MAY WE IDENTIFY THE SPATIAL VARIABILITY OF SOIL HYDRAULIC PROPERTIES BASED ON MEASUREMENTS WITH "SPATIAL TDR"? B) INSTRUMENTS AND MEASUREMENT

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Spatially distributed, temporal dense measurements of soil moisture profiles are used to investigate the small scale variability of soil hydraulic properties. Several twin rod probes buried in soil are distributed over the area under investigation. These waveguides are connected to a time domain reflectrometry (TDR) device via a multiplexer. Soil moisture profiles along these probes are derived from frequent measurements to get a picture of the spatial distribution of soil moisture in time. Certain TDR devices allow to sample the temporal evolution of an electromagnetic wave propagation along a transmission line. If a waveguide, like a twin rod probe or a ribbon cable, is buried in soil, soil and waveguide together form a non-homogeneous transmission line. The wave propagation along such a transmission line is mainly influenced by the soil water content. Recently developed inversion algorithms allow to derive capacity and conductivity profiles along a transmission line from TDR measurements. The influences of waveguide and wet soil on the capacity profile can be separated. The result is the profile of the dielectric coefficient of the soil along the transmission line. With the means of a calibration relationship for the soil under investigation the dielectric profile can be transformed into a soil moisture profile. We call such a system of sampling TDR device, waveguide, and inversion algorithm "Spatial TDR". We are developing a new, inexpensive TDR device, which is specially suited for soil moisture measurements. A sampling TDR device mainly consists of a voltage step generator and a sampler. The TDR device currently under development is based on the new binary sampling technology, which is completely different from the commonly used sampling bridge technology.