

Interactive comment on “Decoupling of dissolved organic matter patterns between stream and riparian groundwater in a headwater forested catchment” by Susana Bernal et al.

Anonymous Referee #1

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The manuscript entitled ‘Decoupling of dissolved organic matter patterns between stream and riparian groundwater in a headwater forested catchment’ by Bernal and others focuses on the role of in-stream transformative processes on DOM concentration and composition by comparing the DOM found in riparian groundwater (source of DOM to the stream) and stream water across 1+ years. This type of research is key in understanding how streams potentially process and transform terrestrial DOM, which adds to our growing knowledge of streams acting as both pipes and reactors of terrestrial organic matter. The authors use a combination of approaches from calculating reach-scale DOC and DON budgets to estimate the loss or export of DOM along with the compositional characteristics of DOM (e.g. PARAFAC). The authors were able to

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illustrate that streams do indeed transform and process DOM during base flow conditions in terms of concentration, but also composition. Overall, the paper was well written and I liked the approaches the authors used to address the role of in-stream transformation of terrestrial DOM. However, I have a few general and specific comments to help improve the manuscript regarding data description and interpretation.

General Comments

The tributaries contribute a significant proportion of the stream water discharge to this study reach (e.g. approximately the same stream discharge as the top of the reach, Table S3), yet there is little to no discussion of the contribution of this source to the stream. How does the influence of the tributary perhaps drive U of DOC and DON? Was the DOM composition from the tributaries similar to that of the main stem? I don't think any new analysis is needed, but simply a description of the findings and perhaps some discussion on how these tributary inputs may (or may not) drive the changes in DOM that is observed along the main stem.

Given the data set, I was missing the spatial patterns of the DOC and DON along the stream reach. It would be nice to see or give a description of the longitudinal trend of DOC and DON along the study reach. Did the 15 sampling locations along the reach vary greatly in terms of DOM concentration or composition? How much did the groundwater differ along the reach? Did the Cl⁻ concentrations, as the non-reactive anion, vary along the reach as the stream water discharge increased? How did this change in relation to the DOM? Similar to my comment above, I don't think new analysis is warranted – but simply a figure depicting an example of the potential variability of the DOM concentration (DOC and DON) and composition along this 3+ km study reach.

Referring to Figure 6, given that the error bars for UDOC and UDON overlap 0, I count 2/10 days where $U > 0$ for DOC and 4, maybe 5 dates where $U > 0$ for DON. I understand the median value is above 0, but given the variability (i.e. the error bars), $U = 0$ cannot be discounted. I suggest the authors re-cast the results to explain this result and

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therefore their interpretation more clearly (in reference to text P9 L11).

Also, did the authors at all consider residence time of the reach in terms of DOM processing (e.g. Casas-Ruiz and others 2017 L&O)? What was the average velocity of the stream reach among sampling dates? And residence time would be a more important factor at base flow than storm flow. While obvious to some, perhaps mention this within the discussion.

Overall, the manuscript presentation is clear and concise. Any comments that I may have had regarding grammar or writing was extremely minor (see below).

Specific Comments

P1 L23 – non-LLF rather than no-LLF

P1 L24 – I suggest changing ‘reflex’ to ‘reflection’ (or reflects) here and throughout the manuscript. Reflex could indicate an opposite or opposing outcome whereas ‘reflect’ and ‘reflection’ indicates similarity. Similarity is what I think the authors intend within this context.

P2 L18 – This is very minor, but I would re-cast ‘important’ as your readers may not understand what is deemed as important in this context. Perhaps recast to ‘a significant fraction’?

P3 L6 – Is there a citation for the carbon vehicle hypothesis?

P6 L7 – The authors calculated uncertainty in U (uptake or generation) based on the variability on stream water Q. Did the authors also consider the variability in the DOM and DON concentrations as well, as flux estimates will vary based both on Q and concentration variability?

P6 L11 – for consistency and clarity, instead of referring to ‘release’ ($U < 0$) as ‘opposite’ of uptake – call it ‘release’.

P6 L17 – typo – ‘steam’ to ‘stream’

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P9 L8 – typo - ‘no’ to ‘not’ statistically significant

P9 L23 – I suggest re-cast for this latter part of the sentence — minor changes – but perhaps ... ‘stream water and riparian GW to investigate whether stream DOM reflected terrestrial sources or if in-stream processes modified DOM quality.’ Elucidate has the same meaning as ‘estimate’ – but I don’t think ‘estimate’ is the proper word here within the context of this sentence (unless you modify the sentence to ‘estimate fluxes’ or something similar). Also, see my comment above – ‘reflex’ should be ‘reflect’ – and were able to modify – can be simplified to ‘modified’.

P10, L20 – The authors already include a number of citations explaining why the uptake rates of DOC and DON were 10-1000 fold lower than rates of in-stream DOM uptake from reported experiments, but I think they should include Mineau and others 2016 – as this particular review paper discusses that ambient DOM uptake «« than DOM uptake using simple sugars, etc. . .

Mineau, M. M., Wollheim, W. M., Buffam, I., Findlay, S. E. G., Hall, R. O., Jr., Hotchkiss, E. R., et al. (2016). Dissolved organic carbon uptake in streams: A review and assessment of reach-scale measurements. *Journal of Geophysical Research: Biogeosciences*, 121(8), 2019–2029. <http://doi.org/10.1002/2015JG003204>

P11 L2 – typo ‘tan’ to ‘than’

P11 L8 – change ‘what’ to ‘which’ reinforces their potential. . .

P11 L9 – suggest deleting ‘as merely’

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2017-511>, 2017.

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