Reviewer Responses to HESS comments re:

Leveraging a time-series event separation method to disentangle time-varying hydrologic controls on streamflow – Application to wildfire-affected catchments

**The comments from HESS and the reviewers are in black and our responses are in blue.

Contents

Referee 1

General Comments

The manuscript is clearly-structured and main points are stated. The author has made efforts to revise and restructure the paper. However, there are a few issues that need to be addressed before it is ready for publication.

Thank you for taking the time to review and provide comment.

Specific Comments

(1)Title: For the revised paper, if you only look the title, I thought your focus of this paper is developing the event separation method and exploring the streamflow hydrologic controls. However, after reading the abstract and introduction, it feels like the overall writing style is still quite focused on exploring the impact of wildfire on streamflow which is you didn't mentioned at all in the title. If you have retained the analysis related to wildfire influences, I suggest modifying the title to something like "Leveraging a time-series event separation method to untangle time-varying hydrologic controls on streamflow—application to wildfire-affected catchments."

We have updated the title per the comment.

(2)Introduction: In current introduction, you only mention the impact of watershed disturbances

to the streamflow and the potential controls on the streamflow. Since developing this event separation method is one of the main objectives of your paper, the literature review about the current event separation methods should be added and you also need to mention why you want to develop a new event separation method? What is your motivation to do this?

We have updated the text to introduce the existing event separation methods and provide motivation for the development of the method presented in this work.

Lines 61-75: Investigating large samples of rainfall-runoff events requires automated, transferable methods for time-series event separation. Common rainfall-runoff event separation techniques rely on established baseflow methods to isolate event flow (e.g. Chapman & Maxwell, 1996; Duncan, 2019; Eckhardt, 2005; Xie et al., 2020). Runoff events are then identified where baseflow diverges from total flow (Long & Chang, 2022; Mei & Anagnostou, 2015; Merz et al., 2006; Merz & Blöschl, 2009; Tarasova et al., 2018b). Giani et al. (2022b) identified the need for increased method transferability across watersheds as the baseflow separation methods require multiple calibrated parameters in each watershed. To increase transferability, separation methods use fewer modifying watershed parameters (Blume et al., 2007; Nagy et al., 2022) or time-series signal processing to identify rainfall-runoff events (Giani et al., 2022b; Patterson et al., 2020). The commonly used separation methods are not able to identify sub-daily rainfall-runoff events as many are developed or calibrated to use only daily streamflow (Long & Chang, 2022; Mei & Anagnostou, 2015; Merz et al., 2006; Merz & Blöschl, 2009; Tarasova et al., 2018b). These methods cannot capture the sub-daily rainfall-runoff events that may result from convective rainfall events in mountainous watersheds (Kampf et al., 2016). Further, there are limitations in the existing available separation methods including the lack of identification of rainfall events with no runoff response and the filtering of diurnal cycling influenced runoff events that have limited the application of the available methods in snow-dominated watersheds.

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(3)Line 63: ‘Significant’ is an adjective, and it should be followed by a noun, for example, changed to 'significant factors’.

We have updated the text per the comment.

(4)Table 1: The streamflow, P and PET values in this table look quite strange. The unit for mean annual streamflow/P/PET should be mm/year. The streamflow is listed in m^2/s, which seems incorrect. Did you intend to use m^3/s instead? In addition, typically, catchment PET values are between 500-2000 mm/year, and then they won’t exceed 200 cm/year. Why are your PET values so large, almost an order of magnitude larger than the precipitation values, and nearly 10 times bigger? These annual data might be available in CAMELS-US dataset, it will be worth to carefully check on this.

We have updated the table 1 and associated text per the comment. The values and units for mean annual PET and mean annual precipitation have been verified against the Gages-II (Falcone, 2011) dataset. The units for mean annual PET have been corrected to mm and the values for mean annual precipitation have been converted to mm for consistency. The Gages-II dataset (Falcone, 2011) is a commonly used and accepted catchment attributes dataset for USGS gages in the USA. Precipitation and PET values from the Gages-II database were compared for three watersheds also within the CAMELS-US dataset. Differences in precipitation and PET values were attributed to differences in the estimation method used by each dataset. The values for mean annual streamflow have been converted to mm for consistency across variables. The values listed for Arroyo Seco, have been cross validated with Bart (2016).

(5)Conclusion: Can you remove the mention of Q1/Q2/Q3 in this section? I don't think it's necessary.

We have updated the text per the comment.