

Responses to comments of Reviewer #1:

Authors should mention in the text how their methodology can be useful for many rainfall-related hydrologic topics. For example, we can refer to:

1. Estimation of Areal Reduction Factor (ARF, Biondi et al., 2021 and references herein)
2. Spatial classification of Rainfall events (Greco et al., 2020; Houze, 1981; Willems, 2001)

Biondi, D.; Greco, A.; De Luca, D.L. Fixed-area vs storm-centered areal reduction factors: a Mediterranean case study. J. Hydrol. 2021, 595, 125654, <https://doi.org/10.1016/j.jhydrol.2020.125654>.

Houze, R. A. Jr. Structures of atmospheric precipitation systems – A global survey. Radio Sci. 1981, 16, 671-689. <https://doi.org/10.1029/RS016i005p00671>

Willems P. A spatial rainfall generator for small spatial scales. J. Hydrol. 2001, 252, 126-144. [https://doi.org/10.1016/S0022-1694\(01\)00446-2](https://doi.org/10.1016/S0022-1694(01)00446-2)

Response: Thank you for your kind comments and suggestions. We have added related literatures in our revised manuscript based on your suggestions.

This study not only deepens our understanding of satellite precipitation estimates products and their hydrological applications, but also contributes to the study of other rainfall-related topics, such as estimation of Areal Reduction Factor (ARF) [33,34] and spatial classification of Rainfall events [35-37].

Refence:

33. Wright, D. B.; Smith, J. A.; Baeck, M. L. Critical examination of area reduction factors. J. Hydrol. Eng., 2014, 19(4), 769-776. [https://doi.org/10.1061/\(ASCE\)HE.1943-5584.0000855](https://doi.org/10.1061/(ASCE)HE.1943-5584.0000855).
34. Biondi, D.; Greco, A.; De Luca, D. L. Fixed-area vs storm-centered areal reduction factors: a Mediterranean case study. J. Hydrol. 2021, 595, 125654. <https://doi.org/10.1016/j.jhydrol.2020.125654>.
35. Greco, A.; De Luca, D.L.; Avolio, E. Heavy Precipitation Systems in Calabria Region (Southern Italy): High-Resolution Observed Rainfall and Large-Scale Atmospheric Pattern Analysis. Water 2020, 12, 1468. <https://doi.org/10.3390/w12051468>.
36. Houze, R. A. Jr. Structures of atmospheric precipitation systems – A global survey. Radio Sci. 1981, 16, 671-689. <https://doi.org/10.1029/RS016i005p00671>.
37. Willems P. A spatial rainfall generator for small spatial scales. J. Hydrol. 2001, 252, 126-144. [https://doi.org/10.1016/S0022-1694\(01\)00446-2](https://doi.org/10.1016/S0022-1694(01)00446-2).

Moreover, I think that Relative Bias (RB) is correctly expressed as summation of terms $(Si - Oi)/Oi$, and not as a ratio between two summations, and (moreover) its range is $[-\infty; +\infty]$ (and not $[+\infty, +\infty]$):

Consequently, authors should verify their calculations, and then eventually correct

Response: Thank you for your kind comments. We are very sorry that the range $[+\infty; +\infty]$ of RB was a mistake and we have corrected it in our revised manuscript.

$$RB \in [-\infty, +\infty]$$

However, we think that the equation of relative bias (RB) in our original manuscript is the commonly used one. See Eq.(2) in Xiang et al., 2021; Eq. (2) in Tang et al., 2018; Eq.(1) in Camici et al., 2020.

Reference:

$$RB = \frac{\sum_{i=1}^n (P_i - O_i)}{\sum_{i=1}^n O_i} \times 100\% \quad (2)$$

Xiang, Y.; Chen, J.; Li, L.; Peng, T.; Yin, Z. Evaluation of Eight Global Precipitation Datasets in Hydrological Modeling. *Remote Sens.* 2021, 13, 2831. <https://doi.org/10.3390/rs13142831>

$$BIAS = \frac{\sum_{i=1}^n (S_i - G_i)}{\sum_{i=1}^n G_i} \quad (2)$$

Tang, G.; Behrangi, A.; Long, D.; Li, C.; Hong, Y. Accounting for spatiotemporal errors of gauges: A critical step to evaluate gridded precipitation products. *J. Hydrol.*, 2021, 559, 294-306. <https://doi.org/10.1016/j.jhydrol.2018.02.057>

$$rBIAS = \frac{\frac{1}{n} \sum_{i=1}^n (SRP_i - P_{ref_i})}{\frac{1}{n} \sum_{i=1}^n (P_{ref_i})} \quad (1)$$

Camici, S.; Massari, C.; Ciabatta, L.; Marchesini, I.; and Brocca, L. Which rainfall score is more informative about the performance in river discharge simulation? A comprehensive assessment on 1318 basins over Europe, *Hydrol. Earth Syst. Sci.*, 2020, 24, 4869–4885, <https://doi.org/10.5194/hess-24-4869-2020>