

Biogeosciences Discuss., author comment AC1
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Reply on RC1

Niek Jesse Speetjens et al.

Author comment on "Dissolved organic matter characterization in soils and streams in a small coastal low-Arctic catchment" by Niek Jesse Speetjens et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2021-317-AC1>, 2022

*We thank the reviewer for his/her comments in formatted **bold** and would like to respond with the following answers:*

The EC at the outlet is rather high (954 uS/cm) is there tidal influence during base flow? Perhaps this is a typo? Looking at supplementary values they are around 90-100's uS/cm, maybe the authors meant a mean of 95.4? Otherwise, if this is correct, was salinity taken into account in terms of DOM behavior at the outlet? As well as comparison between tributaries, main channel, and the outlet?

This is correct, we have taken the mean over the entire monitoring period, including the storm event induced EC peaks. We do not think there is tidal influence during baseflow, but it seems there is during storm events. We will add a line stating the mean EC \pm std when omitting these peaks. The mean EC value then becomes 100 ± 14.0 uS cm⁻¹.

Could you offer an explanation for why DOC dilutes but POC increases during storms (line 365)? Could this be weaved into the discussions of DOM sources in the discussion? POC is not mentioned very much further on, although I am cognizant that it's a small contribution to the DOM pool.

Thank you for your question, I will further clarify my interpretation of this phenomenon in the discussion as follows: The release of DOC seems to be fairly consistent and unaffected by storm events, hence adding water to the system in the form of precipitation basically dilutes the DOC concentration. For POC however this is a different story: The low-energy system that is this coastal tundra plain catchment mobilizes low quantities of POC during baseflow conditions. Presumably this low-flow POC consists primarily of relatively fresh in-stream production. During storm flow, a combination of increased runoff and wind-driven stirring of the water column of ponds, lakes and streams mobilizes POC that is otherwise not in suspension. Hence the peak in POC concentration during stormflow. Also this POC showed a more enriched $d^{13}C$ value, pointing towards the influx and/or suspension of more terrestrial OC.

In lines 507-509, you mention DOM flushing with runoff, are POC values greater in these sites? IF the data is available, perhaps they could be mentioned? Could be another piece of evidence of this and role of storms on this watershed, especially in the switch of DOC:POC ratios.

We do not have data supporting this unfortunately. Moreover, it seems that POC flushing from soils in this low-relief catchment is not dominant. Hence, the aforementioned statement is directed at the flushing of leached DOM from the soil and/or degradation of leached DOM within the soil. Since HCP is generally more well drained we suggest that degradation of DOM (better drainage = better aeration) as well as flushing of DOM is more promoted in HCP.

Figure 4a and line 384 - Perhaps add a letter map to show these differences or no difference? I know the figure is already busy, but these details will help orient the reader when looking at the figures. It's really hard to differentiate between permafrost and active layer boxplots. Is it possible to change the fill of the boxplots to make this more clear? Maybe a translucent green and orange like in other figures. Or any slight change to make the boxplot fill pop out a bit more. And while on Figure 4, the "*" and "g" are really hard to see.

*Thank you for your note, we changed the color and visibility of 4a. The * and g are not easily improved, we will colorize them in a bright color to make them more visible.*

I wonder if the very high SUVA value should be removed and mentioned parenthetically? This might help to make the section starting in 425 a bit more fluid and clearer. A SUVA value that high is also odd so perhaps take away some of the attention given to it.

Yes, thank you that is a good point. We will remove the mention of the high SUVA₂₅₄ value.

Section 4.2 header is about the mobilization of OM from soils to streams yet most of the subsections are of the soil column processes. Lateral exports of inputs to streams are not mentioned until the very last paragraph. Is it possible to elaborate a bit more on the terrestrial-aquatic linkages in the subsections? Or the contributions from HCP and LCP to the stream? Where possible. Or change the header and remove "to streams".

That is a valid point, thank you. While we do think that aquatic DOC processing already starts within the soil (so that is where the terrestrial-aquatic linkage/journey begins) we agree that there is little stream focus here and have removed the "to streams" from the header.

In line 580, could you briefly mention the range of other studies in comparison to yours, just to help put think into context and a quick refresher for the reader.

This makes sense, we have added "(0 – 67% BDOC) (Vonk et al., 2015)".

Have you considered the role of photodegradation in the temporal declines of CDOM and DOC (pint iii in section 4.3)? This might be another aspect of the OM dynamics in addition to changes in temperature?

We have considered it, but think that it is unlikely this relates to the gradual decline in CDOM/DOC because (i) in August the average hours of daylight are slowly declining, and (ii) there was more rain/cloudy weather towards the second half of our monitoring period.

Technical Corrections:

Add a comma between layer and primary in line 466

Thank you for your comment, we have added the comma.

Line 544-545, the wording here is confusing, some clarification is needed on what is meant by "leaches less than more degraded"

Thank you for pointing this out, we have rephrased: "We interpret this as a high abundance of fresh plant material, which releases less DOM per unit time than more degraded plant material (i.e. living plant material has a lower leaching potential)".

Line 553, remove "be" after "is".

Done

Add a comma between "event" and "and" line 674

Done

Figure 3, a minor detail, in panel a, are POC and DOC on the same axis? Is it possible to this to the axis label for clarification?

This is a bit unclear indeed but because we didn't want to repeat axis for DOC on the right side it is only plotted on the left-hand side of the plot. Hence the [DOC] axis is continuing from the plot on the left to the plot on the right in the top panel a. The same holds for $d^{13}C$ in panel b. We will clarify this in the caption.