

Authors' Response to Reviews of

A comprehensive assessment of in situ and remote sensing soil moisture data assimilation in the APSIM model for improving agricultural forecasting across the U.S. Midwest

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RC: Reviewers' Comment, AR: Authors' Response, □ Manuscript Text

1. Reviewer #1

RC: *Overall, the referee's comments are positive and no major concerns have been raised. Several questions have been asked, though, which I kindly ask you to answer carefully. Please also add clarifications to the manuscript where considered appropriate. In addition to the Referee comments, I kindly ask you to consider the following:*

RC: *L309: Please change references to equation symbols to math-mode and make superscripts consistent (do-a and do-f):*

AR: Thank you for the comment. This was modified and now can be found in L324.

RC: *L339: "To set an upper bound": I would advise against calling the assimilation of SM sensor observations "ideal". First, there are representativeness errors present that are difficult to account for (which is the reason why the assimilation of RS observation has often been found to outperform sensor assimilation); and second, also SM sensors exhibit uncertainties that would need to be parameterised properly. While providing a good benchmark, I wouldn't consider it ideal or an upper bound.*

AR: Thank you for the comment. The term "ideal" was replaced with "reasonable benchmark".

RC: *L343: The successive assimilation of these data sets will inevitably introduce error covariances between the model runs and the observations, especially when assimilating data sets from the same source (in fact, all of them are based on SMAP to some degree). I recommend discussing the limitations of this approach and the implication of neglecting error covariance.*

AR: We agree with this assessment and therefore we added a paragraph discussing this point in the discussion section under section (4.3).

RC: *L361: Definitions are given for RMSE, R2, etc. but not for the spectral norm and the wieghted variance. Can you provide these?*

AR: Thank you for the comment. These two definitions were added to the manuscript.

RC: *L406: The figure this discussion seems to be referring to does not show differences between site years, therefore discussions about that leaves the reader to trust the authors.*

Thank you for pointing this out. Although more figures could be added to support this statement, we decided to remove this claim in favor of keeping the same number of figures.

RC: *More generally: Many of the discussions are based on supplementary material. However, all figures and tables that are relevant/necessary to support your findings and understand your results should be part of the main manuscript body. I therefore kindly ask you to reconsider your choice as to which figures go into the main body, and which in the supplement.*

AR: Thank you for your input. We went through the manuscript and double-checked all references to all figures to ensure there were no problems. However, we are open to further editorial suggestions for moving the figures between the supplementary material and the main manuscript body.

RC: *L454: Referring to "Fig. 6a" but there is no annotation of (a) in the Figure.*

AR: Thank you for the comment. (a) was removed from the text.