

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.

Anonymous Referee #1

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The paper is trying to indicate the applicability of "Spatial TDR" in strongly heterogeneous soils using detail indoor experiments. Although the paper totally was in a good organization, there were still several points needed to be paid more attention:

1. Considering the purpose of this paper, the focus should be on the test on the performance of spatial TDR in heterogeneous soils. In the other word, how good the soil moisture profile could be measured considering different heterogeneities. On this point, the experiments in the paper did not support enough that purpose. In section 4, only the experiment 4 considering the solid objects in the integration volume of coated TDR. Although this experiment indicated the influence of different solid objects, rep-

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resenting the heterogeneities, readers still can not completely understand exactly the effect of inserting solid objects. From Fig8., with different solid objects in the same soil wetness, the soil moisture profiles above the solid objects are more stable than below, which will cause a confusion, especially for the wet case. In this experiment, the column was in a stable initial wetness (0.3). It means that only the moisture content at the depth, where the object is inserted, would change. However, in Fig8.F, the soil moisture profiles also changed. Some are underestimated (iron, Boulder, brick), while others are overestimated (plastic, wet W). It might be caused by the probe deformation. However, no matter what, this kind of inconsistency above and below the solid objects should be explained. Otherwise, readers would not know exactly whether the inserted object affect the measurement of soil wetness below it or not;

2, The heterogeneity considered in soil water dynamics mainly acts as different soil layers. The steady or transient flow in layered soil has been studied for few decades. The method proposed in this paper would be a useful tool to study this topic. If the author could conduct several experiments on the layered soil instead of solid objects, the scientific significance would be improved significantly;

3, The experiment procedures in section 4 needs to be described in more detail. For example, is the glass bead same in all five experiments? What is the size of T-pieces? What is the size of the THETA probes? Is there inter-influence between THETA and SUSU03? How can you ensure the soil moisture levels achieved? and so on.....;

4, In experiment 2, the transient conditions was checked. However, according to the Fig.4 and Fig.6, the cross-check between the measurement of SUSU03 and THETA is not correct due to the T-pieces. According to Fig.4, the THETA was in T-pieces, which actually will retain more soil water during drainage due to soil moisture diffusion. That is why in Fig.6, the THETA measurement is always wetter than SUSU03 measurement. On this point, the discussion related to this part is not correct also;

5, In section 5.6, the description of Fig.9c is not completely correct. What the author

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argued is just for the moisture measurement at depth of 50cm not for 20cm. More details needs to be provided;

6, There are too many subtitles, which make the article fragment. For example, in section 3.5, there is no need to use two subtitle, which are not so related to the 3.5 title, to demonstrate the error sources. Reader can understand that with only 3.5 title. In section 4 and section 5, the experiment description and the results discussions could be combined, which would make the paper more brief and clear;

7, some small mistakes: Page 271 line 7 "heterogonous" should be "heterogeneous"; page 287 line 15 (Fig. 9c) should be (Fig. 9b);

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