Hydrology and Earth System Sciences Discussions

Hydrol. Earth Syst. Sci. Discuss., referee comment RC1
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Comment on hess-2021-642

Anonymous Referee #1

Referee comment on "A two-step merging strategy for incorporating multi-source precipitation products and gauge observations using machine learning classification and regression over China" by Huajin Lei et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-642-RC1, 2022

Thank you for providing me the opportunity to review the entitled manuscript " A two-step merging strategy for incorporating multi-source precipitation products and gauge observations using machine learning classification and regression over China". It's an interesting study and fits the scope of the Journal. However, there are several major and minor flaws that authors should take care of and revise before final consideration in high-quality peer-review Journals like Hydrology and Earth System Science. Authors should improve the quality of the manuscript including research outcomes, discussion, and unique conclusions.
My major comments are as follows;

1- In the abstract, there are too many simple conclusive statements in the abstract, which are well-known to people who are involved in this area. You should first layout a background information description. Second, point out what is the most important in the current field of research and what has not yet been solved. Third, explain your novel method in detail how you solve this problem. Last, a brief description of your own findings should be presented. If your methods and findings are novel and interesting to people who are involved in this area, they will continue to read your main text.
2- It is recommended that the author rewrite the INTRODUCTION, increase the citation of the literature, and extract questions and useful information from the literature. Through literature review, point out the shortcomings of existing research, thus leading to the article's hydrological and environmental significance and purpose. In this section, the literature review needs to be more critical.
3- The authors should detail the methodological novelties with the vast amount of existing literature in this area in the Introduction.
4- The authors should address the clear objectives of the study in the introduction section.
5- In the discussions, comparisons of the results obtained in this manuscript with the extensive existing literature on Satellite-based precipitation and the methodologies used need to be expanded. I recommend authors should compare results with previous approaches. In discussions, it must add what the results mean with respect to what is already known and highlight how your results support or refute the current hypotheses in the field if any. More references should be added to that section. Underline how your results make a significant move in the working field forward.

6- It’s is recommended to improve the quality of grammar and take care of grammar mistakes.
7- Line# 115-120 Expand the hydro-metrological features of the study region with more explanations.

8- Line# 230-240 I am wondering if the technique applied by authors is correctly classified for wet and dry events. Authors only attempted to correct precipitation events fall in wet events. I recommend techniques should test with combined dry and wet days because measurement techniques for all precipitation datasets are quite different and definitely there would be a lag between wet and dry events for all different datasets which could create outliers in applied techniques.

9- Authors have merged ground observations data with different precipitation estimates. While different precipitation products have different spatial resolutions which could cause outliers when merging with ground observations. Apart from these, the authors used a simplified approach to merge coarse resolution precipitation products with ground observations data. Rainfall within a single satellite pixel could vary considerably by 38% between two gauges located within 4 km × 4 km. The deviation between gridded precipitation and single gauge observation is due to the discrepancy of scale and could be reduced by increasing the validation stations or downscaling the TRMM precipitation to a finer resolution. Therefore, authors should firstly downscale all grided precipitation datasets at a finer scale and then merge with ground observational data to make the approach more novel towards environmental significance. The author can learn lessons from the following papers.

Arshad, A., Zhang, W., Zhang, Z., Wang, S., Zhang, B., Cheema, M.J.M. and Shalamzari, M.J., 2021. Reconstructing high-resolution gridded precipitation data using an improved downscaling approach over the high altitude mountain regions of Upper Indus Basin (UIB). Science of The Total Environment, 784, p.147140.

Gebremichael, M. and Krajewski, W.F., 2004. Assessment of the statistical characterization of small-scale rainfall variability from radar: Analysis of TRMM ground validation datasets. Journal of Applied Meteorology, 43(8), pp.1180-1199.

Harmsen, E.W., Mesa, S.G., Cabassa, E.D.V.I.E.R., Ramírez-Beltran, N.D., Pol, S.C., Kuligowski, R.J. and Vasquez, R.A.M.Ó.N., 2008. Satellite sub-pixel rainfall variability. International Journal of Systems Applications, Engineering & Development, 2(3), pp.91-100.

10- The study region covers complex hydro-topographical features and some of the stations are located in snow and glacier coverage regions (e.g., Tibetan Plateau) and hence observed precipitation in these regions is unreliable and unavailable. Therefore, the

orographic correction of precipitation based on the vertical gradients along with glacier mass balance is required to retrieve an accurate precipitation dataset in high-altitude mountain regions such as Tibetan Plateau and some others. Authors can take glacier mass variations from GRACE data and try to correct precipitation for high-altitude regions.

11- Add a limitation section that explains any limitations that your hypothesis or experimental approach might have and the reasoning behind it and some of them I have clearly mentioned. This will help the field in generating hypotheses and new approaches without facing the same challenges. The discussion becomes well-rounded when you emphasize not only the impact of the study but also where possibly it falls short. Consider posing a few questions or directions, preferably in the form of a hypothesis, to provide a launchpad for future research.

12- Conclusions need to revise and well-round major and significant findings of current study