

Comment on **essd-2022-80**

Anonymous Referee #2

Referee comment on "SGD-SM 2.0: an improved seamless global daily soil moisture long-term dataset from 2002 to 2022" by Qiang Zhang et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2022-80-RC2>, 2022

This manuscript presents a novel study on use of three sensors AMSR-E, AMSR2 and WindSat to reconstruct SGD-SM 2.0 products. One of the novel aspects of this study is that global daily precipitation products are wisely assimilated into the proposed LSTM-CNN, to fill gaps in daily soil moisture products. This methodology represents a substantial advancement in generating global soil moisture products that synergistically incorporate soil moisture and its closely associated hydrological variable, precipitation from the last precipitation satellite, i.e., Global Precipitation Measurement. The improved SGD-SM 2.0 product has been shown to outperform the previous SGD-SM 1.0 product in terms of accuracy and time-series consistency. I recommend accepting this wonderful work after minor revision.

-Page 2 Line 24: AMSR2 and WindSat products in caption (a) and (b) are incorrect.

-Page 3 Line 64: Word 'description' is repetitive in this sentence.

-Page 5 Line 101: IMERG precipitation products should be given the full name.

-Page 9 Line 185: Why did the authors use the global land mask M_L in the loss function?

-Page 12 Line 215: 'drawing into global daily precipitation products' should be revised as

'assimilating global daily precipitation products.'

-Page 16 Line 281: The authors claimed that the reconstructed SGD-SM 2.0 points behave more consecutive around their adjacent original soil moistures points than SGD-SM 1.0. More explanations need to be given for this attribute.

-Page 17 Line 297: Data availability. Current descriptions about SGD-SM 2.0 in the website are not Data availability. The authors may want to supplement specific information for possible users.