GEOSOFT.
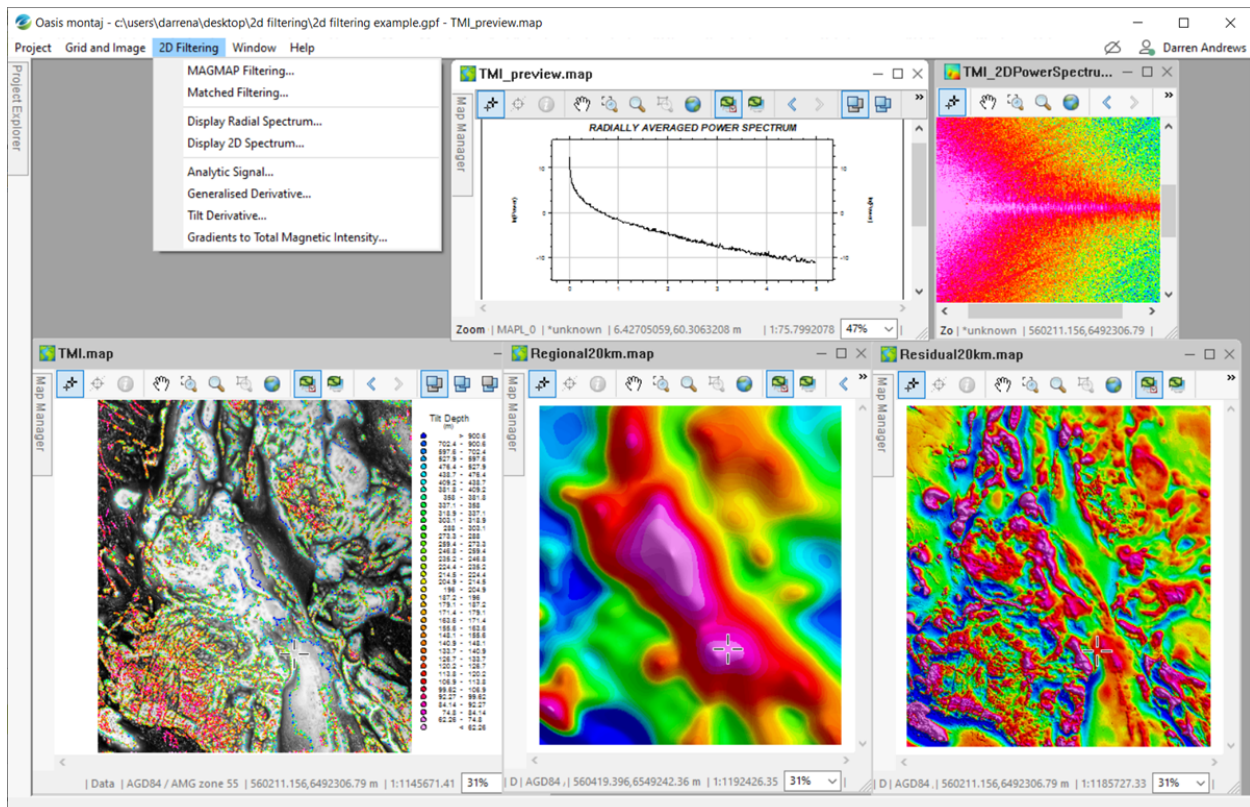
2D Filtering

The 2D Filtering extension within Oasis montaj now offers a primarily interactive filtering experience. Built upon our MAGMAP technology, the extension allows you to apply a wide range of filters to gridded data and interactively refine them. These filters allow you to emphasize subtle features in your data, separate signals representing different source depths, remove noise, and produce different field components, amongst many other things.

The extension contains the following features:

1. Interactive Fast Fourier Domain (FFT) filtering with 29 different filters
2. Interactive Matched (source depth separation) filtering
3. Radial and 2D power spectrum calculation and display for source depth and frequency analysis
4. Analytic Signal filter: accurately define anomaly source locations in low magnetic latitudes
5. Generalised Derivative filter: calculate the curvature of a potential field
6. Tilt Derivative filter: locate source edges and estimate their depth
7. Gradients to Total Magnetic Intensity: reconstruct magnetic field from gradients

2D Fast Fourier Transform (FFT) Filtering

The montaj™ MAGMAP Filtering tool provides a library of 2D FFT filters to apply to gridded data. MAGMAP rapidly processes and enhances gridded datasets by applying a wide range of robust geophysical and mathematical filters. This tool lets you easily define your own filters, modify filter specific parameters and apply any number of filters together in a single operation. An interactive spectrum window allows you to modify filter parameters and instantly observe the effect both on the radially averaged power spectrum (if symmetrical) and the gridded data.

The MAGMAP Filters for gridded data can be divided into 2 categories:

Potential Field Filters

- Reduction to the magnetic pole or equator
- Differential reduction to the magnetic pole (good for very large grids)
- Upward and downward continuation
- Apparent susceptibility and density calculation
- Optimum Wiener depth filter
- Conversion between directional components of the magnetic field

General Purpose Filters

- Integer and fractional derivatives in the X, Y or Z direction
- Integration in X, Y or Z
- Low and High Bandpass filters
- De-corrugation and directional filters
- Four different potential field component calculations
- Custom radially symmetric filters

Use 2D Filtering to:

- Process and enhance gridded data by applying a wide range of FFT filters
- Apply any combination of geophysical and/or mathematical filters
- Interactively modify filter parameters and observe the effect on the output grid in real time
- Define and apply custom filters
- Customise FFT parameters to suit your gridded data
- Interpret the 2D power or radially averaged power spectrum of your gridded data

Interactive Filtering

An Interactive Spectral Filter Builder allows you to design and fine tune filter parameters and instantly observe the effect of the filter(s) in the preview window, collectively or individually.
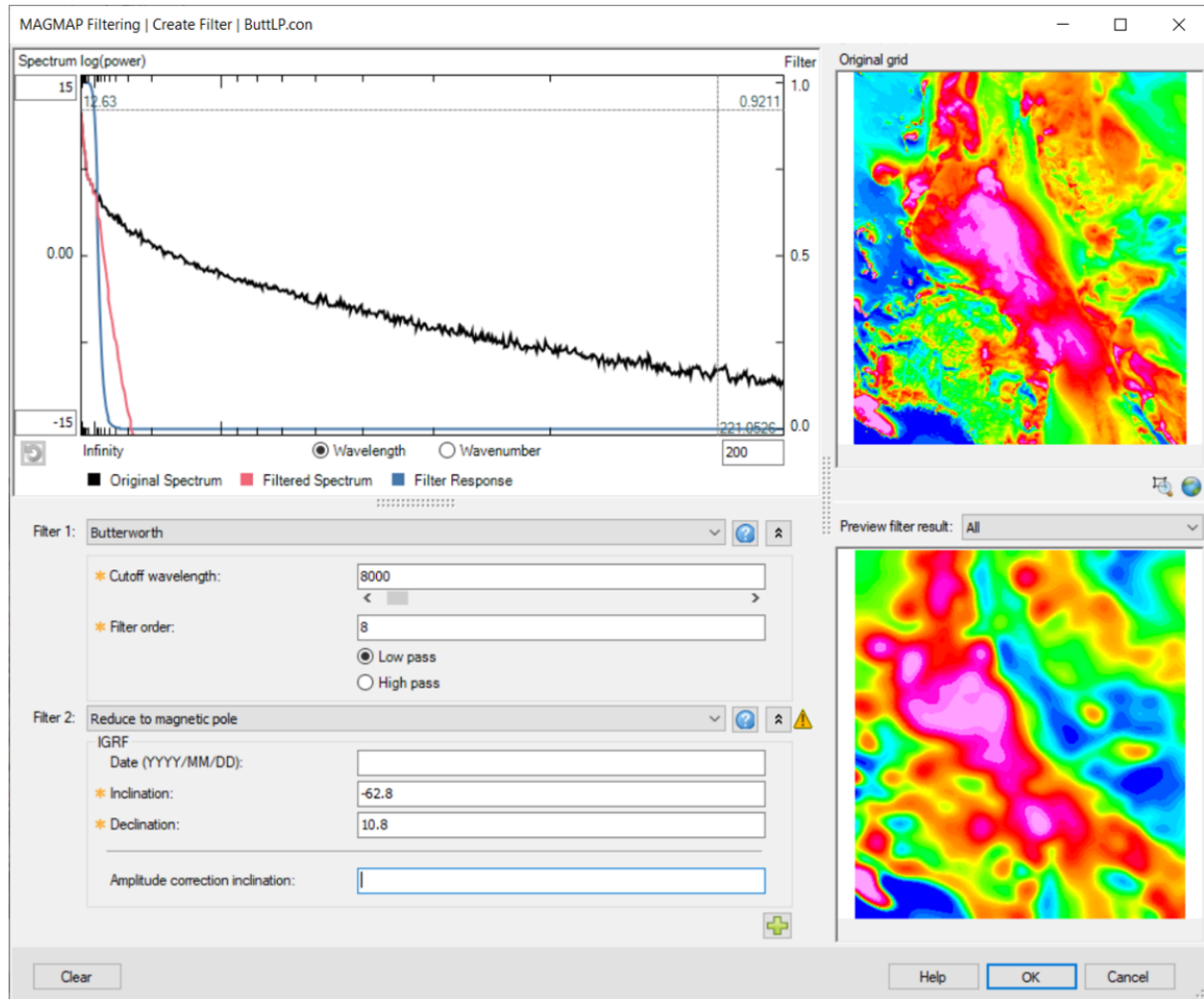

Only radially symmetric filters, such as low and high pass filters will be displayed in the spectrum window. The initial power spectrum, the final power spectrum, the filter coefficients of the currently selected radially symmetric filter and the filter coefficients of the combined filter are displayed in real time.

The grid preview window can be re-sized and you can choose to preview the output grid for individual or combined filters.
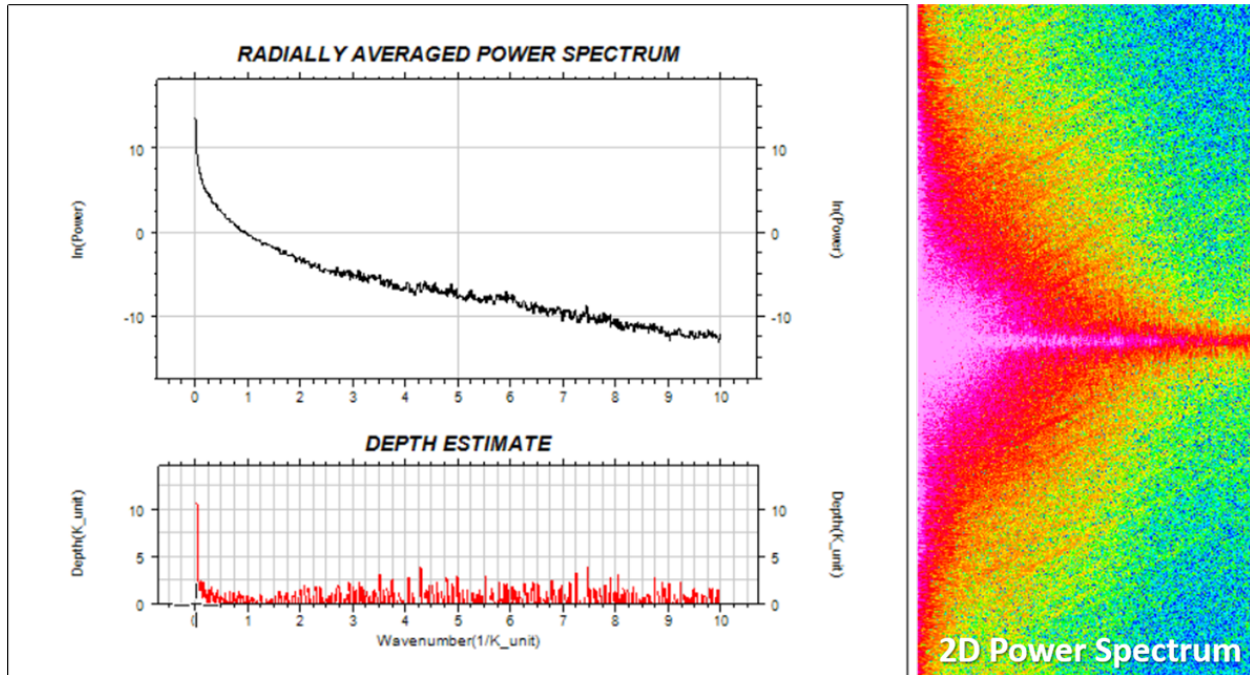
Matched Filtering

The Matched Filtering tool allows you to interactively define a set of complementary filters, each filter emphasizing the signal resulting from a defined range of depths. The matched filters are tapered bandpass filters that collectively cover the entire filter spectrum.
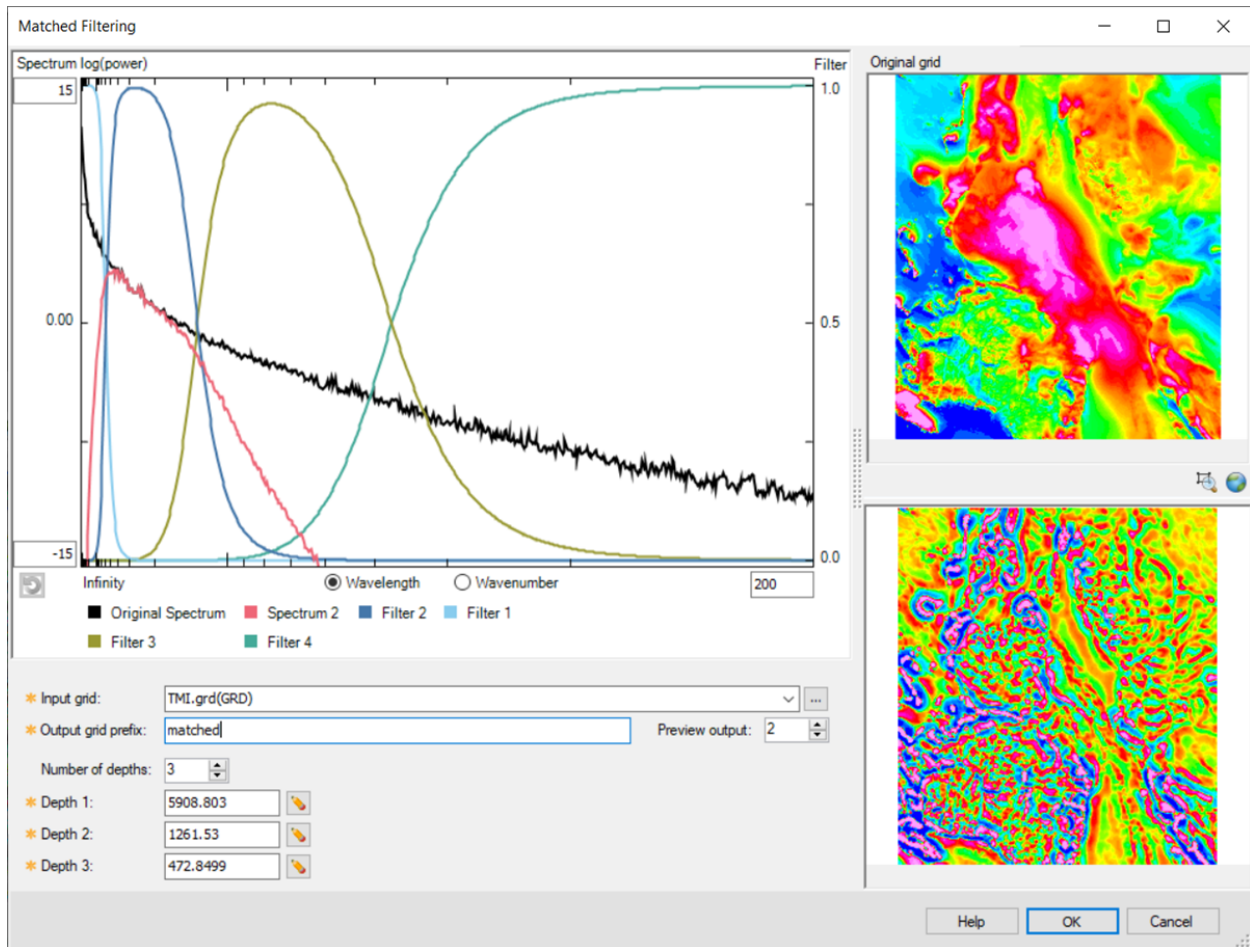
2D and Radially Averaged Power Spectra

The 2D Filtering extension allows you to independently calculate and display both the 2D power spectrum and the radially averaged power spectrum. The 2D power spectrum can be used to analyse the frequency content of your grid and identify gridding or survey artefacts, whereas the radially averaged power spectrum can be used to estimate source depths from your grid.

Specialised Filters

Horizontal and vertical derivatives of potential field data are routinely measured, and can be calculated from the observed total magnetic intensity. The 2D Filtering extension contains several specialised filters that utilize a combination of these derivatives to enhance specific signatures in the data and are an essential part of the interpretation process.

Analytic Signal

The Analytic signal of a magnetic field is a common interpretation tool that is useful in locating the edges of magnetic source bodies, particularly in regions where a low magnetic field latitude and/or remanence distorts magnetic anomalies and complicates interpretation.

Total Magnetic Intensity
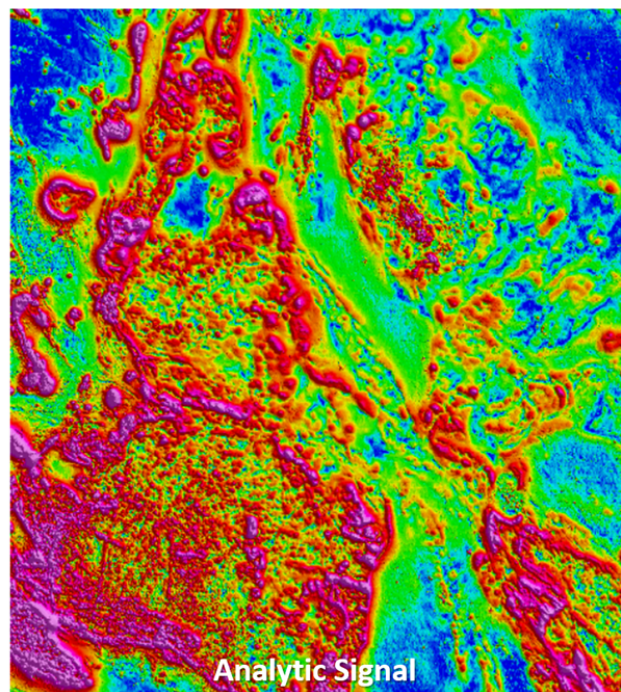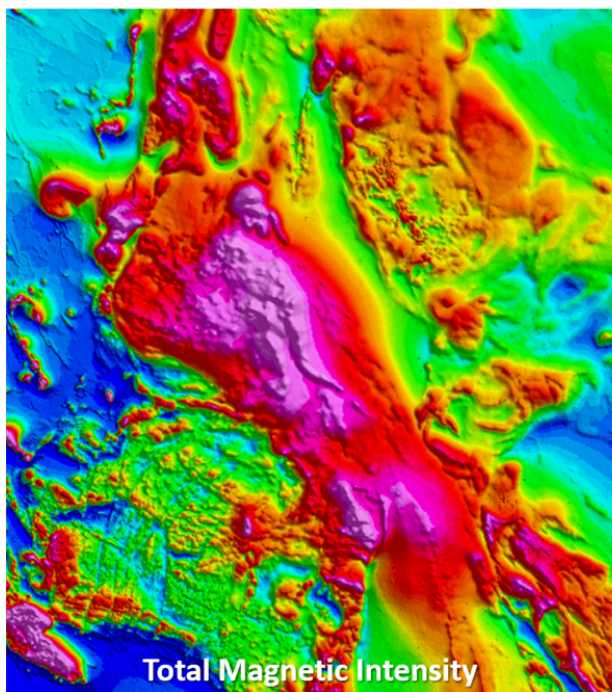
Analytic Signal

Generalised Derivative

This generalised derivative is a linear combination of the horizontal and vertical field derivatives, normalised by the analytic signal amplitude. It is indicative of the curvature response of the potential field response, which is a useful attribute that can be used to enhance the signal and bring out detail that can obscured by higher amplitude anomalies. You choose the specific orientation (azimuth and dip) to enhance the potential field in.
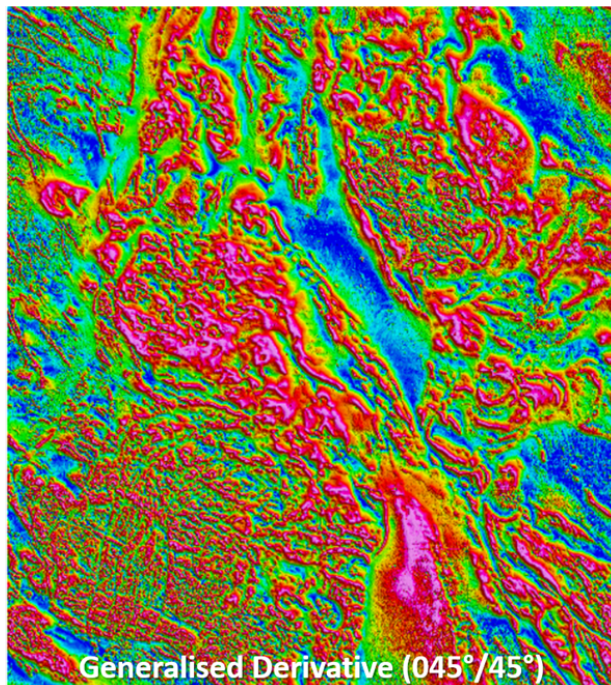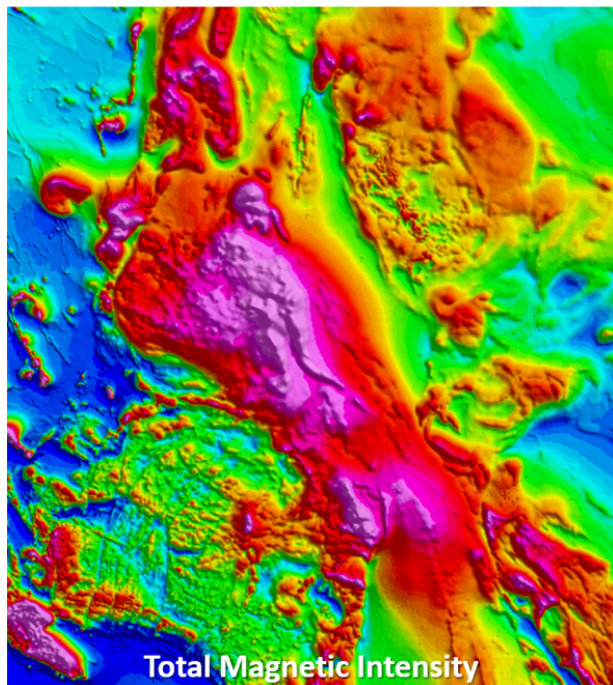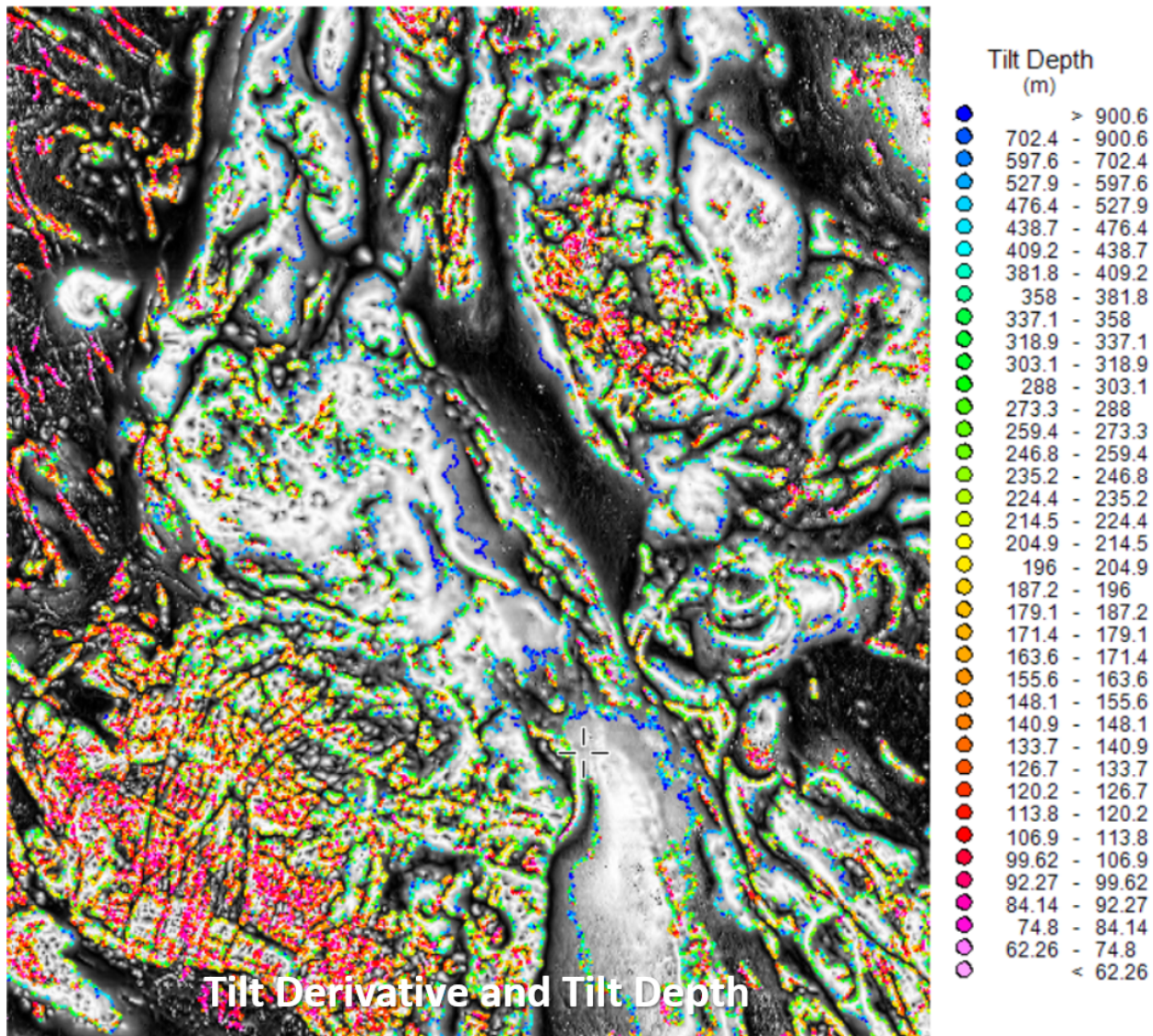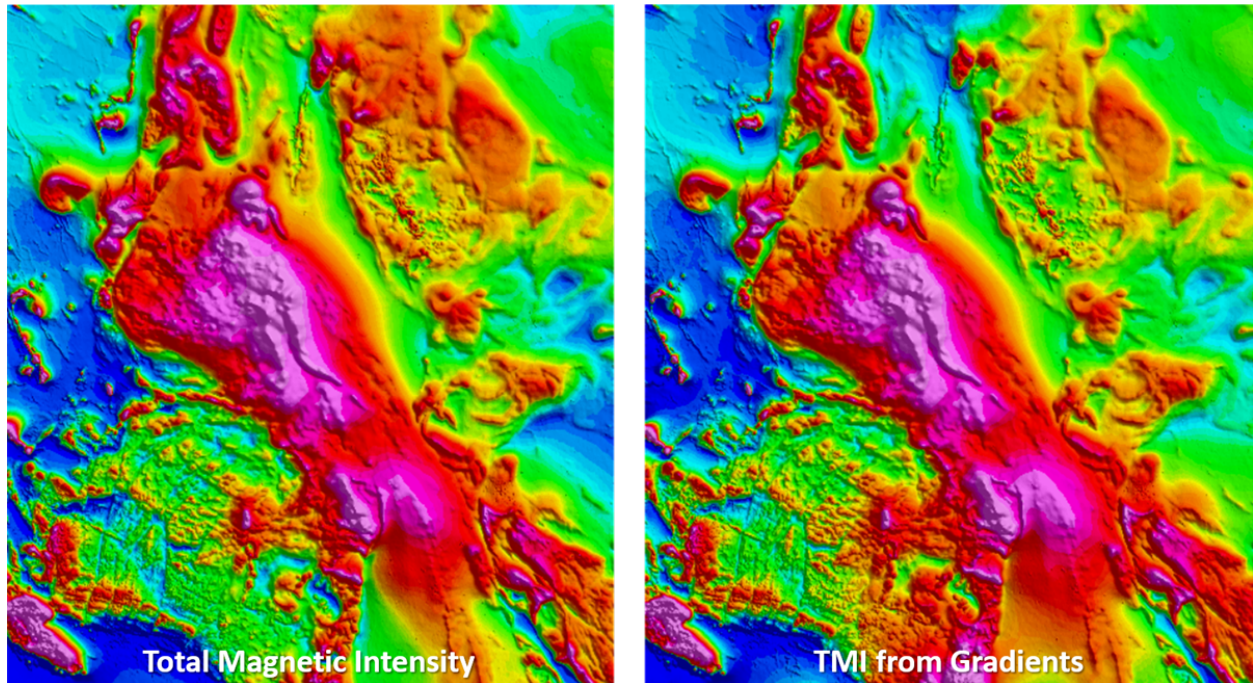
Tilt Derivative

The tilt derivative and its associated total horizontal derivative are useful for mapping shallow basement structures and mineral exploration targets.

The tilt derivative includes a depth estimate that is based on a technique published by Salem et al (2008). This is a simple and fast method to estimate the depth to vertical contacts from Reduced to the Pole (RTP) magnetic data. The estimate provides, with little effort, a useful starting point for interpreting the subsurface in areas where geological information is scarce.

Tilt Derivative and Tilt Depth

Tilt Depth (m)

>	900.6
702.4 -	900.6
597.6 -	702.4
527.9 -	597.6
476.4 -	527.9
438.7 -	476.4
409.2 -	438.7
381.8 -	409.2
358 -	381.8
337.1 -	358
318.9 -	337.1
303.1 -	318.9
288 -	303.1
273.3 -	288
259.4 -	273.3
246.8 -	259.4
235.2 -	246.8
224.4 -	235.2
214.5 -	224.4
204.9 -	214.5
196 -	204.9
187.2 -	196
179.1 -	187.2
171.4 -	179.1
163.6 -	171.4
155.6 -	163.6
148.1 -	155.6
140.9 -	148.1
133.7 -	140.9
126.7 -	133.7
120.2 -	126.7
113.8 -	120.2
106.9 -	113.8
99.62 -	106.9
92.27 -	99.62
84.14 -	92.27
74.8 -	84.14
62.26 -	74.8
<	62.26

Gradients to Total Magnetic Intensity

This filter allows residual magnetic field to be reconstructed from gradient components, and used in conjunction with other data during the interpretation process.

Total Magnetic Intensity

TMI from Gradients

References

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