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Interactive comment on "Rainfall erosivity estimation using gridded daily precipitation datasets" *by* Maoqing Wang et al.

Anonymous Referee #2

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In the submitted paper, authors investigated relationship between gauge data and gridded daily precipitation datasets. Multiple variables were used for the comparison with focus on the precipitation and rainfall erosivity. The topic of the paper could potentially be of interest for readers of this journal. However, there are several drawbacks related to the submitted manuscript that should be improved before further evaluation of this manuscript.

Most importantly, based on the presented results (Table 5) and second aim of the study (i.e. develop a correction factors) I think that authors should perform additional investigations in order to fulfil this second aim since according to Table 5, the developed correction factors do not lead to improved results (at least not for all cases).

Additionally, there are multiple parts that should be either better explained or enhanced

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(some specific comments are listed below). More specifically, I am missing a take home message that could be useful for the international readership. Authors state that correction factors need to be applied but the factors they developed have local characteristics and do not even improve the results in all investigated cases.

Moreover, it should be noted that there are already quite some things done in relation to the rainfall erosivity assessment, even at global scale (for example Global rainfall erosivity assessment based on high-temporal resolution rainfall records by Panagos et al., 2017) using high-temporal resolution data. Thus, this assessment of the erosivity using daily data (either gridded or point-observed) should be well justified. Also in China you have a nice network of high-temporal resolution data. Additionally, there are also some satellite products already developed that have sub-daily temporal resolution. Thus, I am missing a better justification of using of daily data because also for example Yue et al. 2020b map is based on the hourly data. Thus, why would one need to estimate the erosivity based on daily data if a map based on hourly data is already developed and available? Why dealing with daily data since such estimates of erosivity (based on daily data) should only be used in cases without hourly or sub-hourly data because they are less accurate.

Some specific comments:

L76: how can a spatial map be highly accurate since no information about the Âżactu-alÂń R-factor is available. In order to obtain a value that is as close to actual drop-size-distribution measurements are needed, which can only performed for specific station.

L116: I think that more detailed description of the gauge data should be provided. What is the equipment used, is the data verified, what is the data quality, anything that have an effect on the results of this study should be included.

Table 1: What is the number of stations in the period 2006-present for the CPC, more than 17000 or more than 700?

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Eq. 2: Why a threshold of 10 mm is used if standard RUSLE threshold is 12.7 mm or 6.25 mm in 15 min?

L158-159: These variables should be better explained and these sentences should be rewritten.

Eq. 3: Can ARF be defined twice using different variables?

Table 2: What is the difference between mean annual precipitation from only wet days or from both wet and dry days?

Eq. 9: I do not understand this equation, Rref is used on left and right side? Thus, a can only be 1?

Figure 2: The readability of these figures is too low.

Figure 3: Can you really say that these are PDFs? You are showing number of rainfall events in different bins? Or at least better visual presentation should be made since it is not easy to see which dataset yields better agreement with observed data. Additionally, can you add a summary of these differences between models and observed data? Thus, which model/dataset yields the best fit to the observed data.

Figure 4: I am sorry but I cannot understand this figure since obviously I do not understand correctly what should the ARF be according to your study. Perhaps this is related to the definition in L158-162 and Eq. 3 that should be improved. What is usually defined as areal reduction factor can be seen here (for example): https://www.sciencedirect.com/science/article/abs/pii/S0022169418301999. Thus, something different that is shown in Figure 4. For example, the ARF should be a value between 0 and 1. I suggest that authors try to make this a bit easier to understand (what is shown here) for the reader.

L289: Any specific reason for such behavior?

Figure 5: The resolution of this figure is quite low. I would suggest to add the number of

points in all plots, since it seems that some cases (h) or (d) have relatively low number of points compared to the size of the investigated area. Or is this already written in the caption where “grids” is used? Moreover, grids or grid cells?

Table 5: Correction in some cases leads to worse results? What is then the rationale behind adopting such “corrections” factors if the final result is even worse than without these factors.

Figure 7: I suggest to add a map that shows the difference between the erosivity map after applying correction and the Yue map.

Discussion: What not merging results and discussion since you already have some discussion in the results section? And then perhaps also the results section would be more easier to read and understand.

L385: “Reductions”: gauge data compared to grid data or grid data compared to gauge data?

L400: What is the purpose of using a correction factor if it does not yield improved performance? Is there any alternative, a better method that should be elaborated?

Conclusions: What are the practical conclusions of this study that could be useful for people dealing with rainfall erosivity in other parts of the world? What is the main take home message?

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