Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2018-301-RC3, 2018

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Real-time observations of stable isotope dynamics during rainfall and throughfall events" *by* Barbara Herbstritt et al.

Anonymous Referee #3

Received and published: 26 July 2018

The discussion paper "Real-time observations of stable isotope dynamics during rainfall and throughfall events" presents an suitable approach for continuous observation of stable water isotope composition in precipitation and throughfall at the plot level. The paper is very well structured and written. The presentation of results is in general very clear and straight forward. I think, however, that the discussion could be extended in order to explain the findings or show that with the given data no explanation is possible. The focus of the paper is to test the methodological approach. But as the approach was tested in a natural environment, possible natural influences should be discussed e.g. the possible effect of different initial rainfall δ18O values for different events and and its possible relation to low isotopic ratios for events with antecedent dry conditions. This could be linked to the level of rainout of the air mass before the events.

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The discussion also lacks relating the results to the existing literature. Some examples are given below, but the revision should not be restricted to these examples. Right now, the discussion only provides two citations and one of it is a self-citation. Beside this, the following specific comments should be addressed before the publication of the manuscript in HESS.

Page 2, Line 5: “These effects”: The before mentioned effects include “mixing with water from previous events”, which does not affect the mean amount of weekly sampled TF compared to Pg. Please improve the wording.

Line7: Not the absolute interception loss is higher for small events, but the relative loss compared to rainfall.

Line 8: Insert “depth” after TF at the end of the line.

Line 13: “isotopic composition” please indicate whether this is related to TF or something else?

Line 16: “94 gauges” These are TF collectors?

Line 18: Change “temporal” to “spatiotemporal”.

Page 3, Methods: The bulk sampling method needs to be added to the methods section.

Line 32: Delete “when measured below the canopy” as TF can’t be measured elsewhere than below the canopy.

Page 4, Line 7: “periodical back flushing” How often was this done?

Line 17: As it hasn’t be said until this point that there was 1 collector for rainfall and one for throughfall the reader can’t understand to what “each collector” is referring to. Please clarify.

Line 23-25: Were all these meteorological variables used in the publication? If not than

keep only those that were used.

Page 5, Line 20: “high rainfall intensities” Consider rewording as the reader does not know if “high” is related to this event or to all events sampled.

Line 22-23: Please reword as it is not the samples that are shown but the isotopic ratios of these samples.

Page 6, Line 4: Change “compared” to “correlated to each other”.

Line 5: The authors might add that the correlation is significant, but rather moderate.

Line 6: Insert “percentage of” before “interception loss” as the absolut interception loss is probably higher for greater rainfall intensities.

Line 8: There is no positive correlation. The weak correlation is not significant.

Line 13: Please rephrase this sentence. “2-2.5 per mille” were not found “in δ18O values”.

Line 17: How was dryness or wetness of the canopy before an event started monitored? I assume that dry and wet is interfered from a certain period of time without rainfall. This should be described in the revised manuscript.

Line 23: If the information about $\Delta\delta$2H is important then I suggest to take it out of the brackets and include it in the sentence with “and” and “respectively”. Otherwise it should be omitted.

Page 7, Line 11-12: Is this in line with the literature? E.g. see (Qu et al., 2014). Please extend the discussion.

Line 21-22: Figure 3 only shows one significant correlation. Please correct this sentence.

Line 21: An explanation should be given why there is a negative correlation of rainfall intensity with interception loss. I can imagine that this is in line with what others have

found for bulk samples. If possible respective references should be added.

Line 21-22: Is this in line with results reported in the literature? See e.g. (Dewalle and Swistock, 1994; Kato et al., 2013)

Line 22: I don't understand what the authors mean with "There is no clear pattern for only one of these variables. . ."

Line 26-27: This needs to be related to what was reported earlier in the literature (e.g. Allen et al., 2013). There is more room for interpretation here. For instance, the difference of δ18O in rainfall and throughfall is presented for different events and discussed, but the level of δ18O of rainfall for different events is not presented. For events for which the degree of rainout from Ocean to inland is low, levels of δ18O of rainfall could be higher. Would it be possible that high initial levels δ18O in rainfall lead to rather smaller increases of δ18O from rainfall to throughfall?

Page 8, Line 7-9: Scatterplots only presented for bulk samples.

Figure 1: For me it is not absolutely clear whether Pg is collected by the same collector for the water that goes through the tipping bucket and that one that is sampled. So is there only one collector for each, Pg and TF, and the water go first through the tipping bucket and then the pump samples the water? Please clarify this in the figure. I think that the triangle within the box illustrates the tipping bucket, right? This must be shown more clearly.

Figure 2: Add "depth" after "Time series of rainfall".

Figure 2: In the text it says that the event duration was only 2 hours, but in the legend a "three-hour bulk sample" is mentioned.

Figure 2: Please provide the date of this event in the legend.

Figure 3: I don't the point in part a) and b) of figure 3. The only additional information is the p-value. But the p-value should be added to the left side figure part for all corre-

lations, e.g. in parentheses below the correlation coefficients. If the reason for a) and b) was to have interception on the x-axis, then it should be plotted as the first variable in the left side figure.

Figure 3: This is not a scatter plot of throughfall samples. Please rephrase the figure caption.

Figure 3: Please indicate in the figure that the intensity is that one of rainfall (and not throughfall).

Figure 3: Please explain in the legend what is shown the lower left und the upper right part of the figure on the left side. Include an explanation, why the size of the correlation coefficients differ. Is that really needed? The small numbers are hard to read.

Figure 3: I suggest adding δ18O of rainfall and throughfall and the length of the antecedent dry period to the scatter plot.

Figure 4: Please shift the right figure to the left side as it is mentioned first in the text.

Figure 5: Which of these events are shown in figures 2 and 6?

Figure 5: There are events for which $\Delta\delta$18O increases with time and others with an opposite trend. Does $\Delta\delta$18O correlate with δ18O of rainfall per event?

Figure 6: Indicate the date of this event.

Figure 6: Delete “amounts,” from the first line of the figure caption.

Figure 6: The colours of d_Pg and d_TF are hard to distinguish.

Figure 6: Why did throughfall start before rainfall?

References:

Allen, S.T., Brooks, J.R., Keim, R.F., Bond, B.J., McDonnell, J.J., 2013. The role of preâĂŘevent canopy storage in throughfall and stemflow by using isotopic tracers. Ecohydrology 7, 858–868. https://doi.org/10.1002/eco.1408

Dewalle, D.R., Swistock, B.R., 1994. Differences in oxygen-18 content of throughfall and rainfall in hardwood and coniferous forests. Hydrol. Process. 8, 75–82. https://doi.org/10.1002/hyp.3360080106

Kato, H., Onda, Y., Nanko, K., Gomi, T., Yamanaka, T., Kawaguchi, S., 2013. Effect of canopy interception on spatial variability and isotopic composition of throughfall in Japanese cypress plantations. J. Hydrol. 504, 1–11. https://doi.org/10.1016/j.jhydrol.2013.09.028

Qu, S., Zhou, M., Shi, P., Liu, H., Bao, W., Chen, X., 2014. Differences in oxygen-18 and deuterium content of throughfall and rainfall during different flood events in a small headwater watershed. Isotopes Environ. Health Stud. 50, 52–61. https://doi.org/10.1080/10256016.2014.845565

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