Oasis montaj How-To Guide

CET Grid Analysis - Detect Linear Features
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How to Detect Linear Features

The CET Grid Analysis system analyses the texture of an image to detect lineaments along ridges and edges, as well as areas of structural complexity. 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.
To Generate the Lineament

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

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

   **Entropy method:**
   \[
   E = -\sum_{i=1}^{N} p_i \log p_i
   \]

   **Standard Deviation method:**
   \[
   \sigma = \sqrt{\frac{1}{N} \sum (x_i - \mu)^2}
   \]

   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.
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.

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

3. 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.

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

5. To plot the lineations on the original mag data, from the **Map tools** menu, select **Line Path**.
   The **Line path plot** dialog is displayed.

6. Set the **Label location** to **None** and accept the other defaults.
7. Click **OK** to see the lineations depicting the ridges of the linear features on the original map.

⚠️ Setting the threshold lower will result in more lineations. *A priori knowledge can be helpful in deciding what features are of particular interest.*