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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Concentration-discharge relationships vary among hydrological events, reflecting differences in event characteristics" *by* Julia L. A. Knapp et al.

Anonymous Referee #1

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General comments:

This study examines the concentration-discharge (c-Q) relationships of several solutes at the scale of individual storm events and across the entire two-year study period in the Swiss Erlenbach catchment. The authors use the similarities and differences among solute c-Q slopes and intercepts to make inferences about the timing and hydrologic sources of streamwater in the catchment. The study also correlates the c-Q slope and intercept values with a wide variety of environmental controls to identify the most important regulators of solute transport within the Erlenbach catchment.

I commend the authors for undertaking a sampling regime intense enough in both its

frequency and duration to permit the development of such a unique dataset. High-frequency precipitation and stream sampling can be difficult during a single event, not to mention across multiple events. It is unfortunate that the nature of the Erlenbach catchment's hydrology was such that the study's sampling regime could not fully capture the c-Q responses across the complete hydrograph of the sampled storms. However, the authors made a convincing case for constraining their analysis to only the recession limb data, and they were mostly careful to not extent their inferences beyond where their limited dataset would allow them to go. I include the caveat "mostly" because I do question the description of a two-year, growing season only dataset as "long-term". This is perhaps a minor quibble, but I think it would be more accurate to describe the full dataset as "interannual" rather than "long-term". Overall, the authors present an interesting study of c-Q relationships at the catchment scale, highlighting important differences in biogeochemical responses observed across a range of temporal scales. This manuscript may be acceptable for publication in HESS, provided the authors address the specific comments outlined below.

Specific comments:

L99: How long did the precipitation funnel sit out in the open prior to the onset of rainfall? I am curious whether some of the solute concentrations in the early precipitation samples during events might have been biased by the addition of dry deposition on the funnel surface.

L121-122: Related to my previous comment, I'm curious how often it was the case that the first precipitation sample collected during an event was classified as an outlier. It might not affect your overall results much, but depending on how important a source dry deposition is in the study catchment, it might be worth considering.

Also, I think it's important to provide additional details about the identification of outliers in the dataset. Was there a threshold that you set, or did you truly just "eyeball" the dataset? For example, how did you identify outliers in the case of solutes that had more

variable (less tight) spreads? What proportion of the entire dataset was identified as outliers?

L125 and L134: The word “aggregated” is kind of vague. Does this mean you averaged the data? Calculated the median?

L174-175: Did you consider how this flux index might be affected by accumulated dry deposition on your precipitation collector? This would be more important for some ions (e.g., nitrate, chloride, maybe sulfate) compared to others.

L205-210: How many of the 30 events that you sampled fell into the category of being “not well constrained”? I can understand why you would want to limit your analysis to only those events for which the c-Q relationships were relatively straightforward, but this approach also kind of seems a little like “cherry picking” to me... From a practical standpoint, I completely understand the need to make such decisions about whether and when to exclude data (assuming they constitute a small percentage of the overall dataset) but I wonder if by limiting your dataset in this way, it also means that you’re excluding some potentially important information about biogeochemical processes at event timescales. Those high RSEs are caused by something, and if they are attributable (even in part) to environmental and/or hydrologic drivers, there could be some very useful insights to be mined out of that variability.

L678-680: Somewhat related to the previous comment: do you seen smaller uncertainties within events relative to the variability between events because you have removed from your analysis the storms with elevated RSEs?

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