

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2  
<https://doi.org/10.5194/hess-2021-357-RC2>, 2021  
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## **Comment on hess-2021-357**

Anonymous Referee #2

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Referee comment on "Event controls on intermittent streamflow in a temperate climate"  
by Nils Hinrich Kaplan et al., Hydrol. Earth Syst. Sci. Discuss.,  
<https://doi.org/10.5194/hess-2021-357-RC2>, 2021

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This study focuses on the factors that explain whether a precipitation event results in a streamflow response in intermittent streams or not. It uses an amazing dataset of flow observations for many different sites with intermittent flow in a catchment in Luxembourg. Because streamflow intermittency depends on geology, the analyses are done for sites and catchments underlain by three different geologies. The authors do not only compare the mean values of the event characteristics for the events that led to streamflow and those that didn't, but also analyse the relative importance of these factors in a random forest model to predict the occurrence of flow or no flow. The work is very interesting, novel, and based on an incredibly large dataset. I find the methods robust and the analyses solid (though I am not an expert on random forest modeling). However, the introduction and particularly the discussion section of the manuscript are not strong and the writing could be improved. The work is not put in a larger perspective and instead the specific results for the specific sites or catchments are discussed. More discussion on how this work fits into the limited but rapidly expanding literature on dynamic stream networks and streamflow in intermittent streams would significantly strengthen the manuscript.

My main comments are provided below. Additional comments and suggestions are provided in the annotated pdf.

- The streamflow and soil moisture data were collected at an impressive number of sites but it is unclear how they were selected and how they are related. Did you use the catchment average scaled soil moisture data or the scaled soil moisture data from the nearest site for the analyses? How were the sites selected?
- Some sites are referred to as logging tracks. This was confusing to me. What are they? Ditches along roads that occasionally flow? Or erosion channels that have occasional flow? Or are these real streams? What is your definition of a stream? It would be useful if this was clarified in the text a bit more and if it was more clearly indicated which sites are ditches or roads or logging tracks and which are stream channels.

- Some basic information on the study catchment is missing. What is the drainage density? What is the average soil depth? Also what data was used to determine the catchment boundaries and the stream network that is shown in the maps?
- The different measures that represent the antecedent wetness conditions (soil moisture at 10 and 50 cm and API7 and API14) are probably highly correlated. I understand that the random forest approach is not very sensitive to correlation between predictor variables but still it would be good for the reader to know how well these different predictors are correlated. Can you include a plot or table that shows the correlation between all of the predictors?
- P12L10: Did you do the t-tests for each site individually or as Figure 4 shows grouped per geology? This unclear from the text. Also were they one-sided or two-sided?
- P17L3: The models for sites with an unbalanced number of flow and no-flow events are not acceptable. What does this tell us? Does it just mean that we can't use the random forest approach in these cases or that we need more data for these cases, or does it mean that other predictor variables need to be used? A bit more information and discussion on this would be very helpful.
- The discussion section tries to infer runoff generation mechanisms for the catchments on the three different geologies. However, it doesn't really focus on the intermittent stream dynamics themselves, nor how this work improves our understanding of what drives streamflow responses in intermittent streams (P1L27), which is the main topic of the manuscript and the research questions. There is almost no comparison of the results with other studies on intermittent streamflow responses (e.g., Jenssen et al, Zimmer et al., Durighetto et al., Warix et al., Hale and Godsey, etc.). Instead, the inferences and discussions are all related to other studies in this catchment. As such, it is a narrow discussion that is focused on this catchment and doesn't go "beyond" this study catchment. I suggest that the authors significantly revise the discussion and focus much more on comparisons with other studies on intermittent streams and what these results mean for people who want to understand or predict which reaches are likely to respond to certain events and which don't. For example, after reading the manuscript, it is still not clear to me if other studies found similar predictor variables to be most important or if all of these results are unique. This is a petty because the dataset is very novel and the manuscript could have a much larger impact.
- The section on the uncertainties in the classification of events etc is good but there is no discussion on how good the random forest models are. It is clear that the poor models were excluded from the analyses of the most important predictors but are the models that you included good or just barely OK? Would this approach allow you to predict the streamflow response at a site? If so, how good or bad would that prediction be? If you used a model that was created for one site for another site on the same geology, would that lead to a reasonable prediction of the occurrence of a flow response? I realize that this study is not about modeling the streamflow responses per se but some discussion of how good or poor the models are that you use to determine the most important predictors – and thus how good these predictors are - would be very useful.
- The writing and organization of the text can be improved. The order of several paragraphs is not very logical as important information comes too late. Also several sentences are either too long or more often are written too cryptic with articles and commas missing. The results should be written in the past tense as these events occurred in the past. Furthermore, it would be good to use more consistent terminology (runoff or streamflow, not both for the same thing, reactions or responses, etc.). I am attaching a marked-up pdf. I am not asking the authors to implement all of these suggestions but hope that they can use this as an indication on how and especially where to improve the writing and structure of the manuscript. The results sections 4.1.1 (page 12) and 4.1.2 (page 14) could probably be shortened as most of these values could be shown in a table as well.

Please also note the supplement to this comment:

<https://hess.copernicus.org/preprints/hess-2021-357/hess-2021-357-RC2-supplement.pdf>