

# ***Interactive comment on “A daily/25 km short-latency rainfall product for data scarce regions based on the integration of the GPM IMERG Early Run with multiple satellite soil moisture products” by Christian Massari et al.***

## **Anonymous Referee #1**

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The paper introduces a potentially useful precipitation product and is overall quite well-written. However, some serious issues need to be resolved before it can be published.

"we minimised the daily root mean squared error (RMSE) between the SM2RAIN rainfall applied to the specific SM product and YREF during 2015-2017." This is problematic because of the noisy nature and highly skewed distribution of precipitation. ERA5 already underestimates precipitation peaks, and using this approach, the obtained SM2RAIN estimates will underestimate precipitation peaks even more. The Kling-Gupta Efficiency is probably a better choice as it accounts for the variability.

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"The final product is then composed of multiple rainfall datasets weighed according to Eq. 6." An averaging scheme like this causes underestimation of peaks and introduces spurious drizzle. I realize that zero values of IMERG were kept, but this does not eliminate all spurious drizzle issue. It will, however, probably introduce a spurious discontinuity in the precipitation distribution...

"The continuous scores were the Pearson correlation coefficient (R), the Root Mean Squared Error (RMSE), and the additive bias (BIAS)." The RMSE statistic should not be used at the daily time scale because it yields "better" values for datasets which underestimate precipitation peaks (such as SM2RAIN and the dataset introduced here). The KGE (with its three independent components) is probably a better choice.

Overall, I think the authors should remove the RMSE from the evaluation and introduce metrics that evaluate the low and high tails of the precipitation distribution of the new product. Any issues revealed using these new metrics should be highlighted in the abstract.

"Note that, based on this choice, the integrated product is totally independent upon rain gauges" This not true as ERA5 assimilates precipitation gauge observations.

"ERA5, which provides full coverage and generally homogeneous performance all over the world." Not sure I agree with this as atmospheric models tend to perform markedly worse in convection-dominated regions.

Page 10 line 27: Add "out" after "carried".

Figure 12: Can you add short titles to each subplot?

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