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Geophysical investigations for detecting water retention potential of agricultural soils

G. Kurz, M. Müller and U. Yaramanci

TU Berlin; Institut für Angewandte Geowissenschaften

Ackerstr. 71-76; ACK 2

D-13355 Berlin

The main objective of the project is the development of an integrated geophysical concept to assess the water retention potential of agriculturally used soils. All of the studies must be investigated in dependence of the soil type and their agricultural processing (ploughed, unploughed, mulched). The results of the investigations will then be embedded in a concept for flood protection.

Hence, the purpose for geophysics is to determine the porosity (i.e. the potential water volume) and to investigate the structure of the pore space (i.e. the distribution of the porosity and hydraulic conductivity) with non-invasive methods. The porosity and the structure of the pore space will then be used to create a high resolution map of the water retention potential up to a depth of 5 m.

Various geophysical methods (DC, GPR, SIP, EM, SNMR, TDR) were applied to deduce the soil moisture distribution. The geoelectric measurements show, that the ploughed field seems to be more homogeneous than the unploughed and the mulched field. Vehicle tracks are responsible for solidifying the soil, which can also be seen particularly in the ploughed field, where the agricultural cultivation is most intense compared to the two other fields.

The in situ examinations are supported by measurements in the laboratory (POR, SIP, NMR, BET, ...). They confirm the in situ results and indicate fine grain material in the soil like clay silt. Laboratory measurements are necessary to adapt the geophysical methods to the different soil types.