

The dataset is potentially useful, but the manuscript does not sufficiently demonstrate its added value over existing satellite-based gap-free global soil moisture datasets. The validation is extensive in quantity, but much of it repeatedly compares the final product with other soil moisture datasets or reconstruction methods. Additional evaluation of physically and meteorologically meaningful soil moisture variability is needed before the dataset can be considered reliable for broader Earth system applications.

Major comments

1. **Clarify the novelty and added value of the dataset.** As the authors state in the introduction, many satellite-based global soil moisture datasets already exist. In addition, a previous gap-free FY-3B soil moisture dataset has already been developed. Therefore, the authors should clearly explain what new scientific or practical benefit this dataset provides compared with existing global soil moisture products and the previous FY-3B reconstruction dataset.
2. **Limited physical and meteorological validation.** The reconstruction is based almost entirely on FY-3B soil moisture itself, without using meteorological forcings or ancillary variables. Also, the use of a four-month temporal mean in the feature fusion step may smooth the reconstructed values toward the average state. The authors should test whether the final dataset can capture physically meaningful soil moisture variability, such as seasonal variations, wet and dry events, and responses to rainfall/temperature changes.
3. **Need for uncertainty information and clearer data limitations.** The validation primarily relies on artificial masked FY-3B observations. While this approach is useful, it does not fully prove the accuracy of reconstructed values under real missing-data conditions (e.g. frozen soil, snow, vegetation effects). The final dataset should include uncertainty or quality information, especially to distinguish direct satellite retrievals from reconstructed estimates. Based on this information, the authors should also provide clear guidance for users on data reliability and potential limitations.

Minor comments

- 1) Fig. 1: The definition of “temporal coverage proportion” should be clearly explained. How can some regions reach 100% coverage for a LEO satellite?
- 2) Table 1: The distinction between sparse and dense networks should be clarified. The definition seems to be based on the number of stations within each FY-3B pixel. If this is the case, it would be useful to report the number of matched FY-3B pixels and the average number of stations per pixel, rather than the total number of stations per network.
- 3) The manuscript contains too many figures and tables with overlapping messages. Figs. 5–6 and Tables 2–3 all present in-situ validation. Figs. 7–10 and Table 4 also convey the same simulated-gap evaluation and do not provide different messages. Fig. 12 is merely a sequence of images. Many of these materials could be summarized into a figure/table or moved to the supplement.
- 4) The visual comparisons between soil moisture products are not always convincing. For example, several patch-level figures show similar soil moisture patterns, so it is difficult to judge whether GSP is truly better. Difference maps would be more informative than absolute maps alone.
- 5) Please carefully check types. For example, in lines 261-263, “form” should be “from”. In line 383, “FY-3M” should be “FY-3B”. At line 497, 1 February 2011 is outside the study period.