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Results of single and function inversion of resistivity data for hydrogeological application

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Introduction

Nowadays the water-basin protection has become an important question. Several water-basins are situated in a geologically risky area. These area are need to be protected. During the defensive steps we can use the geophysical methods to locate the aquifers and hydraulically active structure for tracing the movement of contaminated plumes and seepages in the ground.

Supposinge vertically and laterally varying 2D near surface geological structures they can be effectively investigated with geoelectric method(mainly by VES).

In this study the single and the 1,5D function inversion(which was developed for interpretation of traditional VES measurements) results are compared by synthetic and field examples.

Function inversion with 1D forward modelling (1.5D inversion)

The 1.5D inversion method was developed for interpretation of Vertical Electrical Sounding(VES) measurements. In the iterative inversion LSQ algorithm using functions expanded in series, 1D forward modelling is applied on the VES measurement positions, and parameters of an approximatelly 2-D geological structure are estimated (that's why it is called 1.5D).

The main idea of function inversion methods is to describe thickness and physical parameters of the layers along the profile with functions expanded in series. At first, we determine the function coefficients with an inversion technique and then we compute the local physical and geometrical parameters of the model point by point along the

profiles. The inversion resulting in coefficients is a joint inversion procedure which uses all the data measured in each separate geophysical locations. In the series expansion different kind of functions can be chosen to describe the parameters. In the field example the variability of physical parameters and the number of VES measurement points explain the use of Fourier functions.The goodness of the parameters estimation was compared of the 1,5D inversion to single inversion by synthetic and field example.

Conclusions

The 1.5-D inversion method uses all the data of the VES stations measured in the direction of the structural strike of the section and inverts them in one joint inversion procedure.

1-D solution of the direct problem is used at each VES station (i.e. local models) in the section.

The choice of the basic functions is based on the information about the geological model and the number of VES stations.

According to the study, the estimation of the thickness and the physical parameters, if we use the 1.5D inversion method improves considerably compared to the single inversion.

The method is good for the research the inhomogeneous vertical and lateral structures and determining their qvalitative geoelectrical parameters in case of the aquifer.