"EULER 1.15" -- Euler Deconvolution for Profiles
EULHELP

Contents

For Help on Help, Press F1

Introduction

Euler deconvolution assists the interpreter by indicating portions of the data of interest, which can then be modelled in detail. No particular geological model is assumed ; a range of elementary magnetic distributions such as point poles and dipoles are used as the source of the anomalies. The input is a magnetic, gravity, or analytical signal profile, and the output is a plot of the location of the different types of sources present.

Sources are characterised by their structural indices, which correspond to the rate of decay of the field strength with distance from the source. Some examples are given below ;

Structural Index	**Source Type (Magnetics)**
1.0	thin prism
2.0	line of dipoles
3.0	point dipole

The locations of sources that correspond to up to 5 structural indices may be searched for in one pass through the data. Solutions of each index will be displayed using symbols of different colours, as shown below ;

1st index	Black +
2nd index	Red x
3rd index	Blue square □
4th index	Purple *
5th index	Green ^

When large numbers of solutions plot on top of each other it can be difficult to determine by eye where the highest density of solutions lies. The 'Display results as image' discretises the solution space. Regions with no solutions are plotted as dark blue, regions containing an average number of solutions are plotted in green, and regions with the highest density of solution are plotted in light red. This only applies to solutions from the first structural index used.

See the references for more detail about how Euler deconvolution works.

Data Input

Euler requires a space delimited ASCII file containing two columns. One is for the measurement locations, the other for the field values. The measurement locations need not be equally spaced. If the data type is magnetics then the parameters of the geomagnetic field at the survey location must be entered, along with the profile direction (degrees positive from North).

Data Processing

The solving of Euler's equation requires the horizontal and vertical gradients of the potential field data, which are calculated in the frequency domain (see Gunn, 1975). In addition, magnetic data is reduced to the pole before the gradients are calculated. The pole reduced data and the gradient data are displayed onscreen.

The desired structural indices must be chosen, along with the window size to be used. This is an odd number of data points, and should be set to a size of about half the width of the anomalies of interest. If it is made too large then it may encompass nearby anomalies and generate spurious results, while if it is too small then wider features will be missed.

Euler deconvolution has a tendency to generate large numbers of solutions which can result in a confusing output. To ease this problem, lone solutions far from other solutions can be removed. Enter distances for the maximum allowed horizontal (X separation) and vertical separations (Y separation) of consecutive sources. The larger these distances are made, the greater the number of sources that will be displayed. To reduce the number of solutions and minimize the clutter, make X- Separation and Y-Separation very small numbers !!

The 'Use vertical gradient' option computes the solutions with the vertical gradient as the main dataset (rather than the RTP data). The gradients are calculated in a specific manner to minimise noise (see Cooper, 2002). The structural index is automatically updated to reflect the use of higher derivatives of the field.

The 'Enhanced resolution option' compensates for the finite window size when computing the solutions. The resulting improvement in solution clustering is most apparent when larger window sizes are used.

Data Output

The solutions may be plotted on any Windows compatible printer, or written to disk as an ASCII file. To put an image of Euler's output into another program, simply press Alt-PrtSc while running Euler, then switch to the other application and press Edit...Paste.

References

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Thomson, D.T., 1982. Euldph : A new technique for making computer assisted depth estimates from magnetic data. Geophysics 47 (1), p.31-37.

Credits

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It was inspired by an earlier mainframe based program written by R.J.Durrheim (formerly at the University of the Witwatersrand) that was converted to Dos in 1987.

Euler is provided here courtesy of Professor Gordon Cooper.
It was Tested by Afif Saad . For questions you may E-mail afif.saad@gmail.com