

VERTICAL ELECTRICAL RESISTIVITY SOUNDING

Objective: - To carry out a scale model vertical electrical sounding, and then interpret the results quantitatively. Also, use a computer program to interpret quantitatively two field data sets collected using a Schlumberger array.

Background information:

Read the Laboratory Manual notes on Electricity Theory and Electrical Depth Sounding.

Equipment supplied:

You are supplied with a layered-earth model consisting of a single uniform conducting layer of unspecified thickness (graphite or compressed carbon) situated over an insulating sub-space (air), and a current source, a sensitive voltmeter, and appropriate electrodes to conduct a model VES survey.

Data and software supplied:

Field data from two Schlumberger soundings are provided for the second part of the exercise in graphical form and as computer data files. Your task is to find a layered earth model that fits these data using modelling computer program (RESINV) that is available on the Laboratory computers. RESINV is a combination of a forward modelling program with an interactive, iterative least squares inverse program. Given an apparent resistivity sounding curve, the program can be used to determine model resistivity and thickness parameters for a horizontally layered earth. Note that RESINV is set up only for Schlumberger sounding survey data. You may also use it to just calculate a forward model. RESINV does not have a built in hard copy plot facility, but it does create output data files simple ASCII format. So, to get hard copy output from RESINV, you need to use a graphics program. We suggest Excel. RESINV is described more completely in a separate document, and help files may be found on-line.

Exercises:**1. Scale model vertical electrical sounding**

Make a Wenner resistivity over the graphite layer to determine its resistivity and thickness. Justify the survey parameters you have selected. (a Schlumberger survey would also be satisfactory, but the spacing of potential electrodes may have to be so small that it is difficult to set accurately.) Use the supplied type curves for a single layer on a half space to do the interpretation using the sliding scale method. Note possible effects of data error and also the effects of the finite model extent on the interpretation.

2. Field data interpretation

Inspect the field curves looking for the number of inflection points and the approximate resistivity values to guess a basic model. Then use the supplied computer program for forward and inverse modelling to make a quantitative interpretation of this data. You may have some difficulty in creating a model that can combine very thin surface layers with a much deeper structure. Try making separate interpretations for the small and large spacing data. Suggest what the geology of the section might be (be creative!).