Earth Syst. Sci. Data Discuss.,
https://doi.org/10.5194/essd-2020-353-RC2, 2020

Earth System Science Data Discussions

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

Anonymous Referee #2

Received and published: 11 December 2020

Soil moisture information from remote sensing is of great value to understand the interactions between the land and the atmosphere, drought evaluation, ecosystems, hydrology, and water resources. Data gaps of remotely sensed surface soil moisture due to orbits and other sensor and environmental factors in space and time hinder our understanding of these important phenomena, studies, and applications. To address this important issue, the authors have proposed an approach that wisely utilizes 3D spatio-temporal partial convolutional neural network (CNN), to exact both spatial and temporal information for global daily soil moisture product gap-filling. Moreover, the experimental results and related validation have been fully examined and implemented, making the results and quality of the generated data sets convincing. Overall, this work is interest-

ing and significant for generating seamless global daily (SGD) soil moisture products that could be valuable in a broad range of research and applications. I recommend acceptance of this manuscript into the prestigious journal of ESSD after addressing issues as follows:

Major issues: -The authors also need to emphasize the unique aspects of daily soil moisture products, compared with monthly/annual average soil moisture results at lower temporal resolution. The high temporal resolution and the global scale are the most important attributes and contributions of the generated SGD long-term soil moisture in this work. This is valuable in hydrology and climate communities.

-In Fig. 3, how did the authors design the patch selecting and mask simulating operations in the training procedure? In addition, in the testing procedure, it seems that the proposed model just uses 8-day soil moisture products. Why not use 16-day or 30-day products for gap-filling?

-In the validation section, the authors employed three validation approaches to test out the effectiveness of the SGD soil moisture production between 2013 to 2019: 1) In-situ validation; 2) Time-series validation; 3) Simulated missing regions validation. More explanations may need to be supplemented for these validations from both the spatial and temporal prospects.

-In the discussion section, the authors claimed that time-series averaging strategy has the obvious "boundary difference effect". And the contrast experiments are performed in Fig. 12 (b) and (c). What is the fundamental reason if better describing this common phenomenon, especially for monthly/annual average soil moisture products?

Minor issues: -Line 70: "for AMSR2 soil moisture productions gap-filling" may be better presented as "for global daily AMSR2 soil moisture productions gap-filling".

-Line 114: "part" may be better written as "a portion of".

-Line 232: "ignore the regions of" may be written as "ignore the coverage of".

-Line 243: “soil moisture stations (0 10cm)” lacks “-” in this sentence.

-Line 266: “daily time-series date between 2013 to 2019” may be written as “daily time-series date between Jan 1 2013âĂŠDec 31 2019.”

-Line 305: In Table 3, the best statistical metrics such as R, RMSE, and MAE could be highlighted, to better demonstrate the superiority compared with the time-series averaging method.

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