



Comment on **essd-2021-84**

Anonymous Referee #1

Referee comment on "Development of observation-based global multilayer soil moisture products for 1970 to 2016" by Yaoping Wang et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2021-84-RC1>, 2021

By synthesizing a wide range of SM datasets using statistical methods, this study developed and evaluated seven global, long-term, multi-layer monthly SM products, which are crucial for many research fields. I appreciate the great efforts made by the authors and I believe that this study will definitely contribute to better understanding the global water, energy and biogeochemical cycles. Generally, the topic is very interesting and the material was well organized. However, some clarifications are needed to improve the quality of the manuscript, and I'd like to recommend an acceptance of the manuscript for publication after minor revisions.

Comments and suggestions:

1. Section 2.1, three time ranges have been used in OLC method, please give necessary explanation on this.
2. Section 2.2, please describe the details about the usage of the ISMN observation to train the OLC method.
3. Figure 3, what is the purpose of using SMOS L3, SoMo, SMVERGE v2, SOMS L4 and GLEAM v3.3a in the analysis? The relevant discussion is not clear enough.
4. Figure 4, Mean ORS, OLC ORS and EC ORS show large bias after 1988, however, they give high correlations. Why?

5. Figure 5, too many plots present limited useful information, which should be improved.

6. Section 3.5, the discussion is not deep enough, which provides limited information to the readers.