**Hydrology and
Earth System
Sciences
Discussions**

Interactive comment on "A quality assessment of spatial TDR soil moisture measurements in homogenous and heterogeneous media with laboratory experiments" *by* T. Graeff et al.

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Firstly, we thank Reviewer II for the constructive comments that helped us improving the paper. The following lines explain how we met the recommendation in a revised manuscript.

Comments to the Author General comments By using a recently developed fast TDR-inversion algorithm for soil moisture, this paper estimated soil moisture profiles from the measurement of three rods TDR probes. An extensive discussion about the influences of rod geometric deformation (convergent and divergent rods) on the simulated soil moisture profiles were conducted, the discussions about the influences of coated

and uncoated probes on the TDR reflectograms, soil structures (homogeneous and heterogeneous media) on the soil moisture retrieval were also presented. The spatial moisture distribution in nature soil obtained in this paper is a valuably information for many other research fields. The estimated profiles in loamy soil are in good agreement with the TDR measurements. However, there are still several aspects need to be improved as listed in the specific comments. Therefore, I suggest publish this paper in HESS after a revision. Specific comments 1. How to make this algorithm more applicable or more robust? For example, how to reduce the field measurements by THETA probes? How to simplify and elaborate the eq. (10) under different soil texture conditions, not in specific soil condition? How to obtain eq. (11) at diverse soil conditions? By this way, we can enlarge the applicable domain of this algorithm.

Response: Good point, however, we are pessimistic about this point. If an ideal geometry would be maintained, the parameters of Eq. (10) could be related to soil chemical properties and mineral content (at least as first guess) for an a priori estimate (similar to a pedo transfer function). To answer on the second point about Eq. (11): Very ambitious and laborious and might be not successful, if we think about the discussion whether universal petro physical relation in geophysics might be found for the unsaturated zone (Paasche et al., 2006). We thus think a site specific calibration, as done for Eq 11. might be the better choices (Lesmes and Friedman, 2005 and Cassiani et al, 2006). Furthermore, we are afraid prediction of the C-G relations are of low use in case of a non ideal geometry :-)

Cassiani, G., Binley, A., Ferré, T.P.A., Unsaturated zone processes, in: Verrecken, H., Binley, A., Cassiani, G. Revil, A., Titov, C., Applied Gydrogeophysics, NATO Science Series, IV. Eart and Environmental Sciences Vol. 71, Springer, Dordrecht, 2006.

Lesmes, D.P., Friedman, S.P.: Relationship between the electrical and hydrogeological properties of rocks and soil, in: Robin, Y. and Hubbard, S.S., Hydrogeophysics, Water Science and Technology Library, Volume 50, Springer, Dordrecht, 2005.

Paasche, H., Tronicke, J., Holliger, K., Green, A. G., and Maurer, H.: Integration of diversephysical-property models: Subsurface zonation and petrophysical parameter estimation based on fuzzy c-means cluster analyses, Geophysics, 71, H33–H44, 2006.

2. CA in eq. (12) can be used to specify the rods deformation geometry, are the characteristics described by the amplitude coefficient dependent on the soil structure (homogeneous or heterogeneous media)?

Response: Very good point. This is not ideal in case of layered soils, where the lower can be systematically drier/wetter than the upper, as well as in case of gradients in salt, clay or organic content. We will clarify this in the new manuscript.

3. There are several character misprints, e. g., Fig. 9c (page 19, line 15) should be Fig. 9b; "shows that the measurements slightly underestimate: : :: : :" (Page 19, line 16-17) may be "shows that the inverted value or the inversion slightly underestimates: : :: : :"

Response: Will be fixed.

4. The probes deformation will lead to systematic bias in inverted soil moisture profiles (under- and overestimate), then when the amplitude coefficient CA is negative value (the absolute value is not very big, it means that the rod may be parallel or slightly divergent), how to determine the accuracy of inverted moisture profiles?

Response: Important point: We admit that this might be very difficult and will mention this in the text.

5. The conclusion of a study should be more concise, please make a careful revision.

Response: Will be done