

Reply to Anonymous Referee #1

In the manuscript “A Universal Multifractal Approach to Assessment of Spatiotemporal Extreme Precipitation over the Loess Plateau of China”. The authors try to proposal approach to identify the extreme precipitation events (EP), which is vital to the formation of soil erosion, and thereby to assess the spatiotemporal characteristics of the EP in the Loess Plateau (LP) during long term of 1961-2015. The study is interesting because providing new understanding about the spatiotemporal characteristics of EP in the LP. Meanwhile, the results are useful and contribute to the risk management (such as the soil erosion) in the LP. In my view, the MS may be suitable to be published in Hydrology and Earth System Sciences after minor revision.

Reply: Thank you very much for your favorite consideration and detailed suggestions. We have studied all the comments carefully and have made corrections. The responses below are the details of the plan to revise the manuscript.

General comments

The paper is well written and the results are well presented. Bibliography very exhaustive. The analyzed dataset is interesting and the results can be useful to improve the knowledge of spatiotemporal characteristics of EP and could be potentially useful for risk management. The results show that the approach integrating the universal multifractal approach and segmentation algorithm based on parametric statistical method can be used to identify the EP events. Then, giving a detailed description about the spatiotemporal characteristics of EP. What's more, the rationality of EP results is explained and verified through the relationship between EP with the spatial characteristics of soil erosion. Therefore, the presented results are robust and add new knowledge on those relevant eco-hydrologic study and management.

Reply: We quite appreciate your favorite consideration and insightful comments.

Major comments:

1. Please explain the calculation of each indices of extreme precipitation in detail. It can help the readers to understand the meaning of the indices. Such as how to calculate the MEP?

Reply: More detailed information about the calculation of each indices were introduced in the revision of the manuscript.

2. L319-326: Please strengthen this paragraph. How do you get the condition about the recovery of vegetation from the EP intensity?

Reply: Thanks for your suggestion. More detailed information and references were added in this section to cover this question.

Specific comments

1. There is a lack of the specific meaning of EPT (threshold of extreme precipitation), please briefly explain it in the “Introduction”.

Reply: Thanks. We concluded that the specific meaning of EPT should be introduced in the revision of the manuscript.

2. Please include all the indices used in your study in Table 1. Such as EPS.

Reply: Sorry for my carelessness, EPS is EP severity.

3. What is the difference of EPS and EPSI?

Reply: Sorry for my carelessness, EPS is EP severity, and “EPSI” was deleted.

4. L 19: Please replace “scare” with “scarce”.

Reply: Thanks for your reminding. The word was corrected.

5. L148: What is the specific criterion of “approximately equal” in the selection of EPT?

Reply: As shown in Figure 1, firstly, these abrupt points are the alternative EPT, and then the point and its corresponding variance with gentle slope on the right but deep slope on the left was determined as EPT in a station.

6. L159: Please explain the specific meaning of “n” in the equation.

Reply: The parameter n was defined in the Revision.

7. L165: Is the PF represents EPF? Please illustrate the equation in detail

Reply: Yes. P_F was used to present EPF in the manuscript. The parameter was replaced by its abbreviation, EPF, in the Revision.

8. L195: Why the missing data were replaced by a value of 0 in your paper?

Reply: Thanks for your detailed question. The very few missing data were replaced by zeros because precipitation days account for <20% in the Loess Plateau.

9. L208: Please delete “from” after “50 mm/d”.

Reply: Thanks. It was corrected.

10. L212: Please unify the unit of MEP between the manuscript (mm/y) and the Fig. 3 (mm/a).

Reply: Thanks for your careful work. The unit of “yr” was uniformly used in the Revision to represent “year”.

11. L214-215: What do you mean “the annual EPF ranged from 1.0 to 2.1”?

Reply: Sorry for my mistake. It should be “mean annual EPF”. We corrected it in the Revision.

12. L316-L306: What do you mean “The streamflow was 2.41/25.6 times of the mean annual streamflow from 2002 to 2011”? What is the meaning of “/” in your manuscript?

Reply: Sorry for my careless. The characters “/25.6” should be deleted. I missed to deleted them before submitting.

13. L317-318: Please explain “Therefore, it can be inferred that the EPF obtained in this study, about twice a year on average, is rational” in detail. What do you mean “twice a year”?

Reply: We mean that, on average, there are about two EP events in each station. Maybe my expression is ambiguous. We rephrased this sentence.

14. L336-338: Why 50 mm/d and 25 mm/d are the suitable threshold for the Southeast and Northwestern of LP, respectively?

Reply: There is no precipitation event exceed 50 mm/d in the northwest Loess Plateau, where mean annual precipitation is <200 mm. However, precipitation events > 50 mm/d often occur in the southeast Loess Plateau. The EPTs determined by universal multifractals are less than 20 mm/d in some stations of the northwest Loess Plateau but > 50 mm/d in some stations of the southeast Loess Plateau. Therefore, our results demonstrated this viewpoint.

We have extended this paragraph to cover this comment.

15. L358: Please add “the reason” between “may” and “why”

Reply: The phrase was added.

16. Fig. 3: Please correct the title of the figure. There are 6 subfigures (a-f) in the figure 3. However, only 5 subfigures (a-e) are listed and explained in the title.

Reply: Thanks. Missed information was added.