

Hydrol. Earth Syst. Sci. Discuss., referee comment RC1
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Comment on hess-2022-351

Anonymous Referee #1

Referee comment on "The most extreme rainfall erosivity event ever recorded in China up to 2022: the 7.20 storm in Henan Province" by Yuanyuan Xiao et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2022-351-RC1>, 2022

General comments

In the submitted paper authors investigate the characteristics of one extreme rainfall event (20th July, last year) in comparison to spatial and temporal rainfall erosivity characteristics in China. The paper is interesting and within the scope of the HESS journal. However, there are several points that could be improved.

Firstly, the reported rainfall amounts are relatively extreme. Hence, more details about the measuring equipment used to measure rainfall (and accuracy of these instruments) should be reported since this could have an effect on the measured rainfall amounts (can at least for this extreme event uncertainty be estimated).

Secondly, the reported results are sensitive to the selected empirical equation used to calculate the energy. Hence, are there any other data available (e.g., optical disdrometer) measurements that could be used to validate these calculations in order to make less uncertain rainfall erosivity estimates?

Thirdly, the reported frequency analysis is missing uncertainty estimation (confidence intervals).

Fourthly, I am not sure what is the purpose of envelope curves (see also specific comment below). I would suggest to add some specific details about the impact of this extreme event on soil erosion (some measurements perhaps, if available) or at least on the sediment concentrations in rivers (some measurements) or something similar. Hence, could you say that extreme erosive events (with return period over 100,000 years) also leads to soil erosion rates with similar recurrence interval (the same for sediment

transport rates).

Finally, some specific comments are provided below.

Specific comments

Figure 1: Maybe you could more clearly indicate Henan province in this figure.

Equation 1: You should cite the original source of this equation. Additionally, what is the sensitivity of results with respect to the selection of equations (1) and (4).

Lines 132-135: Please provide more details about interpolation method used.

Equation 5: Please provide the original reference.

Line 147: Shape, scale and location parameters and not position parameter.

Equations (6)-(7): Please double check it, I am not sure if these are correctly written.

Equations (8)-(17): I am not sure if these need to be reported in a paper about rainfall erosivity. More details about the rainfall erosivity calculation procedure and measurements could be provided instead.

Line 186: "It showed". Is this referring to Want et al. (2016) study?

Figure 3: It is not clear how was Figure 3a created, is this station-based data interpolated or this is from other source (radar)?

Figure 4: The same as for Figure 3.

Figure 5d: Here these results are probably quite sensitive to the selection of the empirical equations used to calculate the rainfall erosivity. It would be nice to elaborate a bit about this issue.

Table 1: Why ha? I suggest to use either km^2 or $1000 \cdot \text{km}^2$ or something similar. Also in this table you are comparing areal rainfall erosivity with station-based (gauge, probably 200 cm^2 or something similar).

Figure 6: Here you clearly need the conference intervals. I am not sure if you could just say that the return period of this event is exactly 154,154 years. Additionally. You should note that in (flood) frequency analysis there are usually some specific rules about the longest return period that could be estimated based on specific data length (sample size). Different rules can be found in the literature. At least some discussion about this should be added.

Section 3.2.2: I am sorry but I do not completely understand the purpose of defining these envelope curves? How could these be used? It is clear that the shape of the "curve" is defined by the extreme events (as authors also indicate in the last sentences of this paragraph) that are a result of stochastic process.