

Biogeosciences Discuss., referee comment RC1
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Comment on bg-2021-317

Anonymous Referee #1

Referee 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-RC1>, 2022

Review Speetjens et al Biogeoscience

In this manuscript by Speetjens et al, they have characterized DOM in soils and streams in a small costal watershed in the Yukon coastal plains, Canada. They collected a large representation of samples (outlet, tributaries, main channel, porewater, and soil) across 3 types of polygon types and active layer and permafrost layers. A subset of these samples were used in an incubation bioassay to determine bioavailability of DOM. Across all polygon types and depth, DOM characteristics (quantity, composition, and sources) varied widely but they generally found that porewater was highly bioavailable, DOC is the predominant form in streams, and the permafrost is the major contributor of DOM to the watershed.

This paper is very well written and organized and I believe it will be very well received by the Pan-Arctic community. One of the strengths of paper is that they focus on small headwater watersheds, which are topically overlooked in Arctic studies as well as global OM budgets/studies. They also help to better understand the linkages between terrestrial and aquatic ecosystems and OM fluxes between these, where there are still some knowledge gaps, especially in sensitive ecosystems like those dominated by permafrost. This study also helps feed global C models by contributing the headwater watershed DOM dynamics that are usually lacking in these efforts. Especially in polygon tundra settings.

I found this manuscript interesting and have some minor comments:

Specific Comments:

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

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 cognisant that it's a small contribution to the DOM pool.

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.

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.

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.

Section 4.2 header is about the mobilization of OM from soils to streams yet most of the subsections are of the soil columns 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".

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.

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?

Technical Corrections:

Add a comma between layer and primary in line 466

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

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

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

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?