Oasis montaj How-To Guide

CET Grid Analysis - Create a Structural Complexity Map

Manual release date: April-17-12.

Please send comments or questions to info@geosoft.com

Geosoft Incorporated
Queen's Quay Terminal
207 Queen's Quay West
Suite 810, PO Box 131
Toronto, Ontario
M5J 1A7
Canada
Tel: (416) 369-0111
Fax: (416) 369-9599

Website: www.geosoft.com
E-mail: info@geosoft.com

Support

For obtaining technical support, email support@geosoft.com

If you wish to speak to a technical support representative in your region, please visit the Geosoft Support page at: www.geosoft.com/about-geosoft/contact-us/world-offices for contact information.

How to Create a Structural Complexity Map

The **CET Grid Analysis** system analyses the texture of an image to detect areas of structural complexity in green field exploration. The Structural Complexity analysis is used to locate deposit-occurrence favourability.

Prior knowledge of empirical relations between geological features and deposits of interest allows to refine the outcome. This method identifies magnetic discontinuities using a combination of texture analysis and bilateral symmetric feature detection. It then identifies regions of discontinuity and analyses structural associations to locate crossing, junctions, and change of direction in the strike.

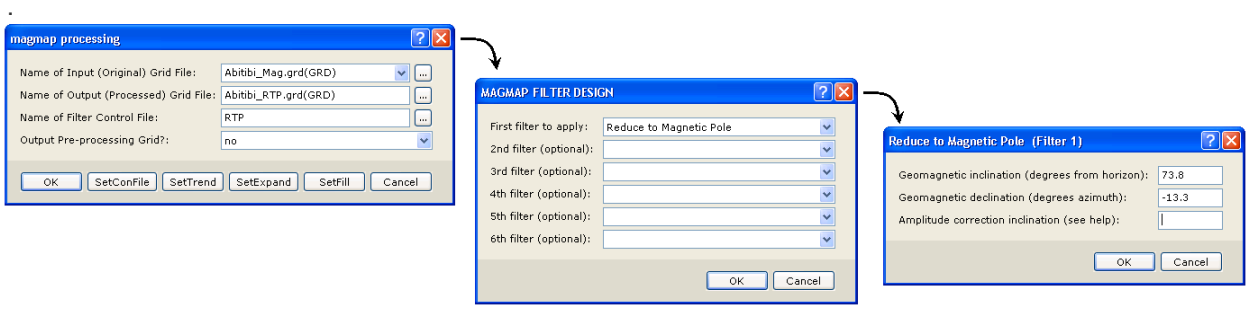
Finally, by measuring the density of structural contacts and the diversity in the strike structures as a heat map, it facilitates picking the areas that are perceived to be prospective. Magnetic field data delineates the geologic structure relatively well and is best suited for this purpose. Nonetheless, since the workflow is directly applied to gridded datasets, any geophysical data sensitive to the geological structure could be subjected to this process to delineate ridges or edges of the geologic structure.

When using magnetic data in this process, it is highly recommended to pole reduce the data first so that the anomalies are shifted over their causative structures.

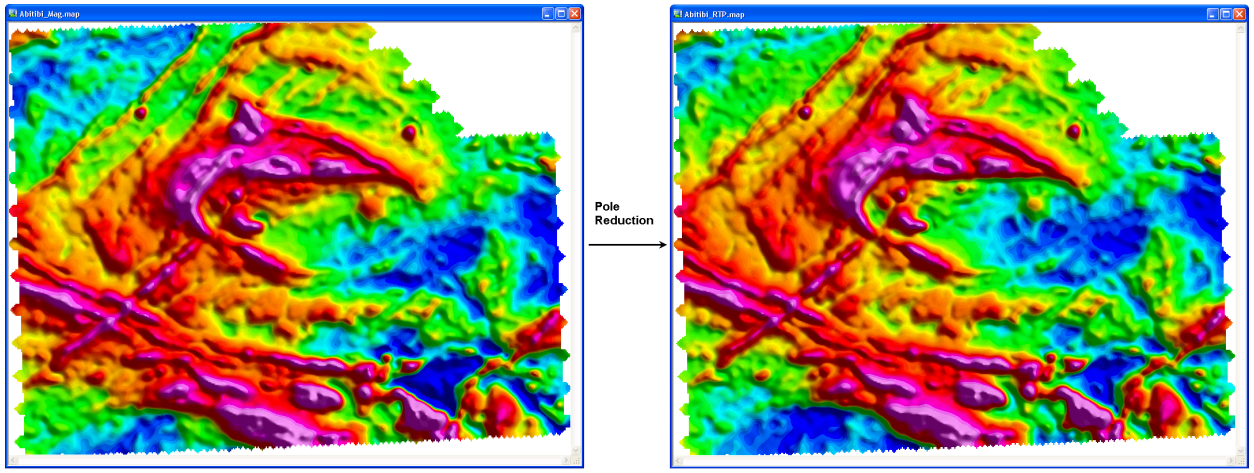
Start by creating an Oasis montaj workspace and load the **MAGMAP** and **CET Grid Analysis** menus.

To Pole Reduce the Magnetic Grid Data

1. From the *MAGMAP* menu, select **MAGMAP 1-Step Filtering**.
2. Specify your input magnetic grid, the output pole reduced grid,and the relevant geomagnetic field parameters.



3. Click **OK** and the pole reduced grid will appear.



For more information on how to use MAGMAP see the MAGMAP Filtering Tutorial.

To Generate the Lineament

1. From the *CET Grid Analysis* menu, select **Texture Analysis | Standard Deviation**.

   The *Standard Deviation* dialog is displayed.

   A running window generates a measure of randomness of the texture. Two statistical methods are supplied:

   Entropy method: $E = -\Sigma_{i=1}^{N} p_i \ \log p_i$

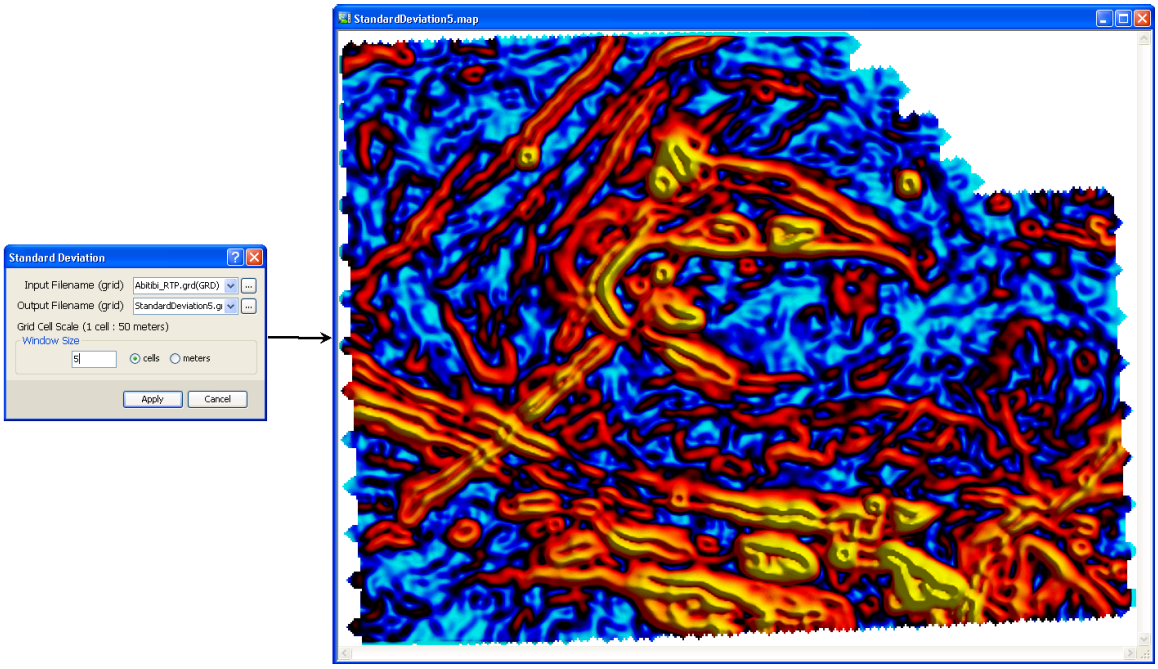
   Standard Deviation method: $\sigma = \sqrt{\left[1/N \ \Sigma\left(x_i - \mu\right)^2\right]}$

   The standard deviation method provides a smoother representation of the degree of randomness, that overcomes the inherent noise in the data.

2. For *Input filename (grid)*, select the pole reduced magnetic grid; for *Output filename (grid)*, enter **Standard Deviation**.
3. The *Window Size* defines the size of the window for the running Standard Deviation calculation. Accept the default of **5** grid cells as it covers well the linear features of interest.

   If your structural features are not adequately covered by 5 cells, then increase this number to

cover the width of the anomalies of interest. This number should be an odd number.



To Detect the Ridges along the Linear Features

1. From the *CET Grid Analysis* menu, select **Lineation Detection | Phase Symmetry (ridges/valleys)**.

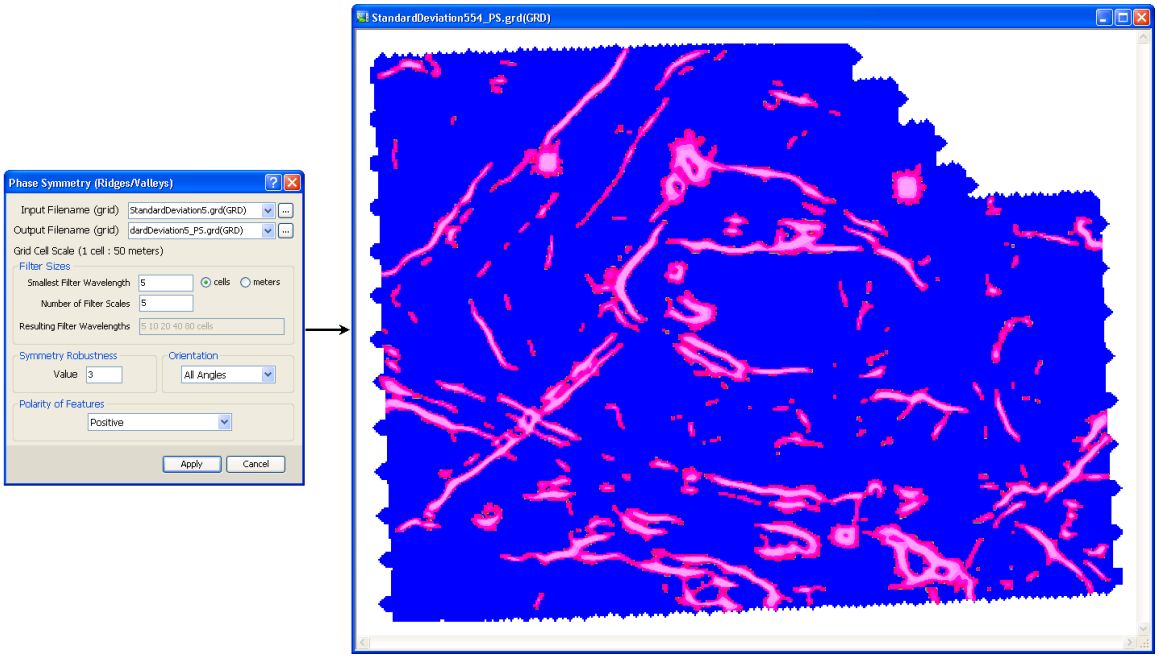
   The *Phase Symmetry (Ridges/Valleys)* dialog is displayed.

2. For *Input filename (grid)*, provide the standard deviation statistical grid **StandardDeviation.grd**.

   The output file will be a normalized grid in the range of 0-1, this being a measure of the symmetricity of the signal at each grid cell. This entry will be automatically filled.

3. Select the *Smallest Filter Wavelength* as **5** cells, and the *Number of Filter scales* as **5**. Then set the *Symmetry Robustness* to **3**. Since the dykes seem all to have a positive magnetic response, you will specifically focus only on the **Positive** features.

4. Click **OK** and the formalized lineament grid will appear.



To Vectorize the Digital Normalized Grid

This digital normalized grid should be vectorized in 2 steps:.

1. To narrow down the lineations, from the *CET Grid Analysis* menu, select **Lineation Vectorisation | Amplitude Thresholding**.

   The *Amplitude Thresholding* dialog is displayed.

   Set the *Threshold* to mean +2 Standard Deviations (**0.1**), and the *Output Ridge Width* to **5** cells and click **OK**.

2. The output is still an image and requires vectorization. For this purpose, from the *CET Grid Analysis* menu, select **Lineation Vectorisation | Skeletonisation (line thinning)**.

   The *Skeletonisation (Line Thinning)* dialog is displayed.

   Accept the defaults.

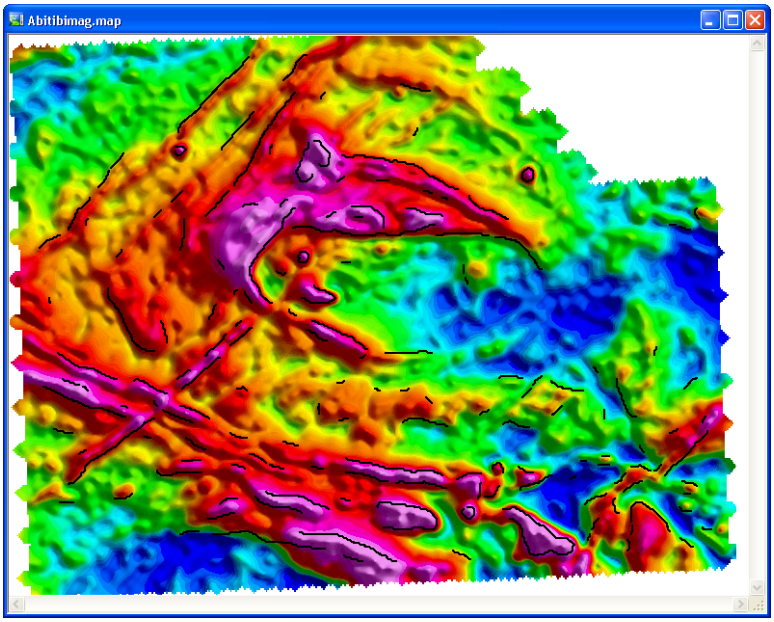
3. Click **OK** to generate a database of the lineations.

4. To plot the lineations on the original mag data, from the *Map tools* menu, select **Line Path**.

   The *Line path plot* dialog is displayed.

5. Set the *Label location* to **None** and accept the other defaults.

6. Click **OK** to see the lineations depicting the ridges of the linear features on the original map.



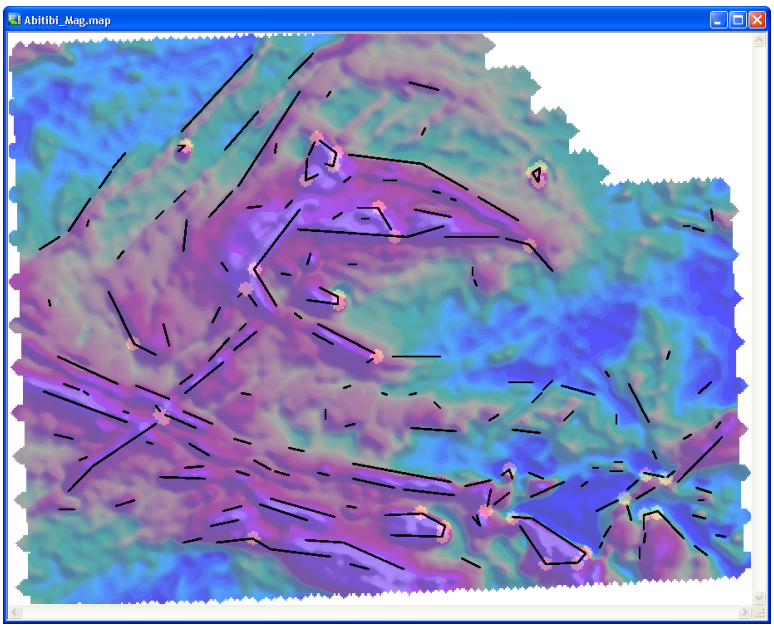
To Vectorize the Lineaments into Short Linear Segments

This is done as a preamble to finding where the linear structures intercept or change direction. Historically, these are areas with a high prospect for mineralization.

1. From the *CET Grid Analysis*menu, select **Linear Vectorization | Skeleton to Vectors**.

   The *Skeleton to Vectors* dialog is displayed.

   Accept all the defaults. This process will produce a database with straight line segments.



2. Then from the *CET Grid Analysis* menu, select **Structural Complexity | Contact Occurence Density**.

The *Contact Occurence Density* dialog is displayed.

3. Decrease the contact voting influence to **3** to pick the localized junctions, as indicated in pink in the previous image.
4. Finally, from the same submenu, run the **Orientation Entropy** for all directions.

   The *Orientation Entropy* dialog is displayed.

   Accept all the defaults.

   The generated map indicates areas of junction high density in red. These are areas favourable for hosting deposits of interest and could be further explored in more detail.