

Interactive comment on “Efficient reconstruction of dispersive dielectric profiles using time domain reflectometry (TDR)” by P. Leidenberger et al.

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The paper presents a numerical method for the reconstruction of permittivity and conductivity profiles from time domain reflectometry data. This way soil moisture distribution along TDR probes may be derived, which is very important for many applications in hydrology. The following comments will discuss some issues of the paper which may need further clarification or addition of important aspects.

1.) In chapter 2 Methods and chapter 6 Appendix transmission line parameters of two- and three rod probes are given. The calculations are based on an approximation. I suggest to compare this approximation with more exact values, e.g. based on finite element software calculations. There is no need to rely only on an approximation when there is widely available software to calculate transmission line parameters with better accuracy. Using the parameters of table 3, eq. 16 and eq. 18 the resulting speed of

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propagation in air is about 3% lower than the expected speed of light. Please check eq. 19 und eq. 21 with the parameters of table 4. The calculation of the speed of light with this formulas gives erroneous results.

2.) One of the most important aspects for the practical use of a reconstruction algorithm is the required computation time. Please provide additional information about computer resources required for typical reconstruction problems. This is essential for assessing the practical value of the presented algorithm.

3.) Chapter 3.1 und 3.2 are called “Validation”, but examples of TDR traces are shown only and no comparison with independent calculation methods is made. So, what is meant here by validation ?

4.) In chapter 3.3. reconstruction examples are shown. I suggest presenting more convincing examples with larger variation of permittivity and pronounced multiple reflections. Most of the examples only show a very slight variation of permittivity. This is not a very challenging task for a reconstruction algorithm. Synthetic profiles with large permittivity and conductivity variations would be better to assess stability and performance of the algorithm. If possible include independent reference measurements to compare the results with the true water content (e.g. from gravimetric measurements)

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