

## Comment on hess-2021-531

Anonymous Referee #1

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Referee comment on "The relative importance of antecedent soil moisture and precipitation in flood generation in the middle and lower Yangtze River basin" by Qihua Ran et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-531-RC1>, 2021

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The authors aimed to reveal the dominant factor controlling flood generation in the middle and lower Yangtze River basin by calculating the ratio of the relative importance of antecedent soil moisture and daily rainfall (SPR). And they further analyzed the relationship of SPR with topographic wetness index to understand the linkage between the dominant flood generation mechanism and watershed characteristics. It is a valuable study and within the scope of this journal. However, there are several aspects that need to be clarified and improved.

Major concern:

- In this manuscript, some conclusions were drawn based on correlation analysis but not casual analysis. For example, on the relationship of soil moisture with flood events in large catchments, due to long concentration time, it is possible that high soil moisture is the result of large rainfall, and at the same time the large rainfall leads to flood under the condition with low antecedent soil moisture. But when using correlation, the used soil moisture is not the soil moisture generating this flood but the one after rainfall. Therefore, I suggest that the authors add area information of the study catchments and calculate the concentration time. Based on the information, some further casual analysis should be taken.
- The analysis was based on the estimation of antecedent soil moisture, whose reliability was dependent on the water balance. However, there isn't enough description for the method to estimate soil moisture. (1) The authors simulated daily soil water storage using a water balance equation, in which there isn't the exchange of soil moisture with groundwater. It can lead to a large error in humid regions, such as Yangtze River basin. (2) Equation 6 was used to estimate the change in soil water storage, but it isn't clear how to determine the initial value. (3) There is lack of necessary assessment on the estimated soil moisture. (4) As an important element of water balance, ET was calculated according to Equation 7, which needs being re-considered. First, the dimension of ET<sub>0</sub> and ET is mm/d, while that of S is mm. Second, why the upper limit

of ET is  $0.75 \cdot ET_0$ ? (5) It isn't clear whether the soil moisture has an upper limit.

- The authors assumed that "When SPR is larger than 1, floods at those sites are more dominated by antecedent soil moisture; when SPR is less than 1, rainfall is the primary driver of floods." Why it is 1, not any other value? More explanations on its rationality are required.

Detailed comment:

- Line 60-61, it states that "Little work has been conducted on the flood generation mechanisms in China (except Yang et al., 2019)". It isn't correct. I notice that Yang et al. (2020) has been listed in the reference. In fact, based on casual analysis, Yang et al. (2020) explored the flood generation mechanism and the dominant factors (antecedent soil moisture, rainfall, snow melt and etc.) in the Eastern Monsoon Region of China, including most of the Yangtze River basin.
- Line 76-77, a comment is similar to the above one.
- Line 171, maximum daily discharge?
- Line 179, it isn't clear how to obtain  $S_{max}$ . Which data was used?
- Line 181, it isn't clear how to define  $P_{max}$ , the maximum in one year, or the maximum in all the years.