审稿意见 1

The Tibetan Plateau (TP) is a hotpot for studying soil erosion under climate change. Rainfall erosivity (or the R factor) is the most widely used parameter regarding to climate in soil erosion study. Thus, an accurate R map and related dataset is benefit to quantify soil erosion on the TP. Generally, this is a good MS and provide valuable data on TP. I recommend a moderate revision. Please find bellow my suggestions for updating & reinforcing the current paper.

1. Abstract: I suggest the authors add more information about the dataset.

Response: Thanks. As you suggested, we have rewritten the Abstract section to present a more clearer description of the reconstructed dataset, including the basic information **(Line 13 – 14)**, the reconstruction method **(Line 14 – 24)** and the performance of the newly released dataset **(Line 24 – 27)**.

2. Introduction: The ERA5 should be introduce in this part. For example, I notice that this product has been used to calculate rainfall of the China's mainland.

Response: The introduction of the ERA5 dataset has been added. Please refer to **Line 100 – 106** for details in the revised MS.

3. Line 112, Please check the spatial resolution of the ERA5 data, is 25 km or 0.25°?

Response: Thanks for your kind reminder. We have corrected the spatial resolution into 0.25°. Please refer to **Line 108** for details in the revised MS.

4. Figure 4 and 5: Add the unit of rainfall erosivity, which is MJ·mm·ha−1·h−1·yr−1.

Response: Figure 4 and 5 have been modified to **Figure 5 and 6** in the revised MS, respectively. We have added the unit in the title of the figure.

5. Part 4.2 (Line 243) Why the authors use multiplier factors to calculate new R map. Are there any references? Or the observed and ERA5-based annual rainfall erosivity show multiple relationship? Also in figure 8, why this is an optimal model with intercept of 0?

Response: Our study has found that ERA5 data has systematical biases in identifying the characteristics of the erosive precipitation events, including significant underestimation of the mean I_{30} for erosive precipitation events and relatively slight overestimation of the mean erosive event precipitation amount, which will lead to overall underestimation of the ERA5-based annual rainfall erosivity.

In the post-processing of the precipitation simulation using weather/climate forecast models, it is always supposed that the model biases could keep stable, and consequently the relative changes between the in-situ and modeled precipitation are commonly used to correct the modeled precipitation for accuracy improvement (e.g. Fick et al., 2017; Cucchi et al., 2020; He et al., 2020). Here, taking the method of precipitation correction for a reference, we made the hypothesis that the biases of ERA5-based annual rainfall erosivity transmitted from the biases of ERA5 data can also keep stable at each grid. Then, the relative changes between the station-based and ERA5-based annual rainfall erosivity are used to correct the ERA5-based estimates. After the correction process, the performance of the corrected values is further examined. To make the method used in this study more clear, we have rewritten the section 3.3. Please refer to **Line 216 – 244** for details in the revised MS. Besides, the overall algorithm for generating the dataset has been illustrated in **Figure 2**.

In the revised MS, Figure 8 has been modified to Figure 9. In fact, the intercept of the optimal models is not equal to zero. We have changed the color of the fitting line to avoid misleading. Please refer to **Figure 9** for details in the revised MS.

Reference

Fick, S.E. and R.J. Hijmans: WorldClim 2: new 1km spatial resolution climate surfaces for global land areas. Int. J. Climatol., 37(12): 4302-4315, 2017.

Cucchi, M., Weedon, G. P., Amici, A., et al.: WFDE5: bias-adjusted ERA5 reanalysis data for impact studies, Earth Syst. Sci. Data, 12, 2097–2120, 2020.

He, J., Yang, K., Tang, W., et al: The first high-resolution meteorological forcing dataset for land process studies over China, Sci. Data., 7(1), 25, 2020.

6. I suggest an additional part as Uncertainties in the results parts. Uncertainties either from the ERA5 or from the multiplier factors should be discussed.

Response: As you said, the biases of the ERA5-based annual rainfall erosivity data were derived from the ERA5 precipitation data, which has obvious biases in detecting the amount and intensity of erosive rainfall events. The correction method we used to reduce the biases unavoidably involved some uncertainties. Please see **Line 390 – 400** for the detailed analysis.

7. Conclusions: I suggest this part focuses on summary of the dataset including its applications.

Response: As you suggested, we have rewritten the Conclusion Section in the revised MS. Please refer to **Line 406 – 411** for the summary of the dataset and **Line 412 – 419** for the application of the dataset.