

Reply to Referee Comment from Zhihua Shi

General comment

In this work the authors proposed an approach integrating the universal multifractals and a segmentation algorithm to precisely identify EP events. Then they assessed spatiotemporal variation of extreme precipitation over the Loess Plateau, China. It is known that extreme precipitation in the Loess Plateau is one of the major agents causing serious environment hazards in the Loess Plateau. However, to my knowledge, traditional method including parameter methods and non-parameter method could not give such a rational result of extreme precipitation in both spatial and temporal distribution. The method proposed in this paper is innovative, and the results are of great significance in catchment management. The paper is in good presentation and fluent expression, and the content of the paper suits to HESS.

Reply: Thanks a lot 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.

My detailed comments follow:

1. The authors should describe the procedure to calculate the EP indices in detail.

Reply: More detailed procedure to calculate EP indices was added.

2. Can the methodology proposed in this paper be applied to extreme precipitation assessment in many other regions? Please discuss this point at the end of the abstract.

Reply: Yes, the method can be applied to regional EP assessment in many other regions, it was introduced at the end of the abstract.

3. Line 42: The most serious soil erosion in the Loess Plateau should be $3 \times 10^4 - 4 \times 10^4 \text{ t} \cdot \text{km}^{-2} \cdot \text{yr}^{-1}$. Please check it.

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

4. Line 153: The abbreviation of “EP severity (EPS)” doesn’t agree with “EPSI” in Table 1. Please check it throughout the paper.

Reply: Thanks for your reminding. The EP severity was uniformly abbreviated as EPS in the Revision.

5. Line 215: Add the unit to the annual EPF.

Reply: Thanks for your reminding. The unit was added.

6. Line 231: it should be “4.2 Spatiotemporal variation of EP”.

Reply: Thanks. The number of the section title was corrected.

7. Line 238: It should be “mainly in”

Reply: Thanks. The word was corrected.

8. Please check the units used throughout the paper and make sure each unit is strictly unique in the paper. For example, Line 42 “yr⁻¹”, Line 214 “days” and Line 237 “days/yr” don’t in consistent with “d” and “d/yr” used in Figures 3 and 4.

Reply: We have checked all units used in the paper and made correction. The unit “d” and “yr” were adopted to represent day and year, respectively. Besides, units in the form of superscript negative powers instead of divided by positive powers were adopted although the paper.

9. The scarce precipitation but intense EP is a major external agent inducing most serious sediment erosion in Loess Plateau. The spatial EPI and EPS derived in this paper is important as it well illustrate this question. This is an important question should be further discussed in section 5.1.

Reply: Thanks for your suggestion. We have enlarged discussion in section 5.1 about EP events and their corresponding natural hazards including sediment erosion.

10. There are some studies to explore the EP in the Loess Plateau. The authors should compare their results with previous studies.

Reply: Comparison with previous studies was further discussed in section 5.1.