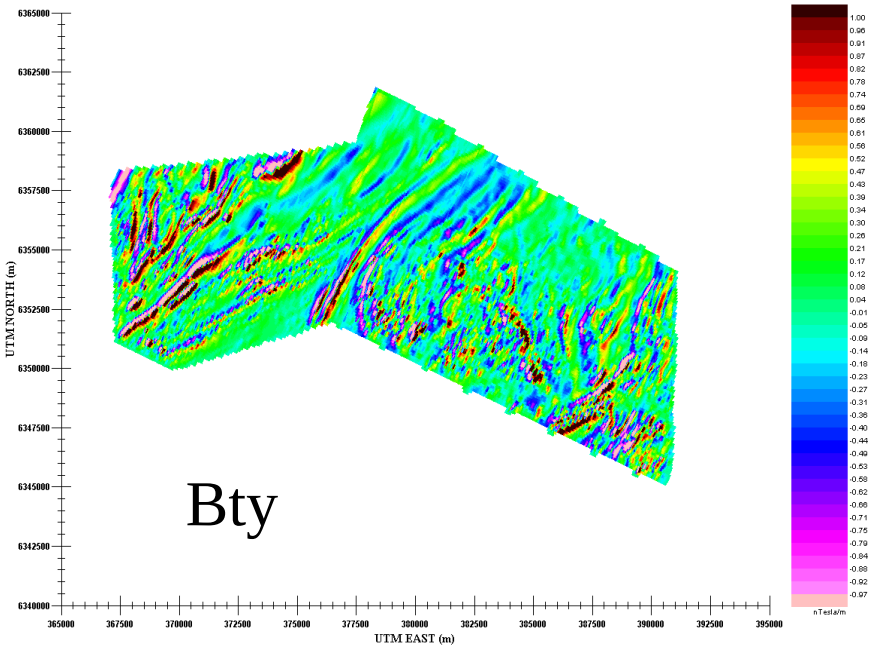
Block 1 - Magnetics



Btx

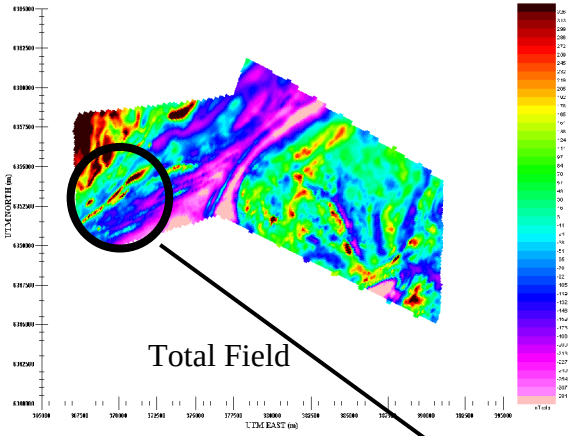
Derivative along the profile lines
Many linear features trending to the northeast; also some towards the north-northwest.

Derivative perpendicular to the profile lines. Many features observed are trending northeast.

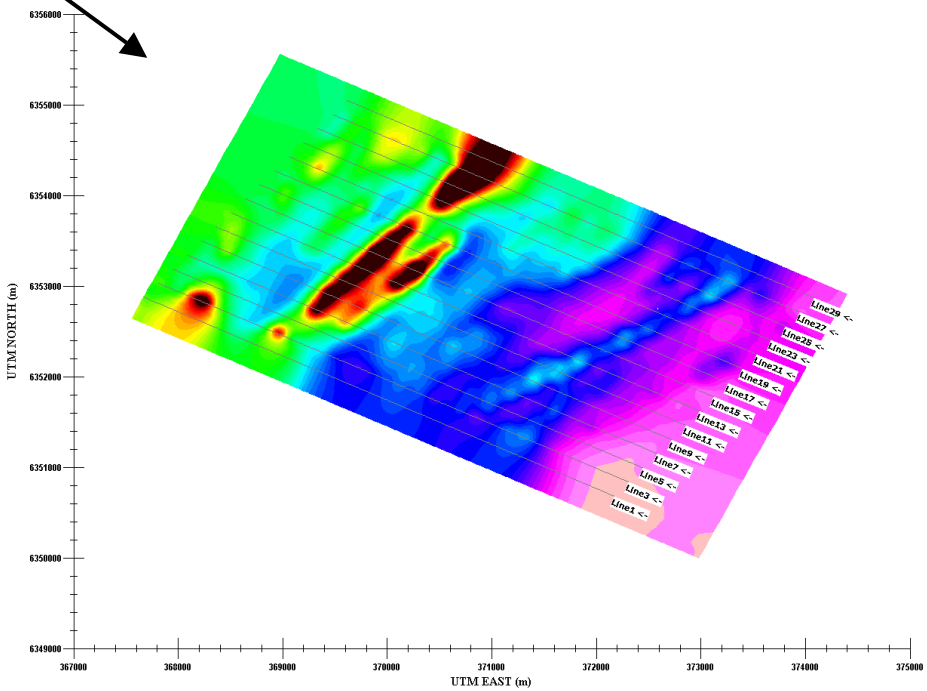


Bty

Block 1 - Magnetics



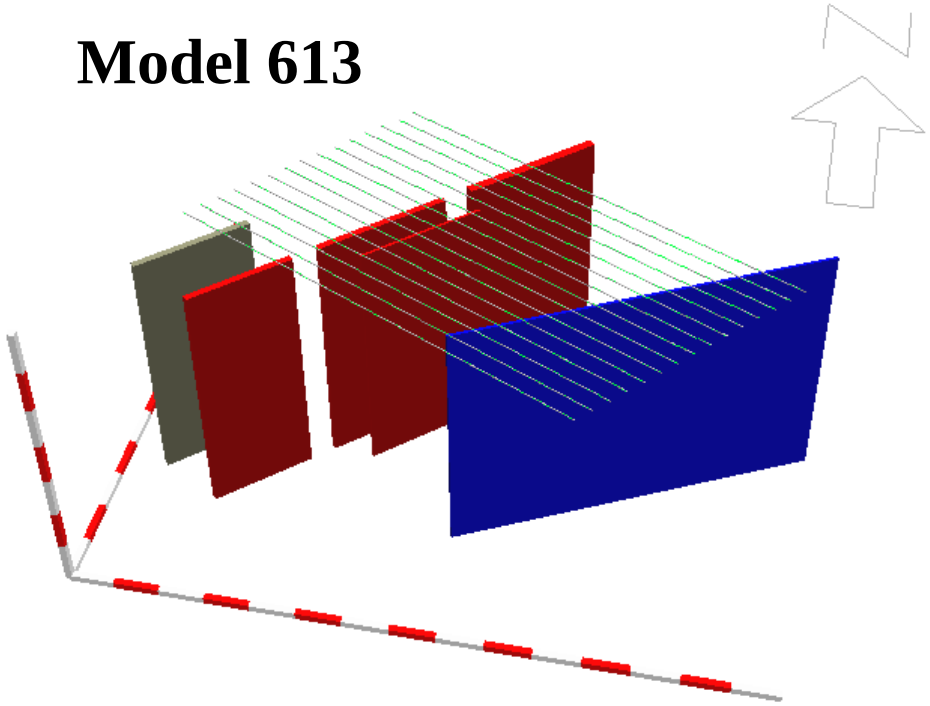
Total Field



A section of airborne data in Block 1 where several linear anomalies are present was modeled. Derivatives were calculated for the gridded airborne data, and the gridded data with the derivatives was exported to profiles for modeling. *Note that the data was exported to new lines, numbered 1-29. Lines 1-29 in the new profiles approximately correspond to Lines 10650-10490.

Block 1 - Magnetics

Model 613



Susceptibilities

- 0.065
- 0.05
- 0.03

Properties:

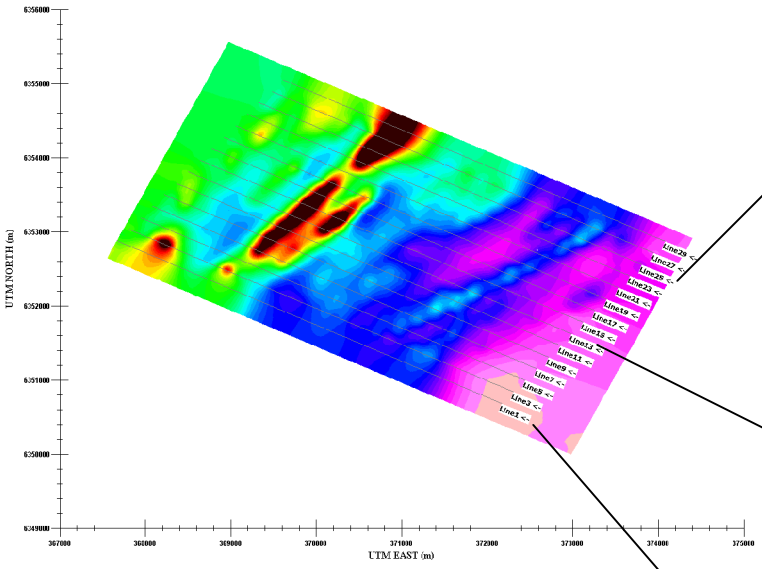
Depth – 30-50 m

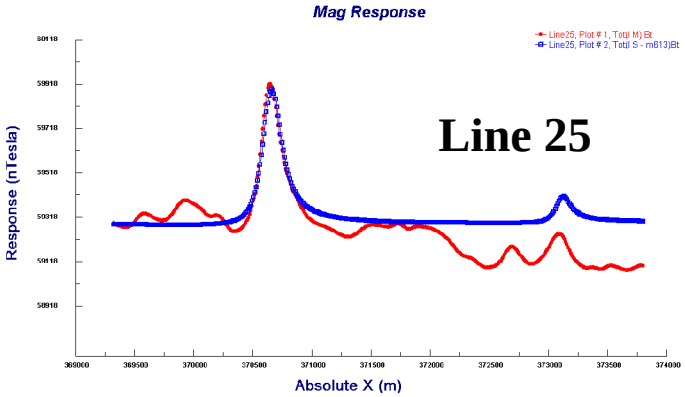
Thickness – 30-100 m

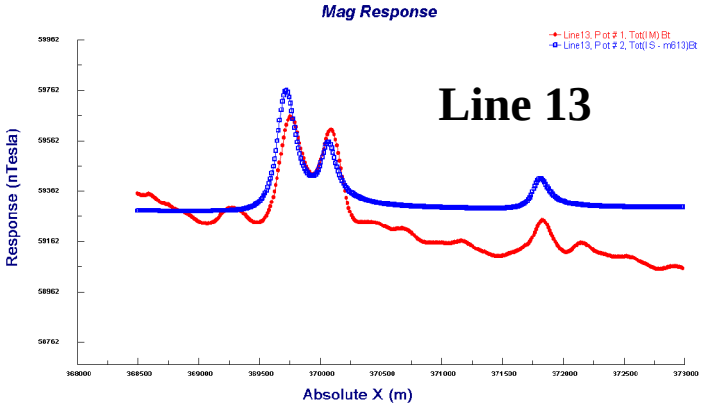
Dip - 90^0

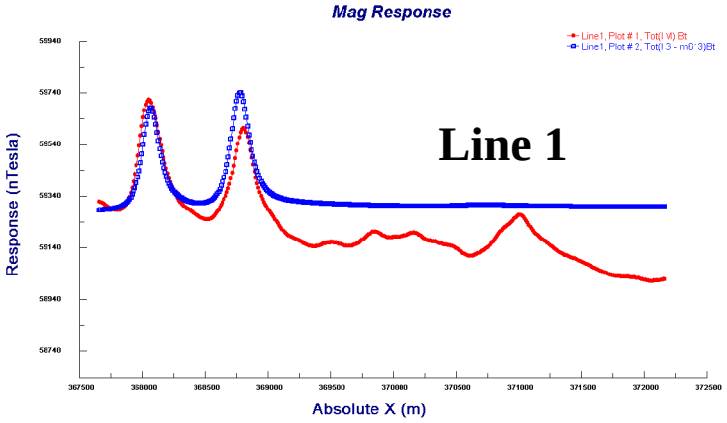
Model 613 was developed to fit the magnetic data over the cut section of Block 1. The model contains several discontinuous, vertical linear structures.

Block 1 – Magnetics (Plots)









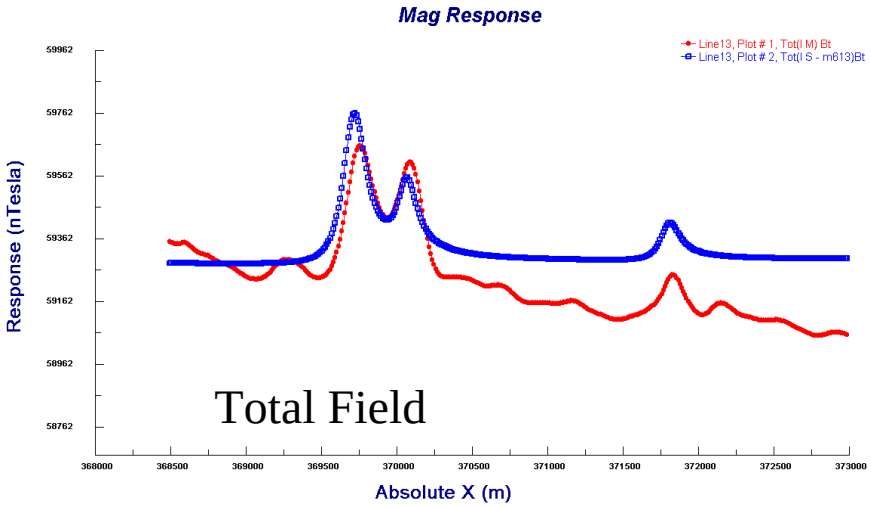
Plots comparing the airborne data with the simulated data for Model 613 are shown along 3 lines.

- Data
- Model 613

Block 1 – Magnetics (Plots)

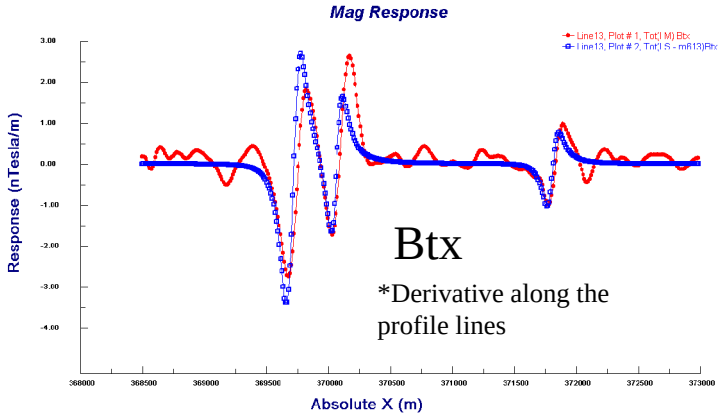
Line 13 Plots

The derivatives for of the airborne data and the model along Line 13 are shown.

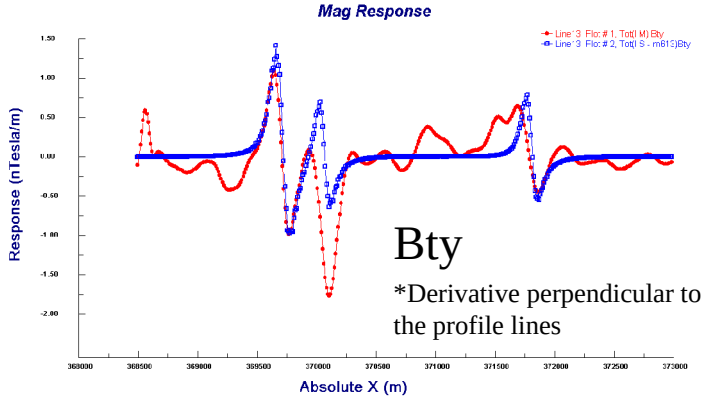


Data

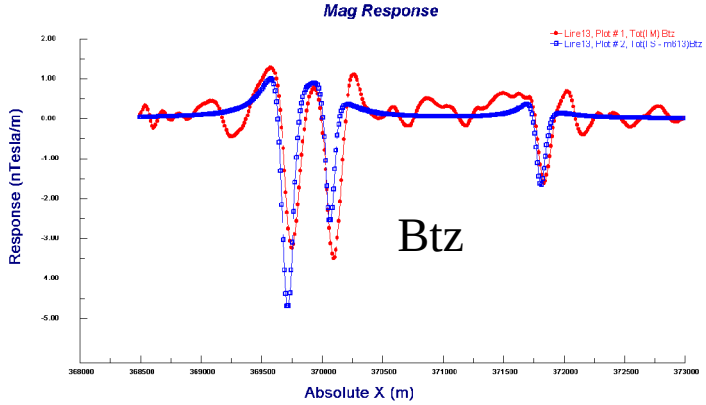
Model 613



*Derivative along the profile lines



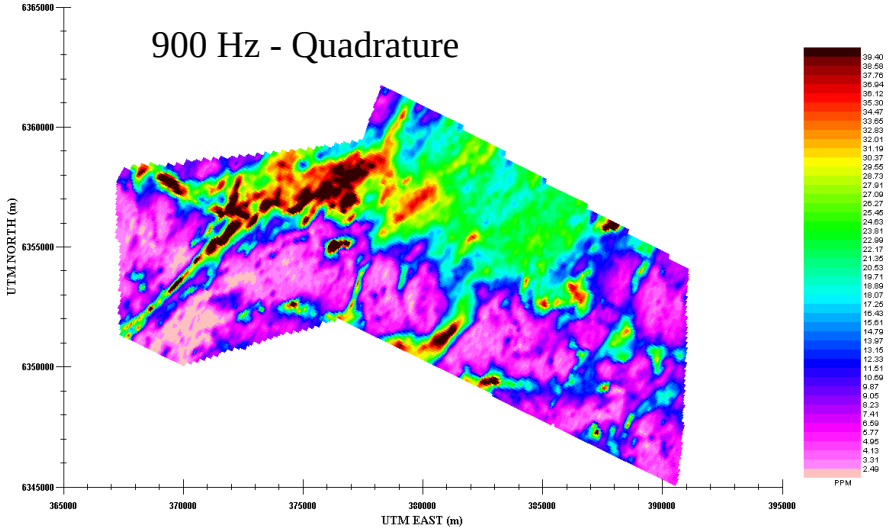
*Derivative perpendicular to the profile lines



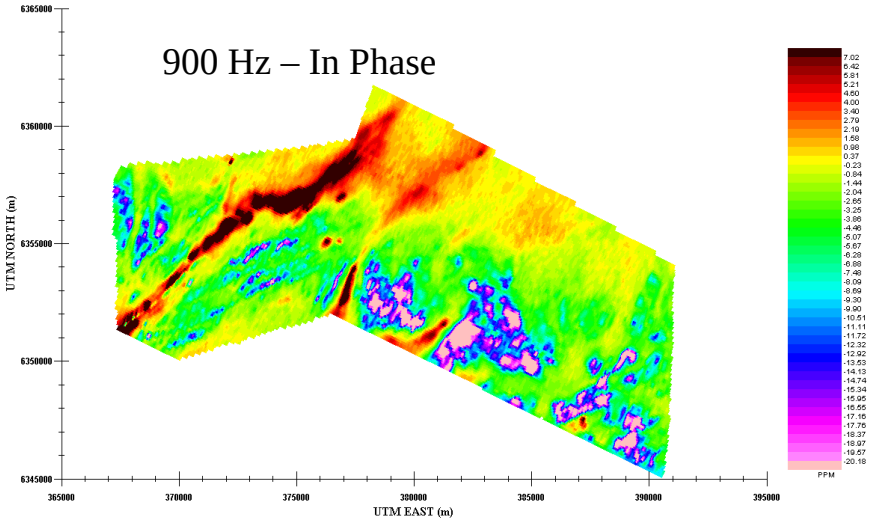
Block 1 - EM

*900 Hz and 7200 Hz are both co-planar

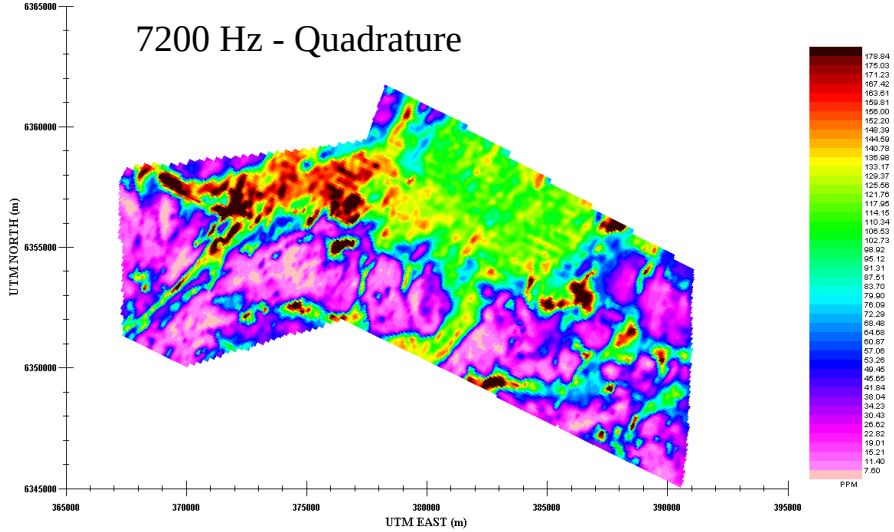
900 Hz - Quadrature



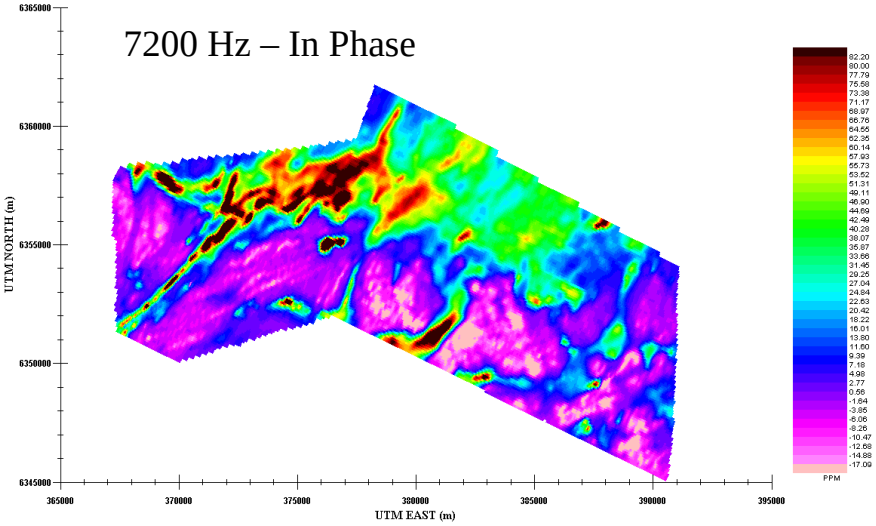
900 Hz – In Phase



7200 Hz - Quadrature



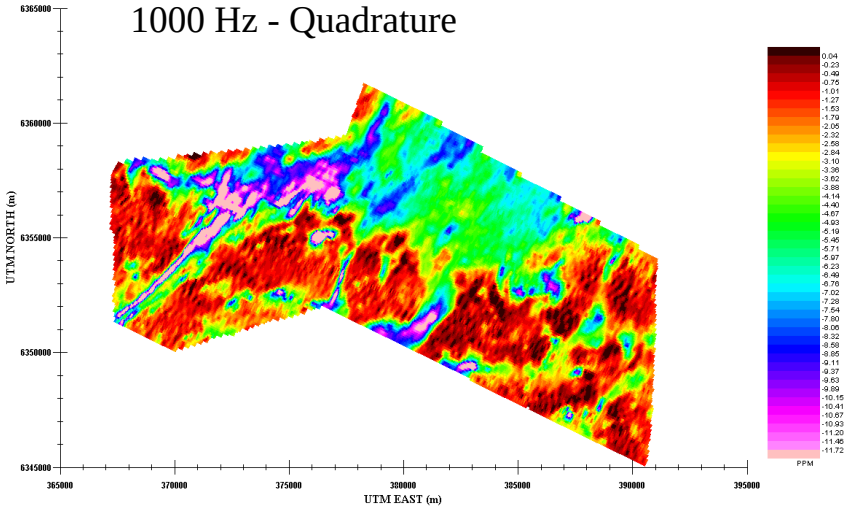
7200 Hz – In Phase



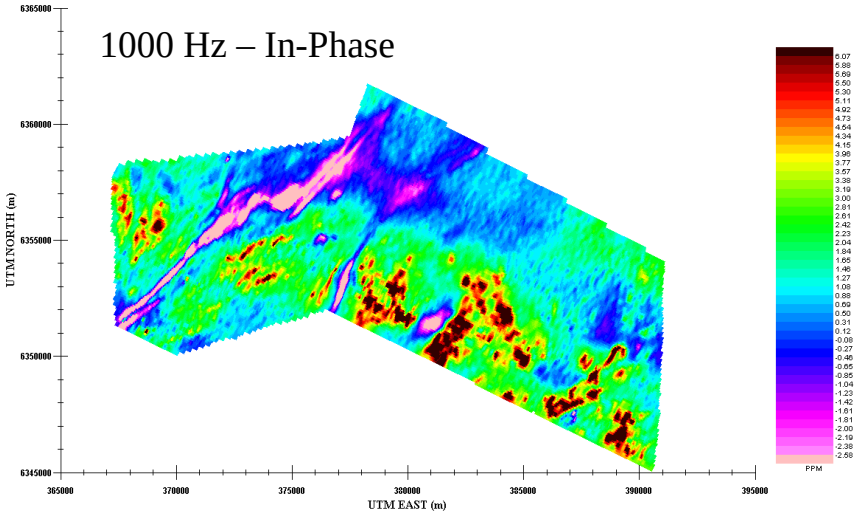
Block 1 - EM

*1000 Hz and 5400 Hz are both co-axial

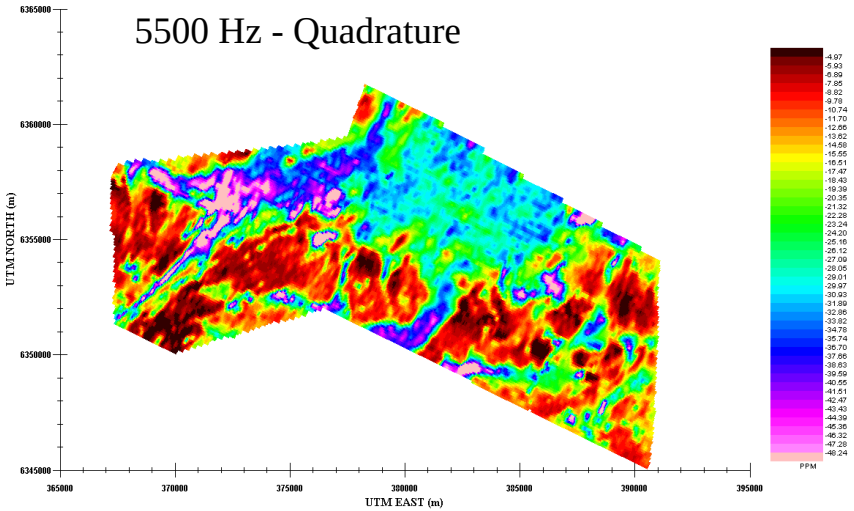
1000 Hz - Quadrature



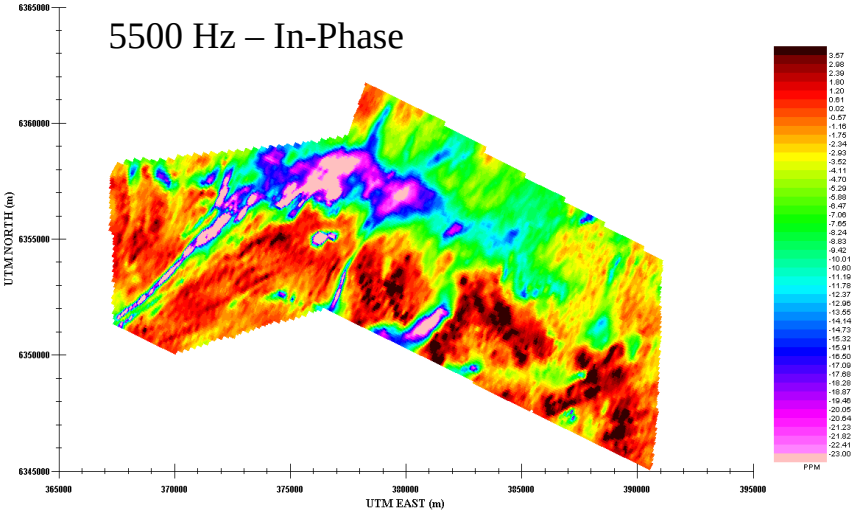
1000 Hz – In-Phase



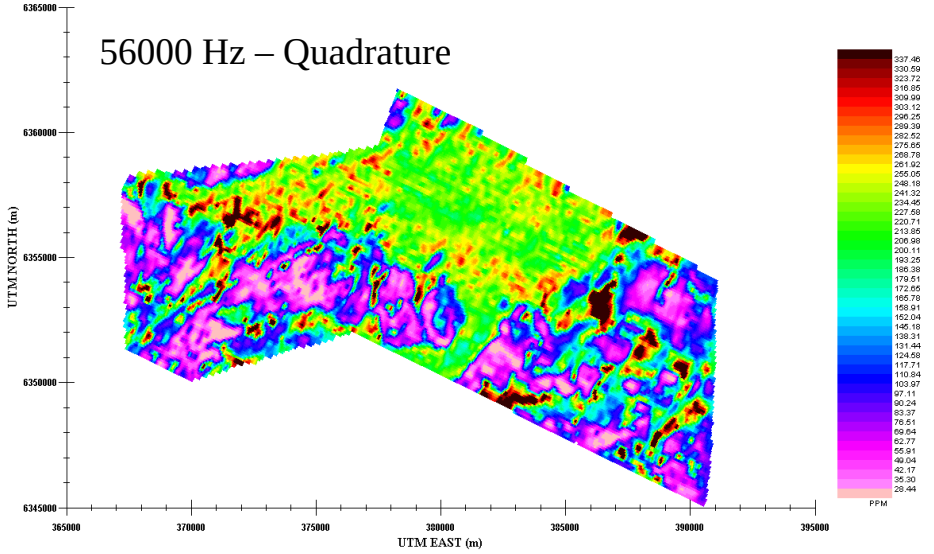
5500 Hz - Quadrature

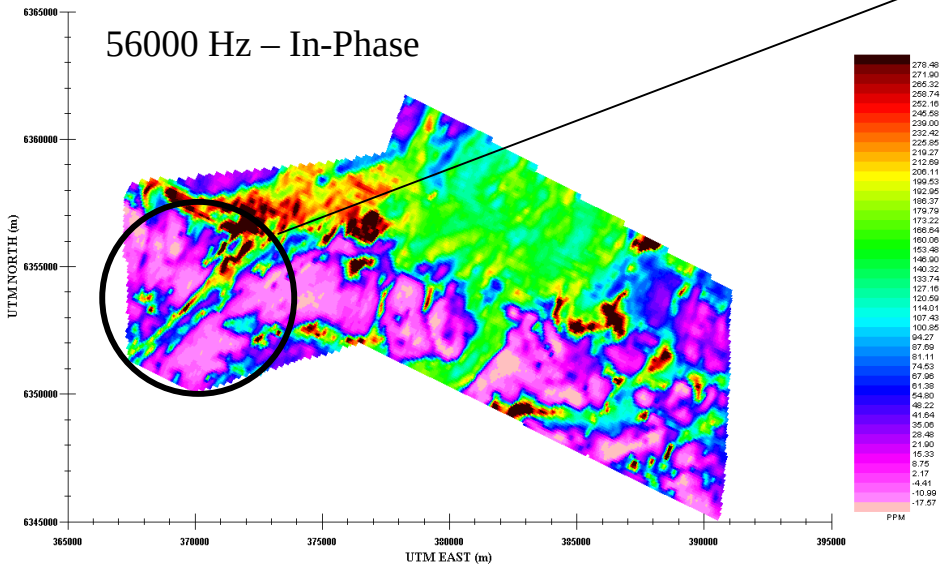


5500 Hz – In-Phase



Block 1 - EM





A linear, northeast trending anomaly in the southwest portion of Block 1 is visible across all frequencies (both in-phase and quadrature components). This is in the same area as the model for the magnetic data.

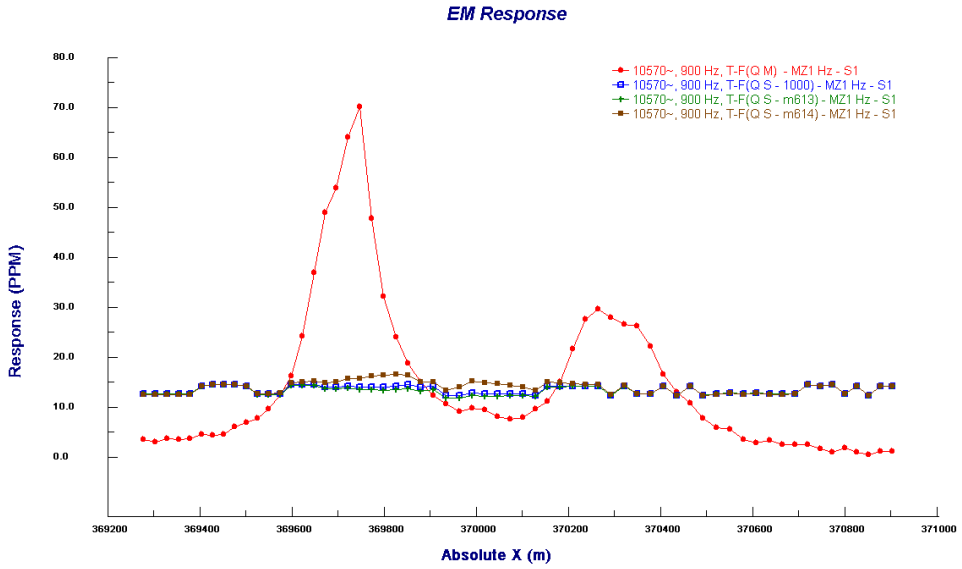
The background response suggests a fairly resistive host (>1000 Ω m). For modeling, 3000 Ω m was generally used.

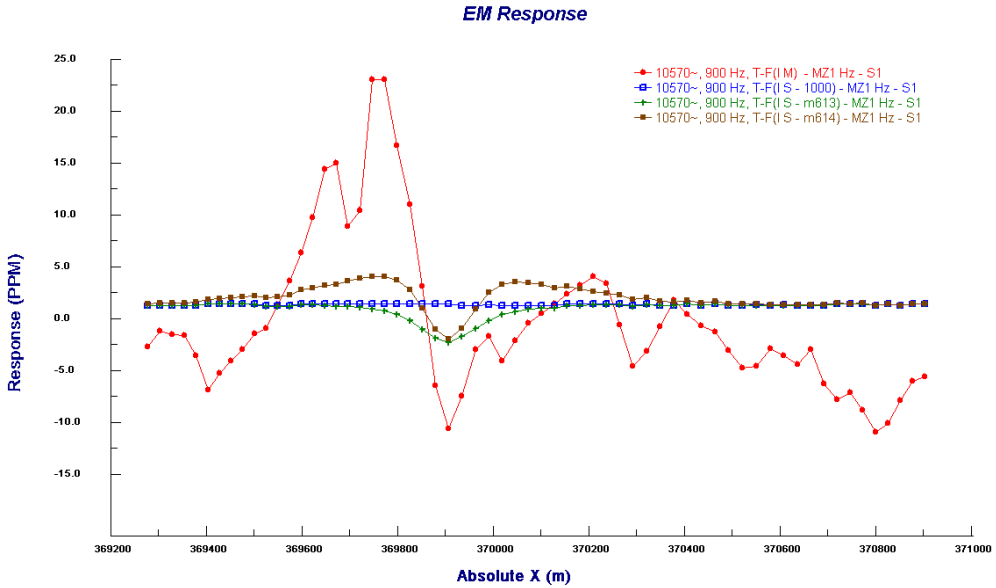
Block 1 - EM

Response from Mag Model

One target from the model for the magnetic data was used as a model for the EM data along Line10570. When this target had a susceptibility of 0.065 (as for the magnetic data) and a high resistivity of 5000 Ω m, the response was only slightly different from that of a half-space. The largest effect was on the in-phase component of the 900 Hz data, but the target still did not have a very large response. The prism was given a conductivity of 1000 S/m in Model 614 to investigate the current channeling effect due to a conductive target. Again, the effect is quite small, and is only present at low frequencies.

- Data
- 1000 Ω m half-space
- Model 613 – Mag Model; resistive targets (5000 Ω m)
- Model 614 – Mag Model; conductive targets (1000 S/m)





Block 1 - EM

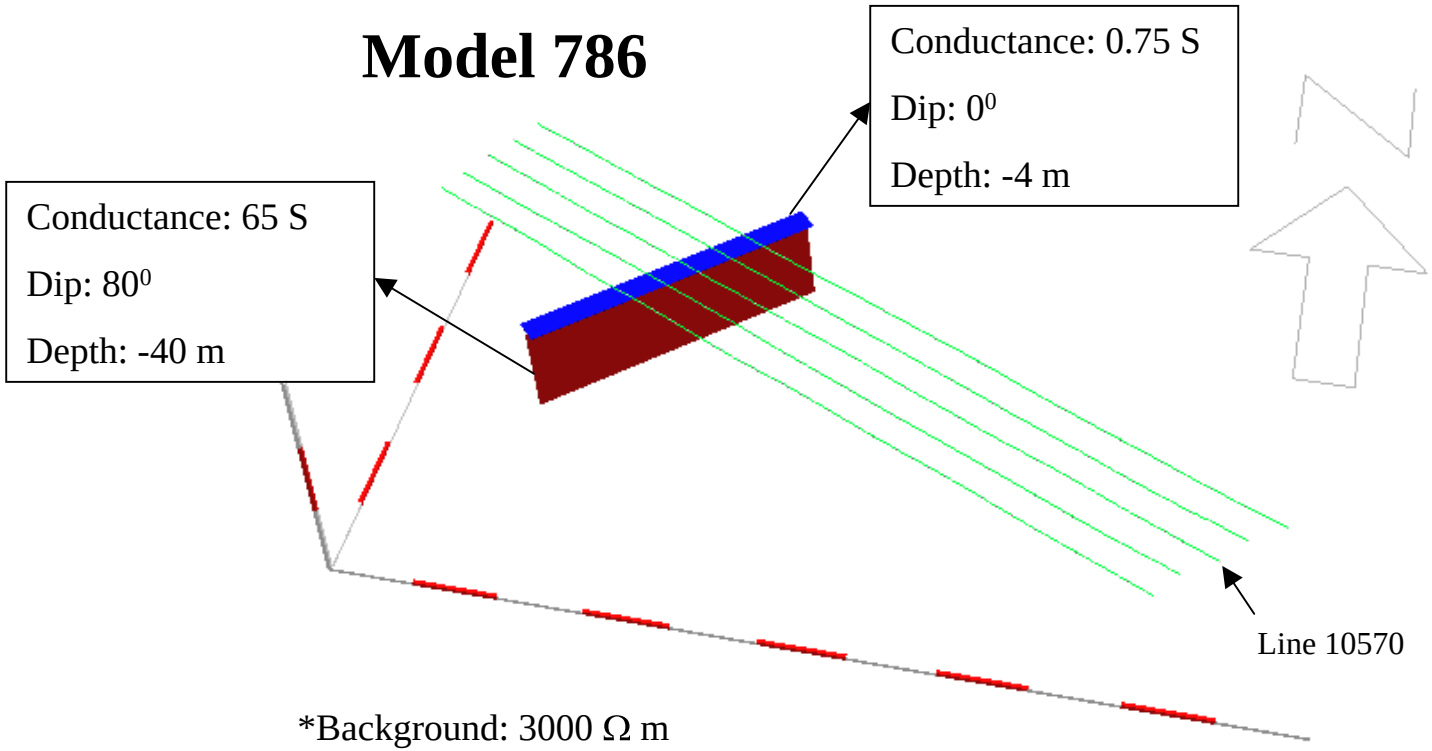
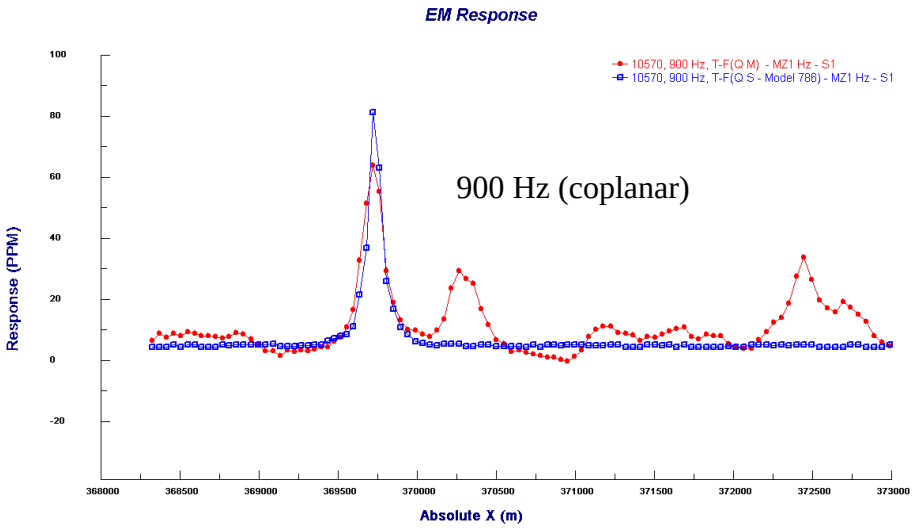
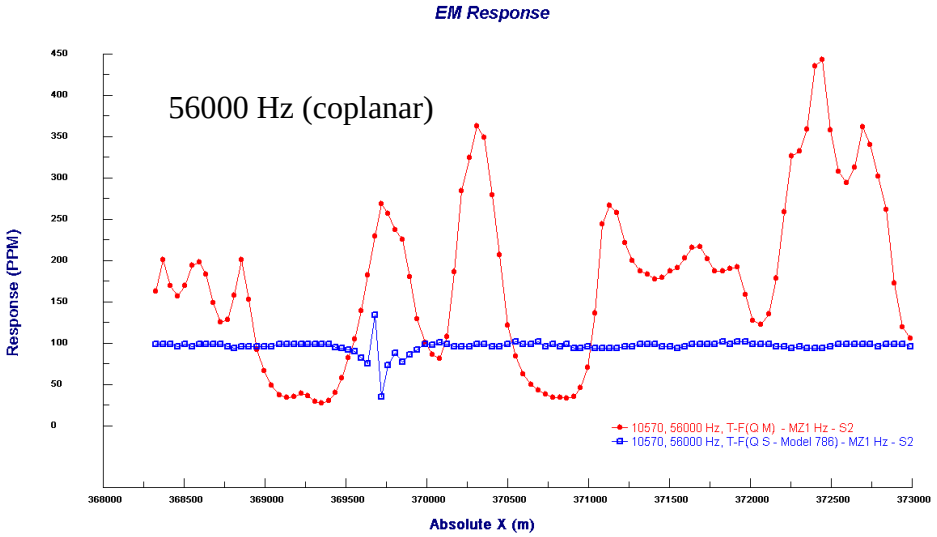


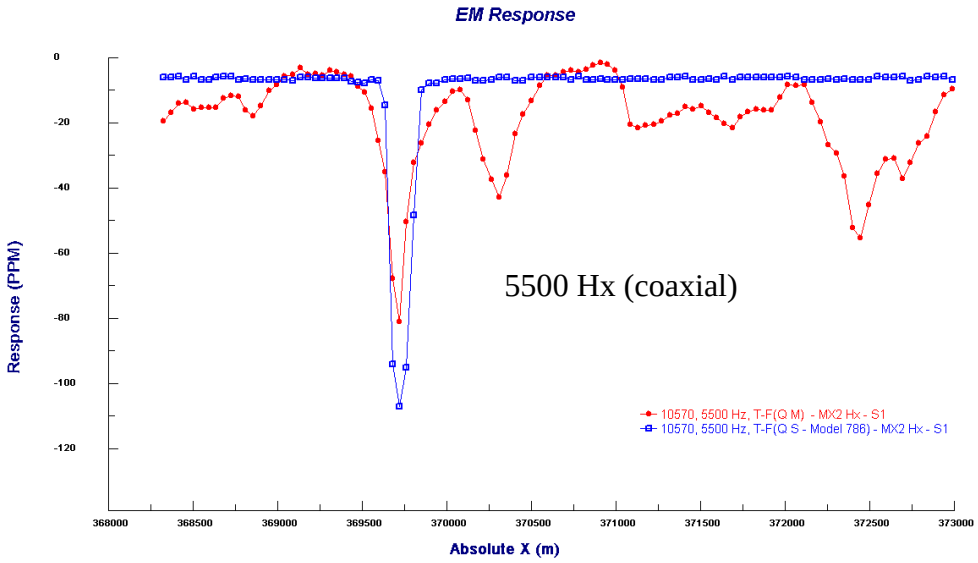
Plate models were used to investigate the induction response. Model 786 was developed to fit the EM data in the same area where the magnetic data was modeled. Two targets were needed to model the largest anomaly seen along these lines (to get both the in-phase and quadrature components to fit). These structures are slightly to the right of the structure in the mag model, but have the same strike.

Block 1 – EM (Plots)

*Quadrature Component







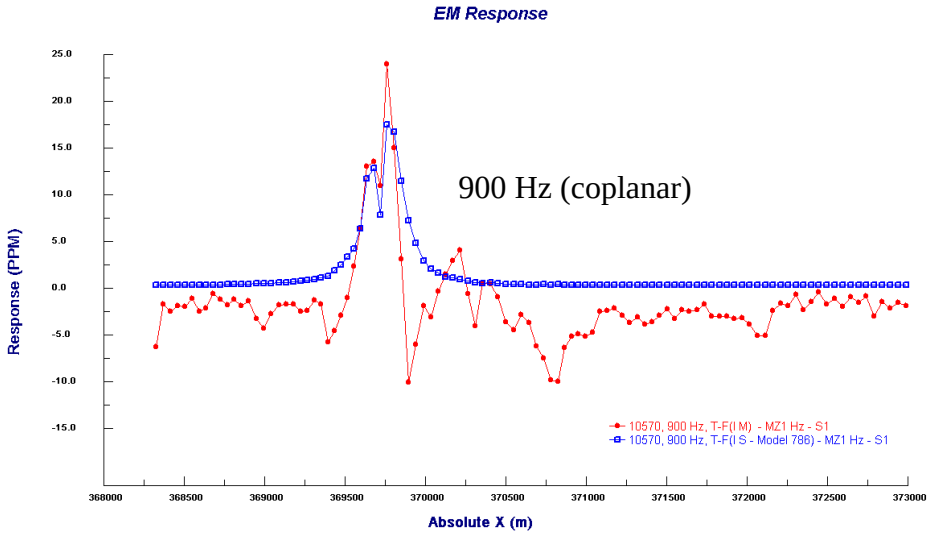
The plots compare the quadrature component of the data and Model 786 for 3 frequencies. (Line 10570)

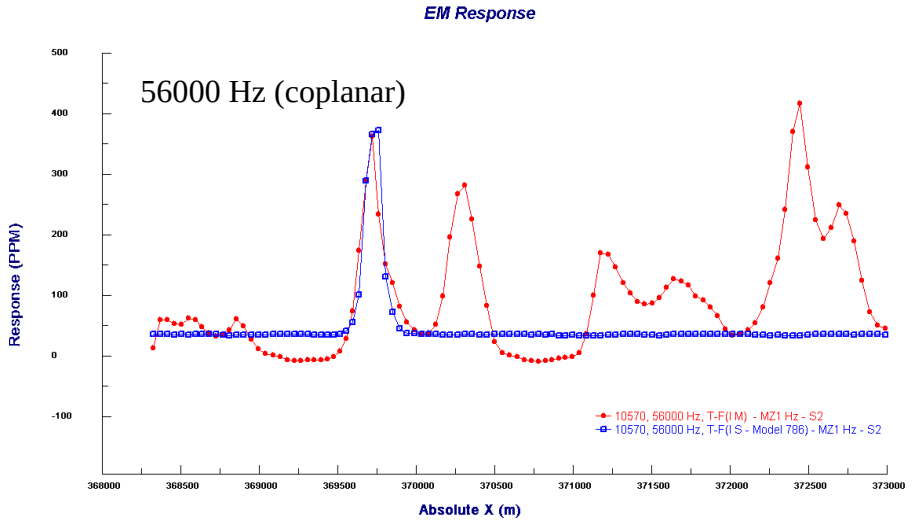
Data

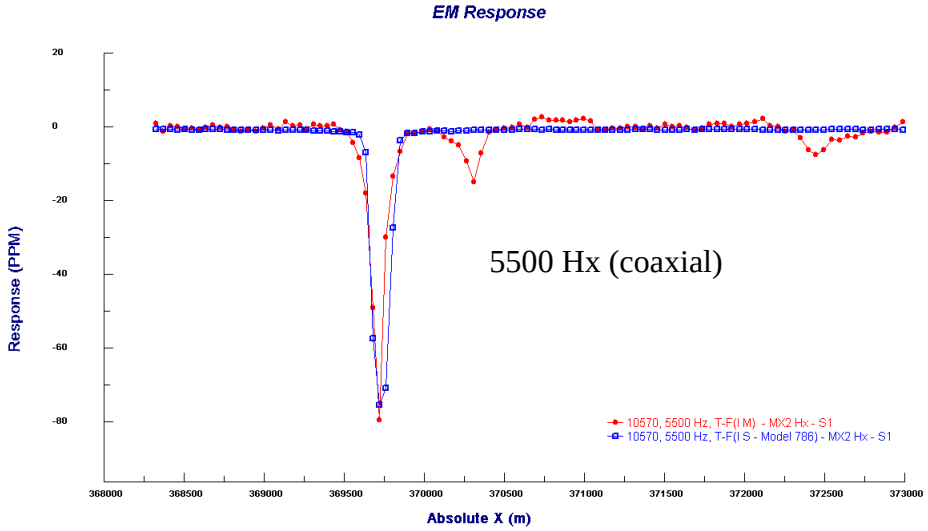
Model 786

Block 1 – EM (Plots)

*In-Phase Component



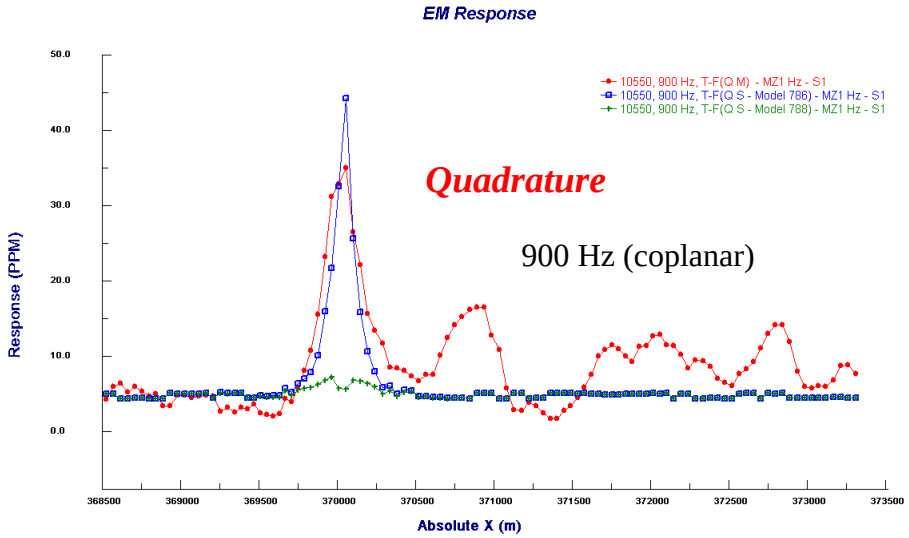




The plots compare the in-phase component of the data and Model 786 for 3 frequencies. (Line 10570)

- Data
- Model 786

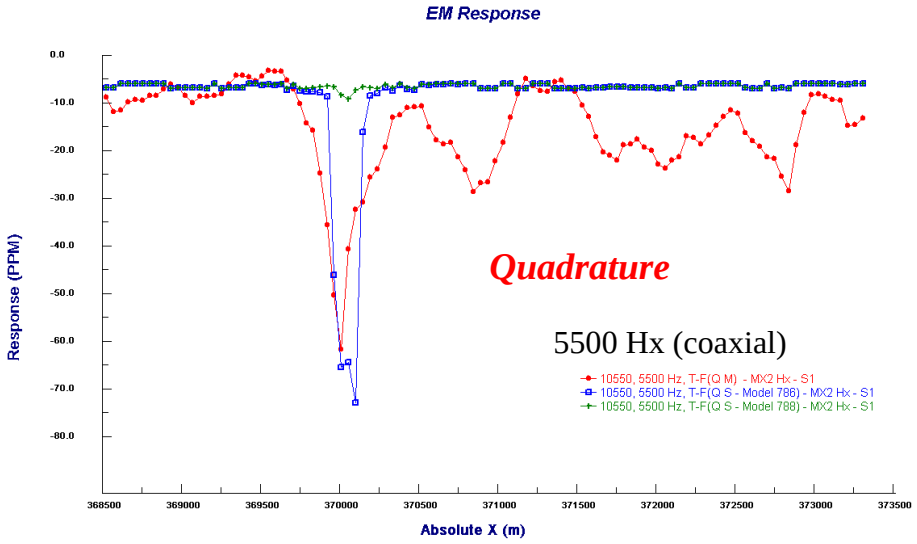
Block 1 - EM

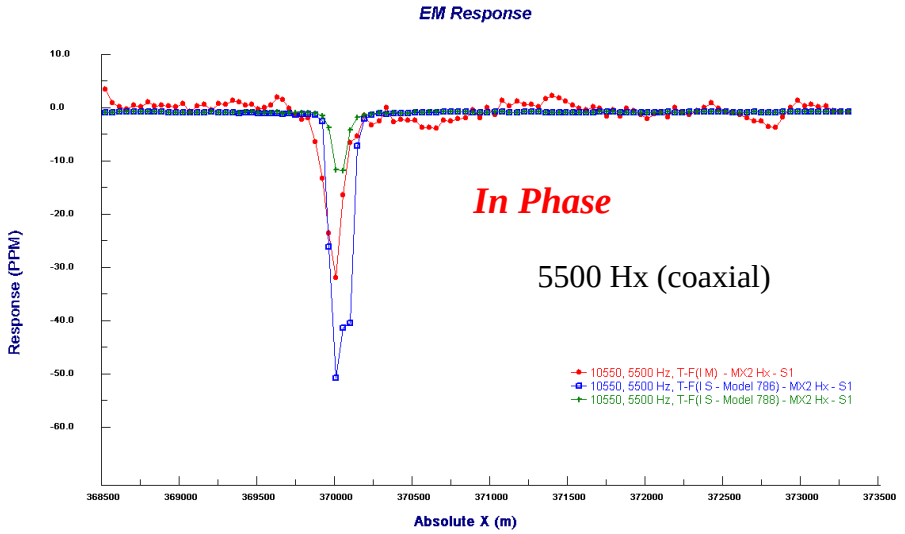


Effect of Shallow Target

The shallow plate in Model 786 has a large effect on the quadrature reponse. Without the shallow plate, the quadrature component of the anomaly is much too small across all frequencies. The shallow plate also has a large effect on the response of in-phase component of the mid-high frequencies.

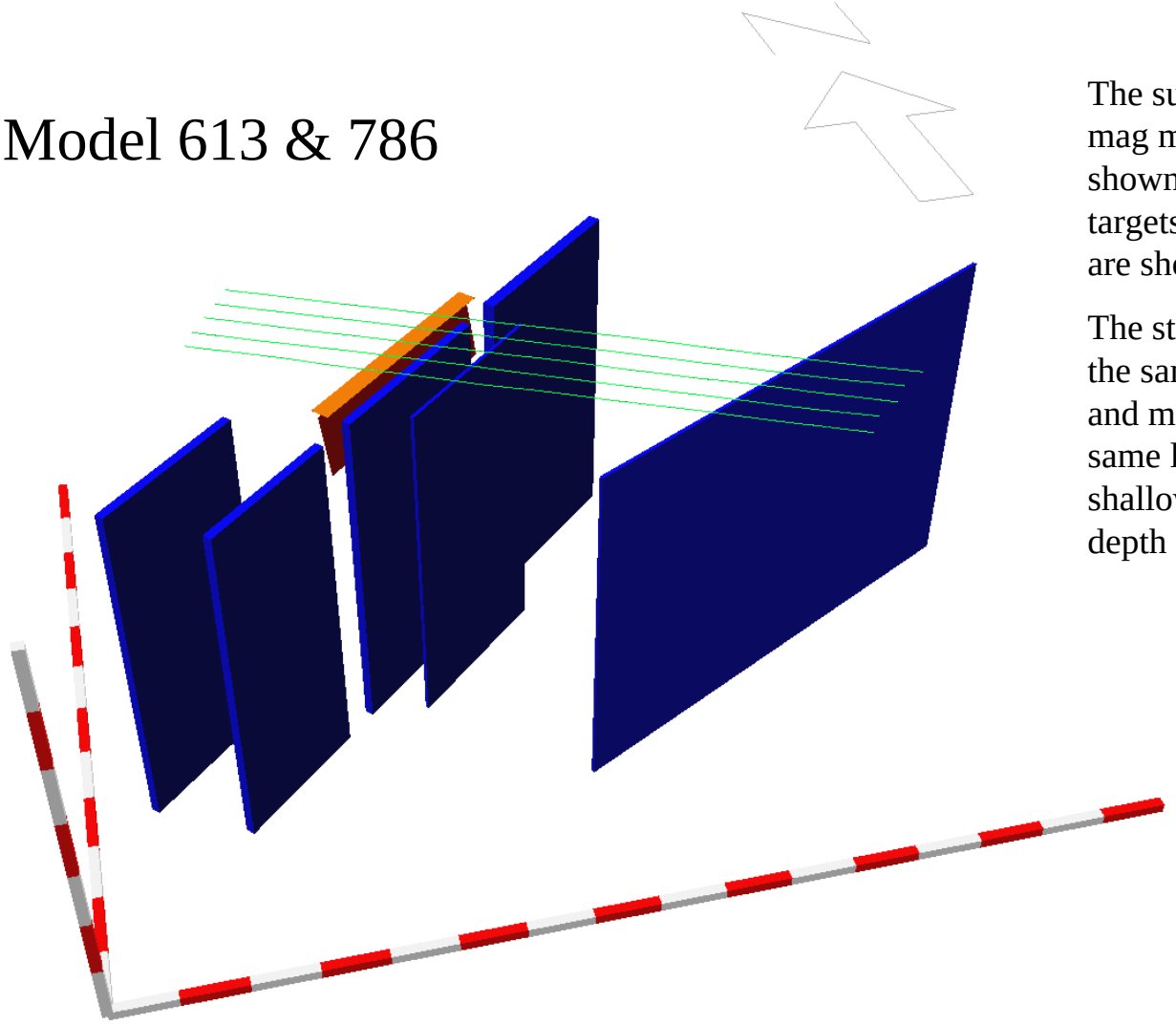
- Data
- Model 786
- Model 788 (deep plate only)





Block 1

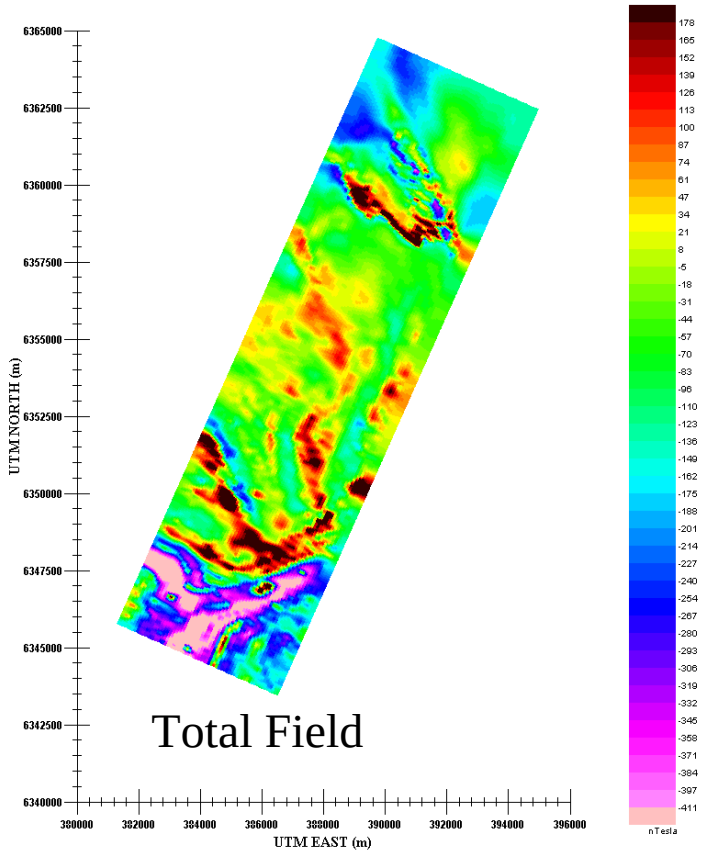
Model 613 & 786



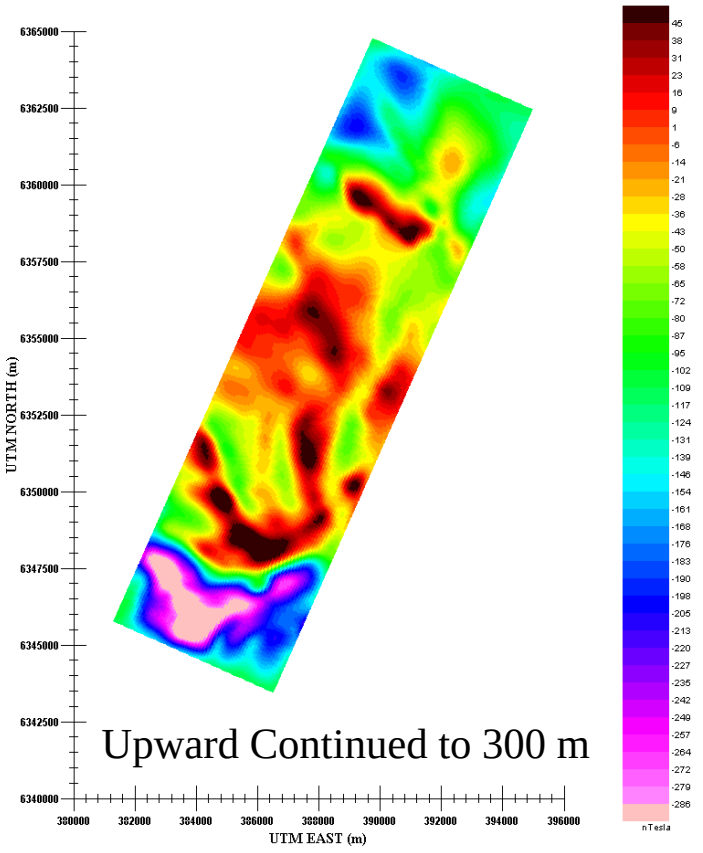
The susceptible targets from the mag model (Model 613) are shown in blue. The conductive targets from the EM model (786) are shown in red and orange.

The structures are all trending in the same direction, but the EM and mag targets are not in the same locations. All but the shallow EM target are at 30-50 m depth and at 80-90^0 dips.

Block 2 - Magnetics

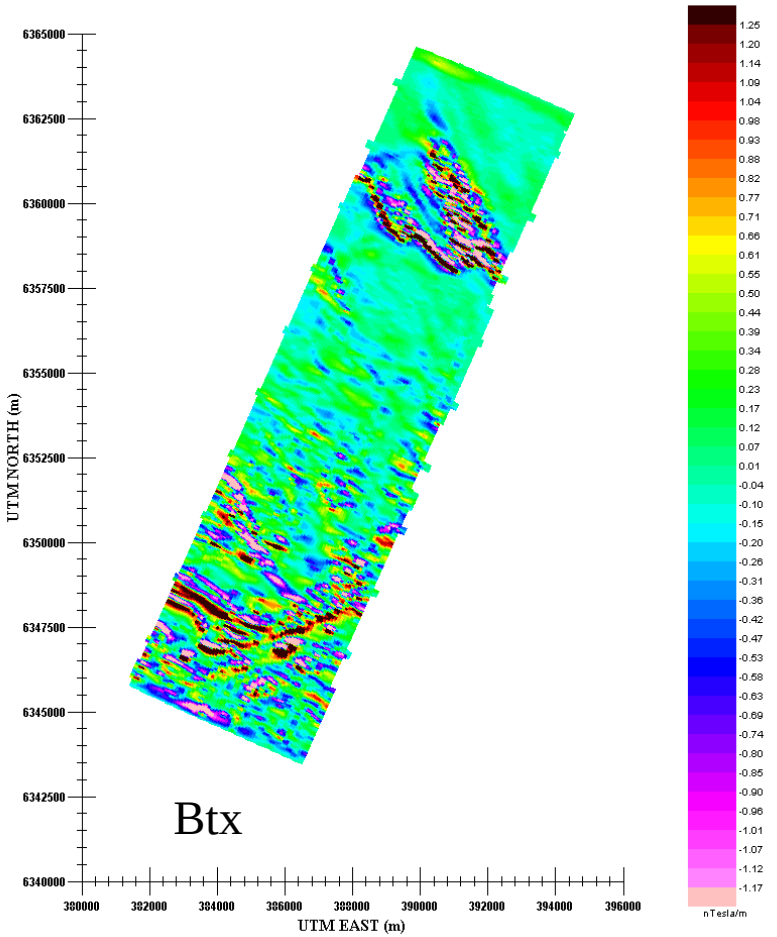


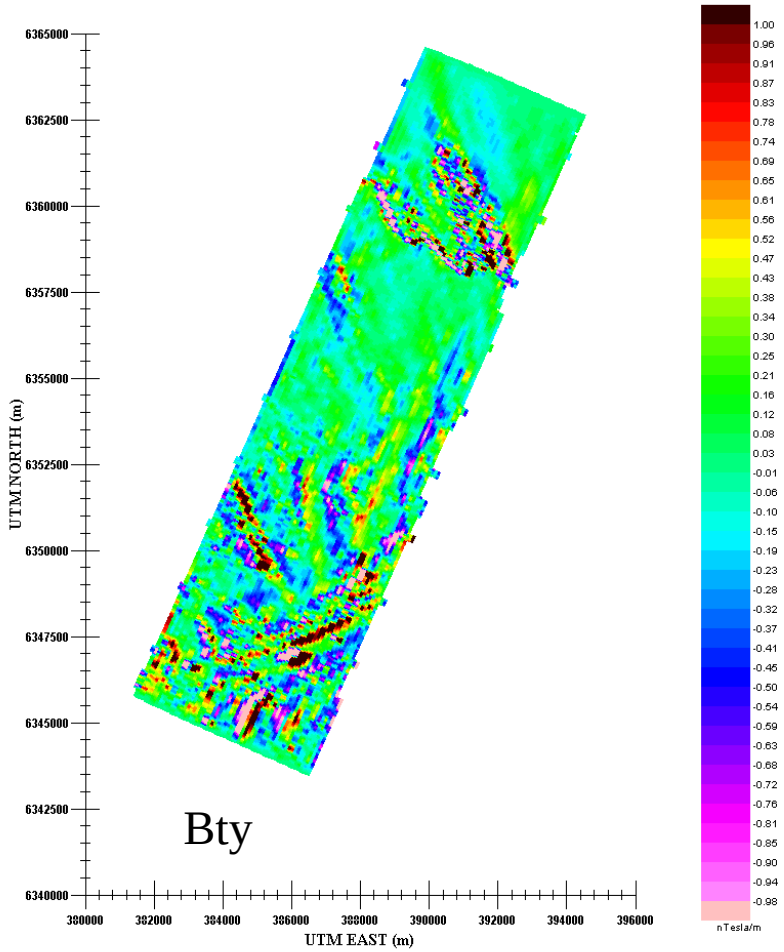
Total Field



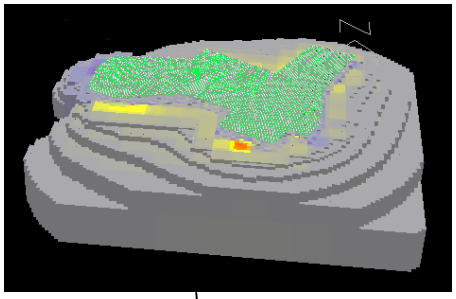
Upward Continued to 300 m

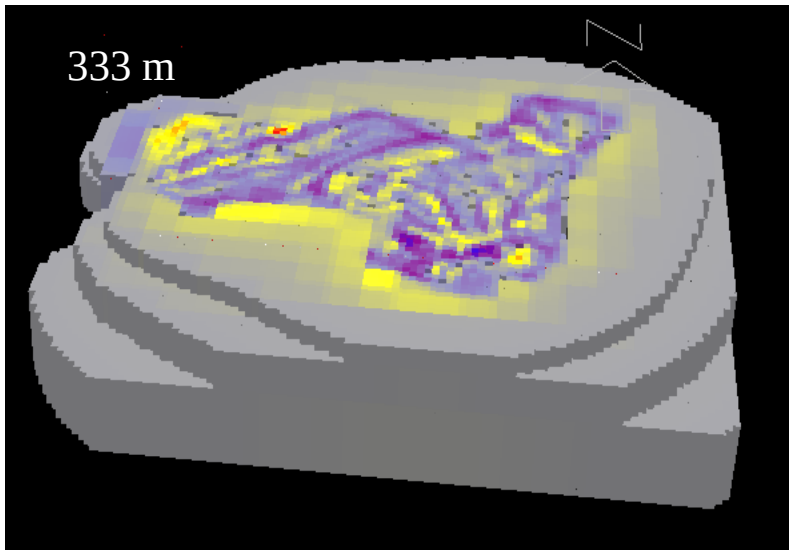
Block 2 - Magnetics



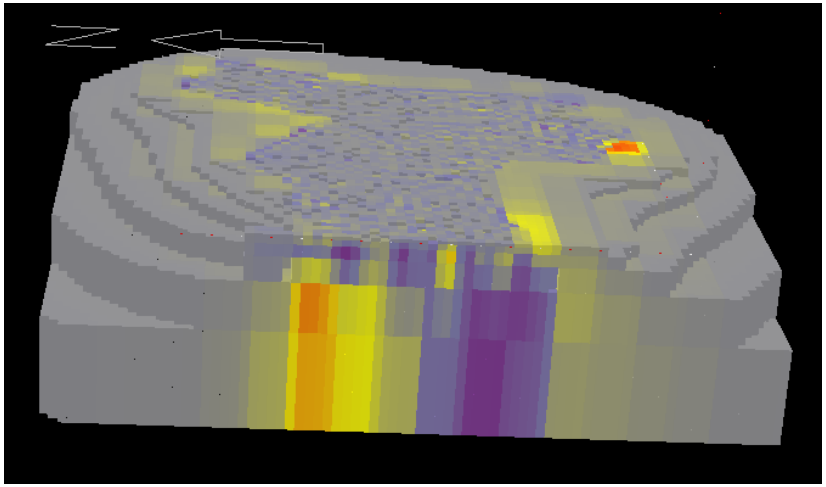


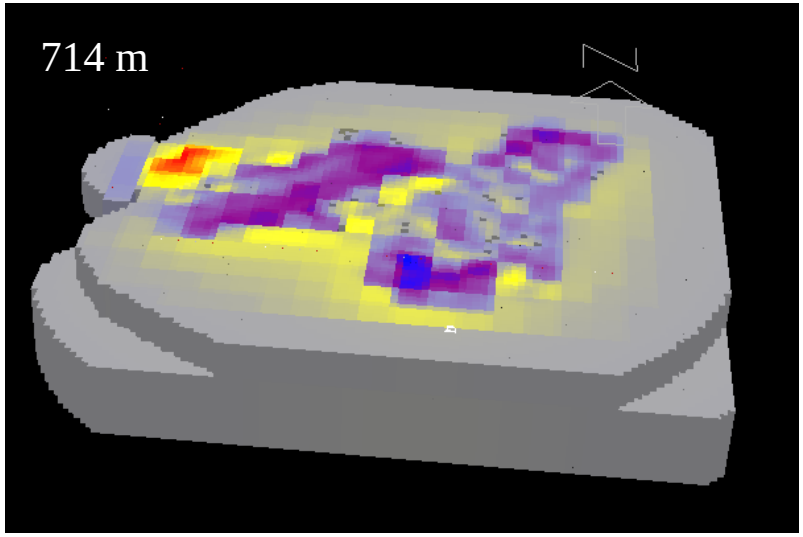
Block 1 & 2 – Mag Inversion





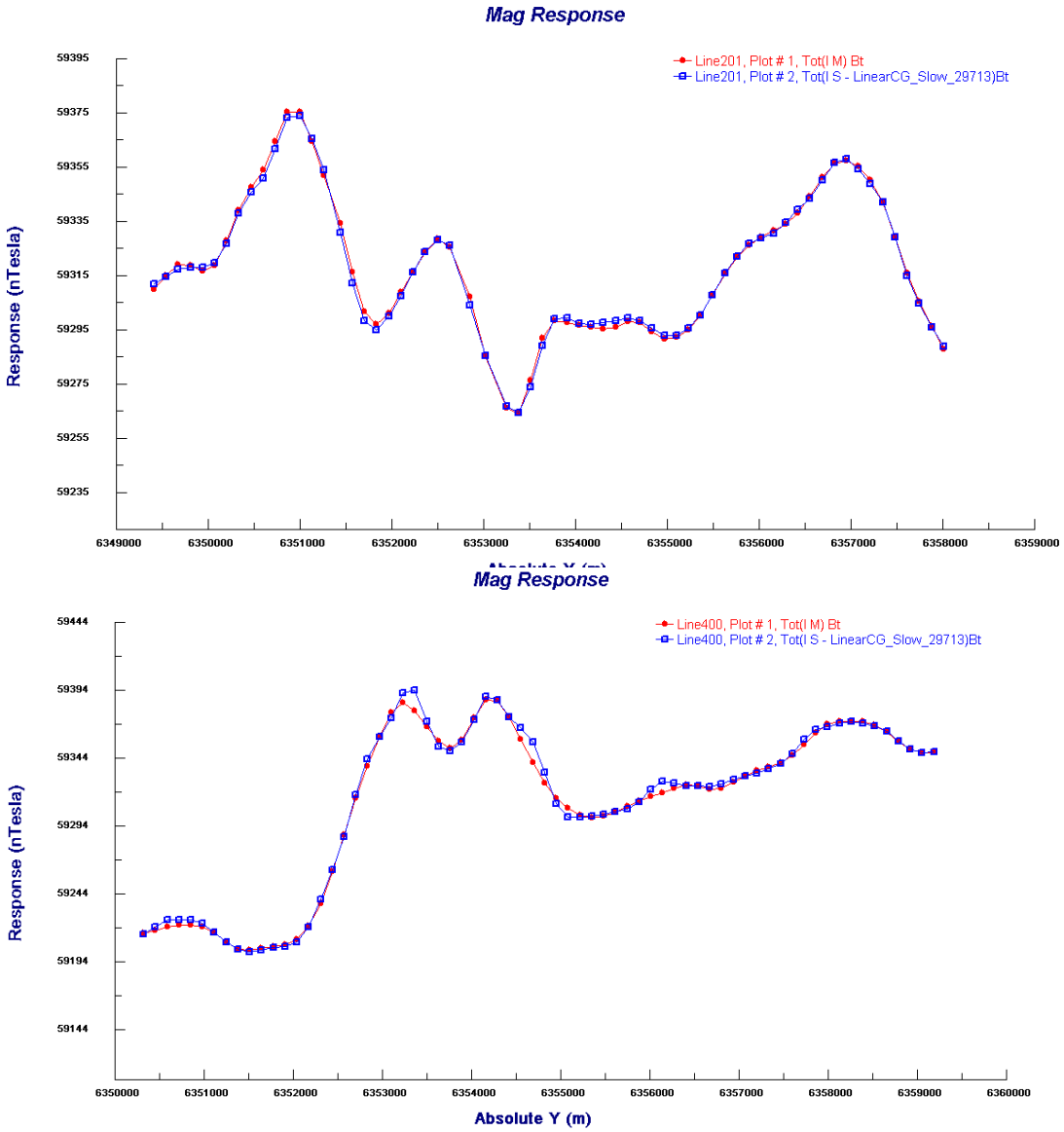
*purple and blue are negative susceptibilities





The magnetic data over Blocks 1 & 2 was inverted. The structure from the inversion result is mostly deeper than in the model. It is useful for showing the trends of linear magnetic features in the area.

Blocks 1 & 2 – Mag Inversion (Plots)



Data

Inversion