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Testing TDR and resistivity tomography in a field study of the infiltration process

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Since 2003, a study of the spatial and temporal variability of the soil infiltration properties at the Liz experimental site, Sumava Mts., Southern Bohemia, has been in progress. The study is based on repeated performance of ponded-infiltration experiments for a set of 19 permanently installed infiltration ring. Within the framework of this research, ability of two geophysical methods to monitor soil moisture evolution during infiltration experiment was tested. Namely, TDR and resistivity tomography was employed. TDR measurements were conducted using Tektronix 1502C cable tester connected to three steel electrodes 1-m long installed vertically in the centre of the infiltration ring. The TDR readings were taken before the start of the infiltration, and then repeatedly during the infiltration and after the end of the infiltration test. The water content increase was evaluated based on a soil-specific calibration relationship determined in the lab using undisturbed soil samples. While the moisture content changes at the very beginning of the infiltration are not captured satisfactorily, an expected slow water-content increase during the steady state of infiltration was found in the TDR results. Resistivity tomography was performed using system ARES (GF Instruments), Schlumberger method was employed. Measurements were taken in a set of lines covering the infiltration ring and its vicinity. The same set of measurements were conducted first before the start of the infiltration experiment and then during the steady state of the infiltration. Electrode span used for different experiments varied from 20 cm to 50 cm. The electrical resistivity distribution was reconstructed using RES2DINV software (Geotomo Software). The results show many inconsistencies, resulting probably from the design and scale of the experiment not being consistent with the assumptions of the methods employed. The study was supported by research grants GACR 205/05/2312, AVCR AV0Z20600510, and MZP VaV650/5/03 Labe IV.