

We would like to thank the Editor for providing further suggestions regarding the fitting. The Editor's comments are in black, plain text and our responses are in *blue, italicized* text.

Quantifying the quality of the fits using the  $R^2$  coefficient is a useful addition. However, a proper definition of this metric would be useful.

*After reviewing the fits and concerns raised by the Editor and Reviewers, we have decided to replace  $R^2$  with the mean absolute error (MAE), which has physical units (in this case, liquid water content) and therefore adds some additional information as opposed to  $R^2$ , which is harder to interpret and may be less meaningful for nonlinear functions. We have added the mathematical definition of the MAE as Equation 11 in the Methods section and replaced the discussion related to  $R^2$  with discussion of MAE (Lines 347-358, 415-426, and 478-488).*

Furthermore, while the referees primarily express concern about the inverse fitting of the hydraulic conductivity, most of the  $R^2$  values indicated in the paper (e.g. in Fig. 4) relate to the fitting of the water retention curve. I recommend adding  $R^2$  values for the different capillary rise curves shown in Fig. 5 (and the similar Figures in the appendix). These  $R^2$  values for the inverse fitting are plotted in Fig. A11, but it is not necessarily easy to establish a correspondence with the other figures.

*We have added the MAE values for each curve in the inverse fitting figures (Fig. 5, A8-A10) and the water retention curve fits (Fig. 4, A5-A7). We have also therefore removed Figure A11 from the manuscript, as this information is now found in the individual figures of each fit.*

The responses also state that  $R^2$  values have been added to Table 1, but I could not find them in the revised manuscript.

*We think the Editor may have misread the response. In our response to Reviewer 1, we stated, "The errors for each of the fitted parameters are included in Table 1 and we added some metrics for the quality of the fit ( $R^2$ ) to the revised manuscript in Figures 4, A5-A7, A11 as well as accompanying text in Lines 426-432." The errors for the individual fit parameters (e.g.  $n$ ,  $\alpha$ ,  $K_s$ ) were already in Table 1 and the  $R^2$  values were only added to the static water retention curve fits and provided over time for the inverse fitting in the newly added Figure A11. We did not intend to add  $R^2$  to Table 1 since it is already nearly too wide for the page.*

*Since we have now replaced  $R^2$  with MAE, Figure A11 was removed and the MAE values for the inverse fitting are now provided for each curve in Figures 5 and A8-A10.*

Regarding the discussion, it would be useful to elaborate further on the level of confidence that can be placed in the parameter values in view of these fitting errors, and on the possible causes of the significant discrepancies observed in certain cases.

Simply letting the “reader interpret the discussion given the limitations” outlined in the manuscript (as mentioned in the response to Reviewer 2) does not meet the expected standard for a scientific paper. At the very least, clear guidance should be provided on how these limitations impact the results, particularly when comparing them to those of other studies from the literature.

*We have updated the discussion using the MAE to provide some additional insights in the fit quality and confidence in the fit parameters in Lines 347-358, 415-426, and 478-488.*

In this regard, the newly added paragraph in Section 4.4 mentions the effect of the “relative location of the fitting nodes with respect to the fluctuations in the measurements”. I am not sure what this sentence means. What are these fitting nodes, and how are they chosen? The Methods section does not address this issue. How do the final hydraulic conductivity values depend on this choice?

*We agree this was confusing, partially because we had unintentionally referred to these nodes differently in the Methods section (as “observation nodes”). We have removed this sentence as it was supposed to explain additional consequences of the vertical heterogeneity but did so in a confusing way. We have improved our definition of the nodes in the Methods section (Lines 229-238) and the vertical heterogeneity is discussed in Lines 391-402 and 462-469.*