

## ***Interactive comment on “Rainfall-runoff processes in the Loess Plateau, China: Temporal dynamics of event rainfall-runoff characteristics and diagnostic analysis of runoff generation patterns” by Qiang Wu et al.***

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General comments:

(1) The manuscript “Rainfall-runoff processes in the Loess Plateau, China: Temporal dynamics of event rainfall–runoff characteristics and diagnostic analysis of runoff generation patterns” reported a study concerning the mechanism changing of overland flow generation in Loess Plateau catchments. The method in which the authors identified dominant runoff generation process in the Loess Plateau catchments is confused

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and not reliable. There is a lack of quantitative approach of identifying the mechanism changing of runoff generation and this made the reliability of the conclusion unsatisfactory.

Answer: Thank you for your comments. We have taken the time to think through all of your comments and carefully revised the manuscript as you suggested. Thank you for your valuable suggestion to improve the quality of the manuscript. The method used for identification dominant runoff generation process would be clearly rewritten. The quantitative approach would be considered for supporting conclusions in next version.

(2) On the other hand, the characteristics of rainfall–runoff processes are highly related to overland flow movement and concentration in catchments, particularly at the small and medium spatial scales. How did the authors deal with this? How to separate the effect of runoff-generation mechanism changing and the effect of overland flow movement condition changing led by LUCC?

Answer: The volume runoff was decided by runoff generation process and the time of runoff to the catchment outlet was decided by the runoff concentration process. So we proposed the method to identify dominant runoff generation mechanism considering of the combination of flow movement and concentration in the catchment. Maybe this method was not clearly enough to understand. Thank you for suggestions to improve our manuscript’s quantity. We would clearly describe our novelty method in the next version.

Specific points:

(1) Line 5-10: are the mechanisms of runoff generation in these Loess Plateau catchments really changed? Any field evidence or reference provided in the main text?

Answer: Yes, there were many studies using field experiment measures to reveal the mechanisms of runoff in the Loess Plateau. However, these field-scale may be not enough to identify the catchment-scale runoff generation characteristics. We proposed

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a new method for identification of dominant runoff generation mechanism. We could add some references to support our method in next version.

(2) Check the citation format of references in introduction. For example in line 22, the format of '(Jiongxin, 2005)' is wrong.

Answer: Yes, thank you for pointing out this mistake. I will check for the similar mistakes.

(3) Line 98: why did the authors choose these spatial scales (100–10000 km<sup>2</sup>) and why these catchments? Please give the reason.

Answer: Yes, the representative analysis of the five selected catchments would be added in next version. These five basins have been used in many studies and they are special for the Yellow River Basin to understand rainfall-runoff changing.

(4) Line 110: why did the authors employ this approach to estimate antecedent soil moisture for rainfall-runoff events? Is there any reference?

Answer: Yes, the method used in this study was similar with the API model. Because of long-term period, observation of soil moisture was absent. Comparing with various methods of estimating soil moisture, the API method was simple and suitable for reflecting catchment scale moisture.

(5) Line 116: why there three steps? Please give references to make it clear.

Answer: The three steps were proposed by this study. However, this was not clear enough and I would rewrite the description of method in next version.

(6) Section 3.2: it seemed that this section introduced a method of qualitatively identifying saturation excess overland flow. However, there is no reference concerning this method. Is there any verification of this method? Did the authors have any field study to check the result of this method?

Answer: Yes, there was not reference concerning this method because this method

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was first applied for identifying dominant runoff generation mechanisms by this study. This proposed study method was based on catchment hydrology mechanisms. There were some literatures that studied runoff generation at field-scale. The results maybe verify my method. I would make a supplement of this verification process in the next version.

(7) Section 3.2: using the method above, how did the authors identify the combination of infiltration-excess overland flow and saturation-excess overland flow in catchments? It looks like the authors used the 'probability' of saturation-excess overland flow introduced in the method to represent the combination of the two types of overland flow. Is this verified and reliable?

Answer: Yes, we used the 'probability' to infer the runoff generation mechanisms because of complicate rainfall-runoff process. This question was similar with question (7) and we would separately make a supplement of the verification process in the next version.

(8) Line 207: is there any research or measured data to support this point?

Answer: Yes, there were some studies that could support this conclusion. We would make a clear explanation to this point.

(9) Line 217-220: why you choose these rainfall runoff events.

Answer: Considering of collected data, we made a standard to select rainfall-runoff events. we would clearly classify this standard in next version.

(10) Check dams have been widely and massively constructed in the Loess Plateau, modifying rainfall-runoff processes in catchments (e.g., the Chabagou catchment in this study). How did the authors isolate their impacts on rainfall-runoff processes from LUCC impacts?

Answer: Yes, check dams and other anthropogenic engineering measures all significantly influenced the rainfall-runoff process. Actually, these human activities eventually

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changed the catchment LUC. So we did not isolate check dam's effects from LUC impacts. We just studied the long-term variability of catchment-scale runoff generation.

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