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The model moisture distribution in heterogenius soil under complexe hydrological conditions

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The main objective of the study is the construction of the 3D model of moisture distribution in unsaturated soil with complexe hydrological conditions due to irrigation works. The 3D model is designed to assess the water dynamics in soil and the processes of contamination of aquifers due to intensive agricultural activities.

The 3D model is based on:
• geophysical investigations (electric resistivity tomography – ERT, electric conductivity - EM) of the site over cultivated land in a farm;
• geophysical (electric resistivity) data processing and modelling;
• on-site measurements of moisture, conductivity, temperature and soil suction using stationaryrecording sensors;
• indicator kriging and ordinary kriging used for the achievement of lithologic and parametric models;
• Conditional simulation for assessement of uncertainty models (lithologic and parametrical).

The electrical investigations consisted in 2D an 3D apparent electric resistivity measurements performed with a multi-electrode system. The used acquisition system was a hybrid Wenner-Schlumberger array, with the interval between electrodes of 0.5m.
Electric conductivity and magnetic susceptibility measurements were performed on the same profiles where resistivity data were collected.

The assessment of the 3D lithologic model is based also on texture and grain size of soils because these parameters are very important for soil suction and thus for migration of water and associated fluids in the unsaturated zone.
For the lithologic model distinct variograms were achieved for each category of soil using the unified soil classification system (USCS) used in engineering and geology, to describe the texture and the grain size of soil.
The distribution of moisture for the parametric model is evaluated within each lithologic unit of the lithologic model and in the same manner was computed the uncertainty of moisture distribution using conditional simulation (with Gauss distribution law).
The created models (lithologic and parametric) using geophysical data fitted with in site physical and hydrogeological measurements provide all necessary data to evaluate the moisture distribution and the migration of water & associated fluids in the unsaturated zone.

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