Interactive comment on "SGD-SM: Generating Seamless Global Daily AMSR2 Soil Moisture Long-term Productions (2013–2019)" *by* Qiang Zhang et al.

Anonymous Referee #1

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In this manuscript, authors generated a seamless global daily soil moisture dataset from 2013 to 2019. The incomplete daily global AMSR-2 soil moisture productions indeed exist the coverage problem, due to the satellite orbit coverage and the limitations of soil moisture retrieving algorithms. Overall, the proposed 3D spatio-temporal deep learning model is novelty for reconstructing the invalid soil moisture area, to solve the above coverage issue in AMSR-2 global daily products. In addition, three validation programs are employed in this manuscript to ensure the reliability of the seamless global daily soil moisture dataset. Several suggestions may be helpful to better improve this meaningful work:

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1) How to deal with the unique mutations for the proposed reconstructing model, such as precipitation or snowfall in single day? It seems that this work relies on the sequential time-series redundancy for generating seamless global daily AMSR-2 soil moisture productions.

2) In the testing stage of Fig. 3, the convergence of the training spatio-temporal 3-D reconstructing model is vital for subsequent processing. Therefore, descriptions of this convergence condition must be illustrated in this manuscript.

3) Why authors use 3D partial convolutional neural network, rather than common convolutional neural network, for the soil moisture gap-filling task in missing area? Besides, the intentions for mask updating operation in the reconstructing model should be given.

4) Authors employed both local and global soil moisture information to optimize the network. The distinction and connection between local and global information need to provide the explanations and effects.

5) In the time-series validation, most of the soil moisture time-series scatters can obviously reveal the annual periodic variations in Fig. 8. Authors should take advantage of these annual periodic variations to better verify the rationality of the daily SM products.

6) In the simulated missing regions validation, the spatial continuity is also important for the reconstructed seamless soil moisture productions. To better distinguish the spatial details of reconstructed soil moisture, authors selected some enlarged patches in Fig. 10. More descriptions should be introduced to investigate this key point for spatial consistency between the reconstructing and adjacent regions.

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