

Depth Estimation Exercises using profile Euler deconvolution method

1. SOFTWARE :

The software (euler.exe) to be used in these exercises is found in the "DE-Exercises_SOFTWARE" directory. Euler is provided courtesy of Professor Gordon Cooper, University of the Witwatersrand, Johannesburg, South Africa. It is a 2-D depth estimation technique for magnetic , gravity or analytic signal profile data. Please read the Readme file which is also the euler Help menu before you start. The software was tested by Afif Saad who also prepared these exercises using model data. For questions or problems with the software or exercises e-mail afif.saad@gmail.com.

2. DATA :

The profile data used for the exercises (the input to euler) are found in the "DE-Exercises_DATA" directory. The data files are ascii files with three columns : [distance along profile(m or km), gravity (mGal), magnetics (nT)]. They have an extension ".dta", please DO NOT change that.

3. PARAMETERS :

The excel file "DE-Exercises_PARAMETERS.xls" has several useful parameters and information that are needed for each exercise, including recommended parameters to consider or use for better results, and the depth answer(s) you expect.

4. DE-EXERCISES :

This is the present directory containing this word doc file, and a Readme file. The Depth Estimation exercises are listed in the DATA directory and PARAMETER File. There are 20 exercises at present. Additional ones may be added later. There are two groups of exercises : the first group (EX-01a - EX-12) are for a single source in each, using only simple sources (point sources, line of source, etc.); while the second group (Ex-13 - Ex-18) are for multiple sources in each profile at constant depth or variable depth such as dipping basement. See the PARAMETER file.

Compute the depths in each exercise using the procedures describe below:

- a) Start: euler --> System --> Load Data --> open the directory "DE-Exercises_DATA" --> Select the appropriate exercise data (.dta) you want to work with.
- b) The Data dialog box that appears when you click on "Load Data" shows the profile data in three columns : distance along profile (X position), Gravity (column 2), Magnetic (Column 3 partly hidden).
Fill in the following info using the PARAMETERS excel file :
 - Data Type - Select the data type : Magnetics, Gravity or Analytic Signals.
 - Select the appropriate column number for X position, Y position (usually the elev or Z position, if available), and Data column number depending on Data type.. (for Gravity should be 2 , for Magnetics should be 3 in all the present exercises).
 - Fill in the parameters for the Geomagnetic Field : Intensity, Declination, Inclination, for the Bearing or azimuth of profile , positive clockwise from true

North, and Flight Height (0.0 in all the present exercises). These parameters are required for magnetic data and have to be correct, since euler uses them to compute RTP data and uses RTP for depth estimation.

- c) Click OK to display these data in the euler window which is divided into three panels:
- Top panel displays the Original Data and RTP Data (in case of magnetics),
 - Middle panel displays the computed Horizontal Gradient and Vertical Gradient profiles; euler computes these gradients in the frequency domain! This may create some problems with 3-D sources and with low quality noisy data !
 - Bottom panel displays depth scaled according to the Maximum Depth specified.
- d) In the menu bar of euler click on --> Process Data --> Process. The Process dialogue box appears. Fill in the following parameters and info using the PARAMETERS file as a guide :
- Structural Indices -- up to five different indices can be used. You can select all, but preferably use one or two at a time. You can change the values from those listed.
 - Window Size -- this applies to the euler deconvolution window in data points (odd number) usually of the order of half-width of the anomaly of interest. You can practice with different sizes.
 - Maximum Depth -- for display purposes use recommendations given in the PARAMETERS file and it depends on the units (m or km).
 - X Separation, Y Separation -- see descriptions in the [Readme file](#). It is recommended that these should be very small numbers (depending on units) to reduce the scatter in the depth solutions, the smaller the numbers the less the scatter, the smaller the number of solutions. Euler generates a large number of solutions.
 - Other Info -- see the Readme file.. but I recommend to check mark the box "Enhanced resolution".
- e) For **Additional Exercises**, verify and compare your DE answers from any or all of the above exercises with those obtained by the quick graphical techniques discussed in the textbook (p. 189, for gravity and p. 357 for magnetics). Use the scaled profile plots in the upper panel of the "euler" window for field (G, and M) data or the middle panel for the scaled Horizontal and vertical derivative plots. For magnetics, I suggest using **the horizontal derivative** curve (in the central panel of euler) and the **half-slope method** to find the depth to the source as described in the textbook (p.363, and figure 13.28).

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