

WHU-SGCC: A novel approach for blending daily satellite (CHIRP) 1 and precipitation observations over the Jinsha River Basin by Shen et al.

General comments:

The manuscript describes a method of merging daily gauge measurements with satellite precipitation product (CHIRP) in the mountainous region of Jinsha River Basin in China. The methodology seems to be quite rigorous in statistical sense. The algorithm is not perfect as it does not take into account the skewed nature of precipitation distribution and the improvements are mostly shown on light rain events but not the heavy rain events. But overall it is a commendable effort and worth publishing.

One major question is the choice of CHIRP data instead of CHIRPS to start with. Perhaps because CHIRPS with all additional gauge and model data actually performs worse than CHIRP in this particular area as the statistics later in the paper shows. If this is the reason, the authors should mention it in the beginning. It is expected that the new data will perform better than CHIRPS because WHU-SGCC incorporates more surface gauge measurements. The question is then the improvement is due to more gauge stations or better merging and correction methodology? If the WHU-SGCC method only takes the station data used by CHIRPS, will the results be better than CHIRPS?

Besides this, the methodology and validation seem to be reasonable. The authors should emphasize that the validation is against the gauge measurements (from using leave-one-out) and not against CHIRP and CHIRPS. Only the error statistics of CHIRP and CHIRPS data are used for comparison purpose. There are still quite a lot of English usage problems. More careful proofreading is needed.

Minor comments:

Line 46, 49: Use Huffman et al. (2018) reference for IMERG data and Huffman et al (2010) for TMPA data. These are official IMERG and TMPA references.

Huffman, G. J, D. T. Bolvin, D. Braithwaite, K. Hsu, R. Joyce, P. Xie (2018). NASA Global Precipitation Measurement Integrated Multi-satellitE Retrievals for GPM (IMERG), NASA Algorithm theoretical basis document (ATBD) version 5.2., 35 pp. https://pmm.nasa.gov/sites/default/files/document_files/IMERG_ATBD_V5.2.pdf

Huffman, G.J., R.F. Adler, D.T. Bolvin, and E. Nelkin (2010). The TRMM Multi-satellite Precipitation Analysis (TMPA). In F. Hossain and M. Gebremichael (Ed.), *Satellite Rainfall Applications for Surface Hydrology*. (3-22). Springer Verlag. ISBN: 978-90-481-2914-0

Line 41-62: These satellite precipitation data or merged data seem to be introduced in random order.

Line 65: The sentence “Table 1 shows ...” should appear in the beginning of previous paragraph before introducing different data set.

Line 69: Temporal resolution?

Table 1: GPCP has a daily product

CMAP has pentad product?

CHIRPS: what is Dekad/Pentad? The temporal resolution does not match 3-day and 6-day resolution described in Line 151.

Line 137 and Figure 2 caption: annual precipitation during JJA is not correct usage. Should remove “annual”.

Line 157: TRMM 3B42 is itself a merged product including both geostationary IR and microwave measurements from polar orbiting satellites and some gauge data.

Line 161: Are you sure that the IR rainfall estimates have pentad resolution?

Line 167-168: Don’t understand why CHIRPS is used as validation data. The new data is supposed to perform better because more surface station is available?

Line 187: Analyze

Line 196: replace “statistically” with “statistical”

Line 231: “molecular” should be numerator

Rule 2 generates clusters of precipitation areas for the JinSha River region. Can you plot the cluster map?

Line 291: Equation (12): It seems that you choose to adjust C3 precipitation based on one C2 pixel that provides maximum precipitation value. What is the rational here?

Line 311: Don’t understand this sentence. Aren’t C4 pixels adjusted in Rule 4? How are C1 pixels adjusted in the end?

Line 430: “In hence”, there is no such usage. Use “Therefore” instead.

Line 470: Should be “multi-model”

Table 5: Why CHIRPS has much worse performance than CHIRP?