

## ***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 #2**

Received and published: 12 November 2019

The manuscript describes a novel approach to integrate multiple precipitation estimates from satellite soil moisture measurements into an existing precipitation data set. The validity of the approach is confirmed over six regions using triple collocation validation and cross-validation with rain-gauge measurements where available.

The manuscript is overall well written and mostly well structured. Title and abstract fit the topic and content. Data generated within the study is publicly available, the URL in the manuscript should be updated in order to work properly (omit “.XThcfHvOOUk”). The supplementary materials contain plots and tables that are addressed in the text

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and support the conclusions.

Using the SM2RAIN approach to improve existing precipitation products is a logical step in terms of deriving short-latency precipitation data and of interest for the community. The underlying concepts of the manuscript (OLI, SM2RAIN, TC) are well established, original contributions are summarized in a comprehensible way and referenced properly. More details on why the OLI method is preferred in the combination step over other approaches should be given. The chosen calibration data set  $Y_{REF}$  within the combination step should show “homogeneous performance in space and time” globally, yet the chosen ERA5 reanalysis is likely not to provide this. ERA5 was found the best fitting of three candidates, yet potential issues of reanalysis products should be discussed and the (in)dependence of ERA5 from the used satellite data resp. rain-gauge data should be addressed thoroughly.

Some background for the chosen threshold of  $R < 0.4$  between SM2RAIN and reference data to perform OLI should be given.

The “classical” validation part and the “assessment of TC validity” could be shorter or it should be explained, why extensive verification of the TC approach within this study was found to be necessary. As referenced in the manuscript, TC has been used to validate precipitation from satellite SM in a previous study (Massari et al., 2017).

Considering the short calibration/validation period, the potential impact of climate patterns or their absence (e.g. due to ENSO) on the calibration process should be discussed.

The increase in FAR in Fig. 7 needs more explanation.

The measures (median) that are shown in the (bar) plots should be defined in the plots or the caption (also for the tables). Areas that bar plots refer to are not always clear from the figures alone (Fig. 4), box plots resp. tables instead of bar plots would provide more information resp. improve readability/comparability. Information on what box

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edges, whiskers represent in Fig.8 are especially necessary, to show that the impact of (single) outlier triples is not omitted in the plots.

P1, L5: "they are" instead of "they're" P4, L25: "Metop" instead of "METOP" P5, L12: A.M. - AM consistency P6, L27: "within" instead of "wihtin" P6, L29: "whereas suffer" missing words P8, L3: "weighting" instead of "weighing" P8, Eq. (5) : missing superscript "1" P11, L3: "satisfy" instead of "satisfies" P12, L23: duplicate section reference P20, L6: "targeted" instead of "target" and duplicate "(" in L5

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2019-387>, 2019.