

Dear Editor,

Thank you for your letter dated Jun 22, 2023. On behalf of my co-authors, we appreciate you very much for giving us an opportunity to revise our manuscript (HESS-2023-34) entitled "Data worth analysis within a model-free data assimilation framework for soil moisture flow". We are also grateful for your constructive comments on our manuscript. We have carefully taken your suggestions into consideration in preparing our corrections, which are all valuable and very helpful for improving our work. In addition, we have also updated the reference list according to the technical requirements of the HESS.

We hope that the revised manuscript is more suitable for the publication in "Hydrology and Earth System Sciences".

Yours sincerely,

All correspondence regarding the manuscript should be addressed to:

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Should you have any questions, please let me know (E-mail: wangyakun@nwafu.edu.cn). Your consideration of the manuscript is greatly appreciated.

Line 158: “observation time, depth” Please specify what you measured at this time and depth. Why is the measured quantity not included in  $x$ ? Or are these the times and depths for which the soil moisture content is sought?

**Answer:**

Thank you for your careful reading. These are indeed the times and depths for which the soil moisture content is sought. We have improved the relevant descriptions in the revised manuscript (please see Lines 154-156).

Lines 169-171: scheme; Supplementary

**Answer:**

We have modified these words in the revised manuscript (please see Lines 165-168).

Line 335: “2cm grids” Space missing.

**Answer:**

We have corrected this error in the revised manuscript (please see Line 312).

Table 2: “0.02<sup>2</sup>” Is this a footnote? If so, where is it? If it is not, why is this there?

**Answer:**

Thank you for your careful reading. In fact, 0.02<sup>2</sup> indicates that the observed error variance of soil moisture is 0.02 squared. In order to avoid misunderstanding, we have modified 0.02<sup>2</sup> to 0.0004 in the revised manuscript (please see Table 2).

Line 570: “whose resultant deterioration” What does this mean here? Do you mean the following? ...unresolved model structural errors. When these lead to a deteriorating DW assessment performance, this cannot be compensated by assimilating more prior data

**Answer:**

We are sorry for your confusion due to our inappropriate expressions. As you stated, this means that “...unresolved model structural errors. When these lead to a deteriorating DW assessment performance, this cannot be compensated by assimilating more prior data”. We have improved these descriptions in the revised manuscript (please see Lines 544-546).

Line 572: “On the contrary” In contrast,

**Answer:**

We have modified these words in the revised manuscript (please see Line 547).

Line 630: I stand by my first assessment aht this is all a bit qualitative, which is a bit unexpected in a paper striving to express data worth in quantitative terms.

That being said, I do not consider this a major stumbling block, and the reviewers did not bring this up, so I will not hold up the paper because of this.

**Answer:**

Thanks for your constructive comments. In the future, we will focus more on the quantitative research on data worth.