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MEASUREMENT OF MOISTURE PROFILES AND INFILTRATION USING SPATIAL TDR

R. Becker (1), Ch. Hübner (2), W. Schädel (1), S. Schlaeger (3), E. Zehe (4)

(1) Inst. of Water Resources Planning, Hydraulic & Rural Engineering, University of Karlsruhe, Germany, (2) University of Cooperative Education, Heidenheim, Germany, (3) Institute of Technical Chemistry, Research Center Karlsruhe, Germany, (4) Inst. of Hydraulic Engineering, University of Stuttgart, Germany (zehe@iws.uni-stuttgart.de)

Spatial TDR is an advanced TDR technology which allows to measure soil moisture profiles at a high temporal and vertical resolution. This method consists of three components: a sampling TDR device, an appropriate moisture probe, and a reconstruction algorithm, with which a time-dependent voltage signal recorded by a sampling TDR can be transformed into a dielectric profile along the moisture probe. A moisture profile can be derived from the dielectric profile by means of calibration functions. The objective of the presented experimental study was to a) measure the temporal evolution of soil moisture profiles and the percolation of soil water in a silty sand under controlled boundary conditions, b) to compare the newly developed TDR prototype "Observer" (Soil Moisture Group, SMG) based on delta modulation with other commercially available devices, and c) to compare the observed temporal evolution of soil moisture profiles with predictions of analytical and numerical solutions of Richard's eqn. For this purpose we installed four 3-rod-probes of 60 cm and a special ribbon cable of 80 cm vertically in a cubic Lysimeter of 1m side length filled with silty sand. HF multiplexers allow to connect each of these probes to each of the following sampling TDR devices: "Observer" (SMG), "TDR100" (Campbell Scientific), and "Tek1502B" (Tektronix). Additionally, four non-sampling TDRs ("Trase", IMKO) and two probes of a new FDR prototype with an integrated temperature sensor ("SISOMOP+T", SMG) have been installed horizontally. Irrigation at the upper boundary was achieved by an automated sprinkler. The lower boundary condition was free drainage. All measurements were automatically performed every 10 minutes. Moisture profiles were derived and compared to each other and the point measurements.