List of Changes

1. Line 2 of page 1: Revised the title, in response to Comment 2 of Reviewer #2.
2. Lines 62-64 of page 3: Revised the unclear sentence, in response to Comment 3 of Reviewer #2.
3. Lines 79-81of page 4: Revised the statement on Martínez-Carreras et al. (2016), in response to Comment 4.
4. Lines 104-106 of page 5: Added a hypothesis to clarify the research direction, in response to Comment 1 of Reviewer #2.
5. Line 201 of page 9: Updated the caption of Figure 2 to better reflect the intent of the figure, in response to Comment 5 of Reviewer #2.
6. Line 225 of page 10: Replaced the term “scenario” with “case”, in response to Comment 6 of Reviewer #2.
7. Line 242 of page 11: Corrected “Upset” to “UpSet” in the figure caption of Figure 4, in response to Comment 6 of Reviewer #2.
8. Lines 266 and 276 of page 13: Replaced "Schematic " with "Conceptual" in the captions of Figures 6 and 7, in response to Comment 7 of Reviewer #2.
9. Line 273 of page 13: Replaced "schematic representation" with "conceptual representation", in response to Comment 7 of Reviewer #2.
10. Line 384 of page 20: Replaced the term "hypothesize" with "conjecture" to better align with the nature of the statement, in response to Comment 1 of Reviewer #2.
11. Lines 531, 540 and 552 of pages 27-28: Changed the numbering of subsections from 1., 2., 3., etc., to a), b), c), etc., for clarity, in response to Comment 8 of Reviewer #2.

Note: The above changes are indicated using track changes in the marked-up revised manuscript.

Response to Reviewers' Comments

Dear Editor and Reviewer,

Thank you for the reviewers' valuable comments and suggestions on our manuscript. We have carefully reviewed your feedback and made the necessary modifications to the manuscript. The detailed corrections are listed below, point by point:

Response to Reviewer #2:

Comment 1:

First, it must be noted that the authors have given a lot of attention to detail in responding to the comments made during the first round of assessments. Major improvements relate to a better organisation of the manuscript, now making a clear difference between sections on methods, results, discussion and conclusions (for example, in the revised version there are no new results introduced in the discussion section, the results section now solely focuses on results, interpretation of the findings is now limited to the discussion section, etc.). Also, the authors have made a substantial effort in better explaining methodological choices that they have made (e.g., instrumental set-up in the field, relating to data aggregation, normalization of groundwater level data, definition of thresholds, etc.). One may not necessarily always agree with certain choices that have been made. But the fact that the reasons behind the choices that have been made by the authors are now clearly and convincingly explained is a substantial improvement.

One point of concern relates to the fact that no clear hypothesis has been stated in the introduction of the manuscript (only a list of primary objectives is given at the end of the introduction). My understanding is that this would almost certainly have been the ideal setting for a hypothesis-driven investigation, and it would have made it easier for the authors to further showcase the novelty and relevance of their work. I understand that adding a hypothesis at this stage is problematic, since this may eventually correspond to 'harking', or hypothesising after the results are known. Maybe this is a point to consider by the authors in future submissions. In that same context, I would refrain from using the word 'hypothesize' in section 3.5. Use 'conjecture' instead of 'hypothesize', since there is no proper hypothesis testing related to this statement.

Considering the statements made above, I consider that this manuscript has been substantially improved and only requires what I would consider technical amendments prior to publication.

Response 1:

Thank you for your thoughtful and constructive feedback. We sincerely appreciate your suggestion regarding the inclusion of a clear hypothesis in the introduction. After careful consideration, we have added the following hypothesis to the last paragraph of the introduction to clarify the research direction and further emphasize the novelty of our work:

"We hypothesize that the generation of delayed stormflow is governed by threshold-dependent interactions between soil water content (SWC) and groundwater level (GWL)." **(Page 5, Lines 104–106)**

This hypothesis is based on the foundational findings of Cui et al. (2024), which first identified the role of shallow groundwater thresholds in bimodal runoff events, and is further supported by preliminary analysis of SWC-GWL interactions within our dataset. Importantly, the hypothesis was formulated prior to conducting detailed statistical tests, focusing on causal mechanisms (such as

threshold dynamics and connectivity) rather than retroactively fitting conclusions to observed results. By including this hypothesis, we aim to strengthen the theoretical framework of our study, while maintaining consistency with the original objectives.

We also acknowledge your concern about the potential for HARKing. To clarify, the hypothesis builds on previous research rather than speculating after the results were known. We hope this addresses your concern.

Regarding your comment on section 3.5, we have replaced the term "hypothesize" with "conjecture," as you suggested, to better align with the nature of the statement and avoid the implications of post-hoc hypothesizing. **(Page 20, Line 384)**

Once again, thank you for your valuable feedback, which has significantly enhanced the manuscript.

Specific comments:

Comment 2:

Title: I would suggest adding 'dynamics' to 'Delayed stormflow generation in a semi-humid forested watershed controlled by soil water storage and groundwater dynamics'.

Response 2:

Thank you for your insightful suggestion. We agree that the inclusion of "dynamics" enhances the clarity and specificity of the title. As per your recommendation, we have revised the title to "Delayed Stormflow Generation in a Semi-humid Forested Watershed Controlled by Soil Water Storage and Groundwater Dynamics." We appreciate your constructive feedback and will make this adjustment in the revised manuscript. **(Page 1, Line 2)**

Comment 3:

Line 77 & 78 (track changed version): The sentence 'Nonlinear pattern, including both the timing and magnitude of the response.' is unclear – there must be some missing elements here.

Response 3:

Thank you for your valuable feedback. We agree with your observation that the sentence lacked clarity. To address this, we have revised the sentence to: "This nonlinear pattern, characterized by both the timing and magnitude of the response, plays a crucial role in understanding stormflow processes." This revision aims to more clearly articulate the significance of the nonlinear pattern and its role in providing insights into both the timing and magnitude of the runoff response. **(Page 3, Lines 62–64)**

Comment 4:

Lines 98 – 100 (and further down in the manuscript): I do not fully share the statement that Martínez-Carreras et al. (2016) did not consider processes and mechanisms behind the double-peak behaviour in their catchment of interest. They identified catchment storage (and subsequently bedrock type and related heterogeneity in weathering degrees and permeability) as controlling factors.

Response 4:

Thank you for your valuable feedback. We appreciate your clarification regarding the work of Martínez-Carreras et al. (2016). We acknowledge that their study did indeed identify catchment storage and related factors, such as bedrock type and weathering degrees, as controlling factors influencing double-peak behavior. To better reflect this, we have revised the sentence as follows:

"Similarly, Martínez-Carreras et al. (2016) observed delayed peaks and identified catchment storage as a key factor influencing streamflow responses; however, they did not explicitly differentiate the underlying mechanisms between unimodal and bimodal responses."
This revision clarifies the focus of their study while acknowledging the role of key factors in their analysis of streamflow responses. We appreciate your input, which has helped us improve the accuracy of this statement. **(Page 4, Lines 79–81)**

Comment 5:
Figure 2. I would suggest replacing 'Definition sketch …' by 'Conceptual framework of rainfall event analysis'.
Response 5:
Thank you for your thoughtful suggestion. We agree with your comment and have updated the caption to "Conceptual framework of rainfall event analysis" to better reflect the intent of the figure. **(Page 9, Line 201)**

Comment 6:
Line 318 (track changed version): I would not use the term 'scenario' here, but rather 'case'.
Figure 4: Write 'UpSet' instead of 'Upset'.
Response 6:
Thank you for your valuable feedback. We greatly appreciate your suggestion and have revised the text accordingly. The term "scenario" has been replaced with "case," and we have corrected "Upset" to "UpSet" in the caption of Figure 4. **(Page 10, Line 225 and Page 11, Line 242)**

Comment 7:
Line 383 (track changed version): I suggest that 'schematic representation' is replaced by 'conceptual representation'. Likewise in figure caption of Figure 7.
Response 7:
Thank you for your thoughtful suggestion. We agree with your recommendation and have replaced "schematic representation" with "conceptual representation" in both Line 383 and the caption of Figure 7. Additionally, we have made the same change to the caption of Figure 6, replacing "schematic" with "conceptual." **(Page 13, Lines 266, 273, 276)**

Comment 8:
Several subsections are noted 1., 2., 3., etc. – I would suggest that they are noted a), b), c), etc. – in the current version this numbering is misleading, as other sections have that same numbering.
Response 8:
Thank you for your valuable suggestion. We agree with your point and will revise the numbering of the subsections from 1., 2., 3., etc., to a), b), c), etc., to ensure clarity and avoid confusion with other sections. We appreciate your attention to detail and will implement this change in the revised manuscript. **(Pages 27-28, Lines 531, 540 and 552)**

The authors sincerely thank the reviewers for their constructive feedback, which has greatly enhanced the manuscript. We believe the revisions effectively address your concerns and further

refine the work. We have submitted the revised version to your esteemed journal and eagerly await your favorable response.

Yours
Zhen Cui, Fuqiang Tian
February 25, 2025