

## **Reviewer #2**

*R2C0 Comment:* This manuscript considers the applicability of satellite-based rainfall data to estimate global rainfall erosivity at multiple scales. The paper is intriguing and the potential for using satellite-based rainfall to achieve global data is promising. However, I have several concerns and should be considered before acceptance.

There are numerous grammatical errors throughout the manuscript. I suggest a thorough proofreading and perhaps a professional editing service. Also, as mentioned by Anonymous Referee #1, there are several errors in the text (ex. L159-160, text for second and third examples are switched compared to Fig1). Please check your manuscript thoroughly and reorganize for better comprehension.

*R2C0 Response:* We would like to thank Reviewer #2 for reviewing our manuscript. We very much appreciate the encouraging comments and overall positive evaluation on our study. Point-by-point detailed responses to the specific suggestions are provided below. Thanks.

As indicated in the response to the Reviewer #1, we will correct all highlighted smaller technical issues and typos. We will also have a throughout proofreading and correct potential issues and if needed (perhaps based on editor evaluation) we will contact editing service.

### **Specific comments**

*R2C1 Comment:* L217-221: I could not understand this section, especially L216-218. Is the Gini[] in table 3 the ratio of CMORPH gini to GloREDA gini? If so, how can we interpret this is better than bias of mean values? Please elaborate.

*R2C1 Response:* This is a good suggestion. Thanks. Additional discussions about the usage of the Gini coefficient will be included in the revised version of the manuscript. The Gini coefficient is a single number that demonstrates a degree of inequality in a distribution of income/wealth. Here, it is used to captures the inequality in the spatial distribution of rainfall erosivity. Accordingly, similar values of Gini coefficient indicate that spatial patterns are similar. Values shown in Table 3 are bias values of calculated Gini coefficients, as Reviewer #2 indicated correctly. Gini coefficient was meant to be used as an additional metric that would capture the spatial distribution of the rainfall erosivity. Thus, it should be looked together with the bias of the mean values to get a more holistic view on the differences between rainfall erosivity maps. For example, mean erosivity per continent could be similar but we could have an overestimation in one area and overestimation in other part.

*R2C2 Comment:* L231-L239: Are the pearson correlation of mean annual rainfall erosivity and gini coefficient calculated using basin averaged mean annual rainfall erosivity? Please elaborate on the calculation, especially how the spatial distribution of each sub-catchment is considered.

*R2C2 Response:* Noted with thanks. Indeed, mean annual rainfall erosivity per catchment was calculated. Additional description will be included in the revised version as suggested by the Reviewer #2.

R2C3 Comment: L301-L314: I could not understand how equation 5 is derived and applied. Please clarify.

R2C3 Response: Thanks for your remark. As already discusses with Reviewer #1, we are willing to remove this part from the revised version of the manuscript. Additional discussion about the needed corrections of the CMOPRH data will be added to the revised version of the manuscript. Thanks.

R2C4 Comment: L327-L328: How can this be said from the limited amount of grids with a significant trend?

R2C4 Response: Noted with thanks. As suggested by the Reviewer #2 this sentence will be modified or removed in the revised version.

R2C5 Comment: L335-L339: In table 3, CMORPH in North America is largely underestimated, whereas Kim et al (2020) reports CMORPH in US in overestimated. If CMORPH in this study is compared for only US, does it show an overestimation similar to Kim et al (2020)? If not, please elaborate on the difference.

R2C5 Response: Thanks for your remark. Please note that Kim et al. (2020) wrote (section 3.3, please also see Figure 9 in Kim et al., 2020): “*The range of the R-factors in Panagos et al. (2017) is 6–9645 MJ mm ha<sup>-1</sup> h<sup>-1</sup> yr<sup>-1</sup>, and the mean value is 2067 MJ mm ha<sup>-1</sup> h<sup>-1</sup> yr<sup>-1</sup>, i.e., 1.65 times higher than the mean R-factor estimated in this study*”. Thus, values obtained according to the CMORPH were smaller compared to the GloREDa (Panagos et al., 2017). This is consistent to what is shown in our Table 3. Our results are in agreement to what was reported by Kim et al. (2020). Please also note that Kim et al. (2020) indicated an overestimation of rainfall erosivity near water bodies and this kind of overestimation was also detected in our study.

R2C6 Comment: L343-L361: Information on CMORPH precipitation accuracy in different regions does not seem relevant unless it is clear to readers how it affects the over/underestimations of CMORPH rainfall erosivity in those regions.

R2C6 Response: Good point, thanks. As suggested by the Reviewer #2 these sentences will modified in order to indicate a link between precipitation and rainfall erosivity.

### **Minor comments**

R2C7 Comment: L11-12: I could not understand what “As this data scarcity is likely to characterize the upcoming years” means.

R2C7 Response: Thanks for your remark. It was meant that since the density of gauge-based data will most likely not increase in future, alternative data sources could be useful. However, the sentence will be modified in order to make it more clear for the readers.

R2C8 Comment: L198: This is not a sentence.

R2C8 Response: Noted with thanks. This sentence will be modified.

*R2C9 Comment:* L202: the comparison of 1981-2019 does not seem relevant for this manuscript.

*R2C9 Response:* Indeed, most of the investigations were performed using data after 1998. Thus, this sentence will be modified.

*R2C10 Comment:* L220: CMORPH seems to be better for Europe? Please clarify.

*R2C10 Response:* Indeed, the sentence will be modified.

*R2C11 Comment:* L267-268: How can this be said?

*R2C11 Response:* Noted with thanks. This sentence will be modified in the revised version.

*R2C12 Comment:* Figure 6: There are no dotted lines.

*R2C12 Response:* Indeed, figure caption will be corrected.

*R2C13 Comment:* Figure 9: What is the blue dotted line?

*R2C13 Response:* Thanks for your remark. The blue dotted line is a linear trend line of the original CMORPH data. However, please note that this section will be removed in the revised version.