

## ***Interactive comment on “Inverse modelling of in situ soil water dynamics: accounting for heteroscedastic, autocorrelated, and non-Gaussian distributed residuals” by B. Scharnagl et al.***

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We thank Dmitri Kavetski for the insightful comments. We have addressed each of them separately below. Changes we made to the discussion paper in response to the comments are indicated by italic font.

1. We can essentially use the same forecasting procedure as with the classical AR(1) model if we assume that the expectation of the residuals will not change

C1541

in the future. From our point of view, this would be a reasonable assumption in many practical situations. *We included a short explanation on this issue in the revised discussion paper.*

2. We used all available observations for model calibration. We consider the available time series as too short for supporting a split-record-test. In fact, it would be very interesting to compare the performance of the calibrated models (using Likelihood 1 and 3) on an evaluation dataset. Unfortunately, this was not feasible in the present case study. *We including this information in the revised discussion paper.*
3. We are particularly grateful for this comment, because it points at an important methodological aspect that we unintentionally missed to explain in more detail. The procedure described in Schoups and Vrugt (2010) to calculate the uncertainty bounds of the model prediction can be used, but we have to make use of the expectation of the residuals, which is known. This procedure is basically straightforward but nevertheless should be explained in the methods section. *In the revised discussion paper, we give a detailed explanation on this methodological aspect.*
4. We fully agree. *We added a paragraph at the end of the description of Likelihood 3 that discusses this topic.* See also our reply to comment 1 of Anonymous Referee #1, which is closely related to the present comment.
5. Yes, this is exactly what we have done. See also our reply to comment 3 where we state that the details of the methodology are now explained in the revised version of the manuscript.
6. This comment is very closely related if not identical to comment 1. Please see our reply given there.

C1542

7. This comment closely relates to comment 2. *We included this information in the revised discussion paper.* Please also refer to our reply to comment 2.

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C1543