

Interactive comment on “A fast TDR-inversion technique for the reconstruction of spatial soil moisture content” by S. Schlaeger

Anonymous Referee #1

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The work is extremely interesting, and well presented. The profile-reconstruction strategy here discussed appears for many aspects attractive, and the results - in some case very good - are certainly promising. As the other referees point out, the relevance of the work would be more appreciated if described within a basic framework of the ongoing research in the field of Spatial TDR. Moreover, the original contributions should be stated clearly in the introduction.

Two specific comments follow. I think it's always convenient to look at the measurements of the dielectric permittivity (ε) and the determination, from it, of the soil water content (θ), as two well distinct problems. This study deals only with the first one, as it describes - and test experimentally - a method for measuring the permittivity profile. This may lead easily to the soil moisture profile, as the results achieved by the Soil Moisture Group, and mentioned in the introduction, seem to indicate, but

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this further step is not object of the paper, and should not be reported in the conclusion (line 14, page 991). As the author certainly knows, the problem of relating the measured permittivity to the water content is not trivial. In particular, concerns derive from the highly dispersive nature of the soil (i.e. from the frequency dependence of its permittivity) - very pronounced in the TDR frequency range - against the limitation of the presented method, which is based on the assumption that the investigated material has, at any point of the profile, a constant value of dielectric permittivity independent on the frequency. This issue should be discussed in chapter 4, "determination of the water content".

A final comment concerns with the experimental validation of the presented method. While the optimization approach is described with sufficient precision, some important details of the experimental work are omitted. For example, the equipment used in the test is not specified, neither is the kind of the materials employed for the construction of the etherogeneous dielectric profile. More importantly, no information are reported on the coaxial feeding line (segment xa - x1 in Fig. 2). The hypothesis of lossless line adopted in the model is highly restrictive, and its consistency with the actual experimental conditions must be proved. Finally, the experimental determination of relevant parameters (such as the inductance L_a) is an important part of the validation process, and details or references should be provided.

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