

EXERCISE 4 –DC - Electrical imaging methods (electrical resistivity tomography, ERT)

FORWARD PROBLEM – for a given distribution of electrical properties in the subsurface (model. txt) – resistances measurements will be simulated (modeled) using an individual electrode configuration.

Individual electrode configuration will be written in each team. Configuration should be defined considering 36 electrodes placed on the surface. Here, 2 electrodes for current injection and 2 electrodes for potential measurements. The forward solution will be computed using a given algorithm (CRMod).

1. Create a measuring configuration

C1 C2 P1 P2

1 2 3 4

16 20 24 28

....

2. Convert the configuration to the format given in ./ meas1_afo.dat:

data

C1*10000+C2 P1*10000+P2

3. Save the file as NAME.dat
4. Modify the 5th line in CRMod.cfg to the name of the configuration made (NAME.dat)
5. Modify the 9th line with the name of the file with the modeled data (for the new measuring protocol) (model_data_NAME.txt)
6. Double click in CRMod_stable.exe

INVERSION

Inversion of the numerical tomographic data using CRTomo (Kemna, 2000)

7. Select the input file: Modify the 4th line in crtomo.cfg with the name of the input file in CRMod (model_data_NAME.txt)
 - a. Note that such file contains the resistances (measured or modeled) for the electrode configurations (column 1 and 2) defined individually
8. Modify the 5th line in crtomo.cfg for the output path for the inversion results
9. Double click in CRTomo_stable.exe

Task:

1. Create a new measuring protocol (at least 200 measurements)
2. Run the forward model (CRMod_stable) to create a numerical data set (modeled data)
3. Run the inversion of the modeled data with CRTomo_i686_no_optim.exe
4. Plot the inversion results as obtained by the last iteration (maximum number rho##.mag in the inv folder) with help of the plot_res.m routine

The report should be delivered electronically by next Wednesday (28.1) and should contain the plot of the inverted resistivity values, as well as a short discussion about the importance of the measuring protocol in the electrical imaging methods.

For a grade of 1 it is necessary to come along with

- Comparison between the initial model (model.txt) and the resistivity model coming from the inversion
- 2 different electrode configurations
- Inversion of the field data using the data available in ./FU
 - o 70e_2m.elm - FE_grid
 - o 70e_2m.elc - FE_grid position of the electrodes
 - o FU56.crt file as input file
 - o Define error parameters as pairs given by:
 - Abs. error= 5%, rel error =0.001
 - Abs. error= 5%, rel error =0.0001
 - Abs. error= 1%, rel error =0.1
 - Abs. error= 1%, rel error =0.001
 - o Discuss the results (images obtained in the last step).