Comment on hess-2022-79

Anonymous Referee #2

Referee comment on "SMPD: a soil moisture-based precipitation downscaling method for high-resolution daily satellite precipitation estimation" by Kunlong He et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2022-79-RC2, 2022

The authors presented a new method to downscale daily precipitation using the SM2Rain method together with soil moisture data in fine resolution. The design of the whole study is new and the manuscript is well-structured. However, considering the high-quality requirement of HESS, the current version should be revised in several aspects.

1) about the spatial distribution of the parameters of a,b, and c. These three parameters are used in equations 7 and 8. According to my understanding, they were calibrated at 10 km resolution and then applied to 1 km resolution. So, firstly, are these parameters scale-independent? Moreover, are they also temporal-independent?

2) The accuracy of the high-resolution SSM data. The authors are suggested to show the reliability of this new information before downscaling.

3) Validation of precipitation data. Currently, the authors are using pixel-point matching comparison. It is suggested to upscale the point observation of stations to grid scales of 1 km and 10 km. And then comparing the two precipitation data to corresponding ground observation.

4) As my speculation, there are more heavy rainfall (big rain rate values) events in high-resolution precipitation data. However, it is not shown in the histogram of figures 4 and 7. The authors are suggested to check this issue with rain gauge observations.