Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2019-276-RC1, 2019

Hydrology and Earth System Sciences
Discussions
Open Access
EGU

Interactive comment on "Characterization of event water fractions and transit times under typhoon rainstorms in fractured mountainous catchments: Implications for time-variant parameterization" *by* Jun-Yi Lee et al.

Anonymous Referee #1

Received and published: 23 August 2019

A transfer-function hydrograph separation model is used to examine event water fraction and transit time of typhoon rainstorms in steep catchments in Taiwan. Few studies of isotope hydrograph separation that involve event water fractions and transit times in high rainfall, subtropical, and steep catchments have been reported in the literature. In addition to a novel catchment setting, a time-variable sensitivity analysis is used to infer processes and controls on event water fractions and characteristics of event water transit time distributions. The results are placed in context with data generated from literature values and show that rainfall intensity influences event water fractions

Printer-friendly version

Discussion paper

and characteristics of the transit time distribution. The primary innovation of the study is the application of an existing model to a new setting and the event-dependent and time-variant sensitivity analysis. The study provides additional examples of a model, i.e., a transfer-function hydrograph separation model, that is not widely used, but has a place in the evaluation of event-based isotopic data to improve hydrologic process understanding. The authors conclude the manuscript with a conceptual model that synthesizes hypothesized footpaths and processes across a range of rainfall intensities.

In general, the manuscript makes nice contribution at improving the use and interpretation of transfer-function hydrograph separation models. However, the discussion is fairly one-dimensional (e.g., mostly focused on how rainfall intensity influences event water dynamics) and misses opportunities to connect the time-variable nature of the sensitivity analysis to time-variable transit time studies (e.g., storage selection ideas). In addition, the comparison with catchment structural controls from the literature needs some improvement. For example, little information is provided about the fracture system in the catchments and the authors assume that is part of the reasoning for differences compared with literature values when it could very well be related to soil depth distributions or other aspects of catchment structure. In other words, the conclusions related to bedrock fractures and preferential flow could be strengthened with more evidence that these processes are important over other controls. The authors also compare their transit time findings with those in the literature when some of the literature studies did not examine event water transit time, but rather transit time of total streamflow. This should be sorted out better throughout the manuscript.

The manuscript also requires revision for readability, grammar (plural vs. singular, verb tense, missing “the,” etc.), and sentence structure. I found the manuscript not easy to read, but I could follow the general ideas quite well. I did not note all the editorial problems because they are numerous. I suggest a professional editor.

Specific Comments:

Line 26: Suggesting that the transit time "implies information" about something is not quite right. It is the investigator who makes a linkage and implies something about process. Please revise.

Line 29: not only the mean, but other characteristics of the transit time distribution as is discussed in the manuscript (e.g., shape parameters of distributions).

Line 32: Please be clear about what is meant by "event driven pollution." Perhaps give an example.

Line 35: It is not clear to me what the authors mean when they say "tracer-aided rainfall-runoff models." I would also suggest thinking about how the concept of storage selection fits (e.g., Harman 2015).

Line 37: not clear what is widely applied.

Line 41: are lacking in hydroclimatic diversity?

Lines 47-48: This paragraph is convolving the idea of transit time in a general sense (e.g., total stream discharge) vs. event water transit time. For example, I do not believe that McGuire et al. or Tetzlaff et al. ever mention event water. Please keep these as distinct topics.

Line 49: Sentence beginning with "Besides" is unclear.

Line 51: What is a "general picture of global MTT"? Please clarify.

Line 58: Catchments that are compared have comparable mean slope. The evaluation of this hypothesis seems rather weak. Also, other the catchments that are compared have fractured bedrock as well (e.g., the Oregon site, see Gabrielli et al. 2012).

Line 67: Given that one of the hypotheses of this study is related to bedrock fracture flow and the preferential nature of flow paths contributing to streamflow, I would recommend provide additional background/context in the site descriptions. Any information the authors can provide to help provide convincing arguments on controls on the event

water dynamics.

Line 68: Inceptisols and Entisols (spelling) are plural. Also, are the near-stream soils one of these orders? That is not clear.

Lines 97-98: While the supplement describes how spatial variation of the isotopic composition was assessed, it is so critical given the size of the catchments that some of those details should be included in the main text. Further, the assessment provided in the supplement is only based on two storms and from collectors are relatively low elevations. Most of the area of these catchment is above 300 m and altitude effects on rainfall are known to vary by about -0.2 per mil per 100 m. This is should be addressed in the manuscript.

Line 129: This is confusing to me. Why are the amounts and composition assumed a uniform value when you have data on the time variation and the model uses this variation to compute the event water fraction? Does this defeat the purpose of the TRANSEP model?

Line 230: Discussion

Lines 242-43: Can you really claim that catchment area is not “a control” with only two catchments? Your results support previous studies, but your results do not “indicate” that.

Line 270: I cannot find that McGuire and McDonnell examined the correlation between rainfall intensity and MTT_ew. You could say that it is suggested by data presented in McGuire and McDonnell.

Line 277: The term squeezing is not clear.

Line 287: Instead of perplexed, how about “there was no clear relationship?”

Line 300: I think some caution is needed here and throughout the discussion where event water results from this study are compared with other studies when some of the

other studies focused on transit times and distributions that represent all streamflow not just the event water. These distributions are likely very different and not comparable. The discussion also never addresses what is unique about typhoon systems. This seems like one of the main contributions of the study, but it is not made clear in the discussion.

Line 307: What does a “fixed flow path without dispersion” mean?

Line 315: What does a “internal operation in simulation” mean?

Line 324: sensitivity

Line 325: “the timing of dominance of a given parameter or a process” is not clear.

Figure 3: Please include error bounds on isotopic simulations too. Also, be consistent with label and label subplots with letters a through f.

Figure 4: Move y-axis label of sites to the left of the precipitation.

Figure 5: provide slope ranges for gentle and steep.

Figure 7: Label y-axis for subplots a. Also, please add a description of the dashed vertical line in these graphs.

References: Other published work that is relevant and could be added to the literature values in the analysis is by Mosquera et al. (2018).

Gabrielli, C. P., McDonnell, J. J., & Jarvis, W. T. (2012). The role of bedrock groundwater in rainfall–runoff response at hillslope and catchment scales. Journal of Hydrology, 450, 117-133.

Mosquera, G., Segura, C., & Crespo, P. (2018). Flow Partitioning Modelling Using High-Resolution Isotopic and Electrical Conductivity Data. Water, 10(7), 904.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2019-276, 2019.