

While this manuscript is greatly improved from the first iteration, it still requires considerable changes to support the main message of the work. In my opinion, the authors have not presented a cohesive message throughout the work and would benefit from more time to revise and clarify the points being suggested. If there was another step in between major and minor revisions, that would be the best suggestion for this work. Certainly, it has improved, but requires some major reorganizing and some minor tweaks. The best advice I can provide to the authors is to use the introduction to set the stage for the novelty of the work (which did improve) and use that platform throughout to tell a cohesive story. Reading this work generated three main themes, small catchments are important, standing and flowing water is important, and comparisons between high arctic and low arctic environments are important. This is in light of the disturbance regimes being tested from the perspective of C quality. Clarify the main theme, support your theme with strong topical statements at the beginning of the results and discussion sections. The results section still requires considerable work to support the main theme of this research project. The data is there, even some data that was eliminated. Report and discuss it all in a way that strengthens your argument for the importance of small catchments AND low to high arctic comparisons. A good deal of explanation is provided for the removal of the data that had precipitates, but I was left wondering whether or not that was one of the defining differences between high arctic and low arctic environments. Would it make sense to have those different C signals in high arctic environments comparatively after the environment was disturbed? Can we consider reporting that data to prepare other researchers for data that might not be outliers for future work? Were any considerations of contamination discussed? Some of that data seemed to be the most interesting and certainly showed the largest differences between low and high arctic environments. Good improvements so far. Consider these revisions to strengthen the work even further.

Page 1 Line 12: “Climate change is an important control of carbon cycling” reads funny. The first line of the introduction reads much smoother. Consider this edit: Climate change is affecting the rate of carbon cycling, particularly in the Arctic.

Page 5 Line 11: Typo “where” should be “were”

Page 5 Line 29: What does “This was noted down in the lab” mean? Please edit to “This information was documented...” And maybe something that says – these samples were removed from analyses?

Page 7 Line 16: Please add Fig. 3c to the end of this sentence and remove it from the next one. Also, how is this claimed when there are circles and triangles circled together in these groups on Figure 3c? This is very confusing.

Page 7 Line 17: DOC and SUVA data is on a different figure? This sentence seems out of place if it’s referring to the next figure and the next thought is back to A350.

Page 7 Line 17-18: Wasn’t it just stated that there was a difference between these two water types?

Page 7 Line 23-24: “The headwaters in both rivers showed slightly smaller slopes than the samples taken downstream.” What does smaller slopes mean? Which rivers? Is this referring to Fig. 4b? Maybe clarify the use of “slopes” and “S275-295” notation or use “slope values” or “S”. A reader might be looking for the slope of the relationship.

Page 7 Line 25-26: “Standing water samples showed significantly larger slopes ($p < 0.05$) and significantly smaller SUVA ($p < 0.05$) than flowing water samples.” Yes, but I had to look for it, since there are low and high values for standing water. It seems like the standing water samples have data across broad SUVA and S ranges. Perhaps this should report its broad nature, because the text doesn’t match the figure very well. Flowing water looks like a broad distribution too, but less so than standing water.

Page 7 Line 29-30: How can this be stated when it clearly increases between 1500 and 1000 m from the outflow? And again for ICW 30 Jul near the outflow? Consider language like “generally decreased” and edit the sentence accordingly. Maybe report the percent of decrease if that is important?

Page 7 Line 30-32: This is true of most of your other time points. Why is it important to highlight this point for just these two?

Page 7-8 Line 32 and 1: Correct, but it contradicts earlier text. Please correct the earlier statement and move this sentence earlier to improve cohesive reporting.

Page 8 Line 1-2: Please add the date in the text so it matches the figure.

Page 8 Line 6: Add Fig. 5b at the end of this sentence.

Page 8 Line 8: Revise the wording in this sentence to remove “remained with” and insert “had”

Page 8 Line 10-11: This information is not evident by looking at the figure. Can some of this information about between rainfall and post rainfall conditions be made evident?

Page 8 Line 11: This section compares a lot of trends back to DOC concentration. Is that important? Or can a general comment be stated more succinctly about DOC and optical properties generally decreasing longitudinally? Certainly, the values of SUVA for Herschel overlap for ICE and ICW for the first time showing similar character? Would it be helpful to have the data discussed in terms of dates? In general, will any values of AcDOM350 and SUVA be discussed to understand what this character might mean or is it just about reporting increases and decreases?

Page 8 Line 14: This kind of language “values were variable...” could be said for all your measured data points. What is the most important thing to report about the S values? An increase near headwaters and then...? This section should be setting the stage for why this information best informs us about this catchment.

Page 8 Line 15: Add the date in for the first rainfall event in the text to match the figure. It will improve clarity. The remaining part of the sentence is clear and is the first mention of seasonal relationships. Consider this type of language throughout this section.

Page 8 Line 16: Why is this important? This sentence structure “We found lows...” is poor scientific writing. Consider editing this sentence to: “The lowest S values were reported for...”

Page 8: There is a lot going on in this manuscript – different catchments (east and west) and seasonal aspects tracked longitudinally, as well as low and high arctic catchment comparisons. If the main message of the manuscript is to include a never before low to high arctic comparison, then a strong point can be made about the differences of each – individually in their catchments (Do east and west really have different influences and therefore different character? And do different rivers in the high arctic behave similarly?) – and then also as a comparison on low arctic and high arctic scales. The DOC concentration, A350, and EC are all quite different when comparing low and high arctic catchments. The other measured variables are not. Some reporting on this would strengthen the message of the work.

Page 8 Line 25: Please add a comma after composition

Page 8 Line 26: Please use rivers in this sentence for consistency. Delete streams, unless they are streams. Same comment again – or just edit for consistency in Lines 28 and 29.

Page 8 Line 30: Please add a comma after 350

Page 8 Line 31: This dynamic was not captured in ICE? It looks like the same trends are there in the figure. Sure, it was sampled at a longer time interval, but some of those trends seem reasonable, just not as highly resolved as ICW.

Page 8 Line 31: Please include a result of the EC data after rain event 2.

Page 8 Line 32: Delete the word “had”. “Baseflow increased after this rainfall event (Fig. 6a).”

Page 9 Line 2: Please add a comma after 350

Page 9 Line 2-3: “SUVA increases with two spikes in the data.” An example of poor scientific writing. What is important about this result? Please consider revising this to complement the work accomplished, such as, “SUVA increased sharply on August X and Y, describing a shift in DOM composition, followed by a general decreasing trend until August Z.” That way, your readers will associate your measurements change after rainfall events and what’s important about the disturbance of C in your system.

Page 9 Line 3: Please use stronger scientific language. “..a drop in SUVA” can be edited to “decreased SUVA values”. This section should be edited for consistent tense, i.e. past or present.

Page 9 Line 4-5: The scale captures the overall variability in the data for a reader, but can it be stated which direction the data went in the gaps? Those two gaps are right after a rainfall event?

Shouldn't those trends be reported as well? Increased S or decreased S values? Consider describing that information in the text and putting the full scale of those points in the caption, so the figure doesn't eliminate any information completely.

Page 9 Line 12: Fluctuating between AcDOM and AcDOM350. Please check.

Page 9 Line 14: These aren't realistic for natural surface waters, so what could it have been? Could it have been related to disturbed permafrost? Or some kind of contamination? Does Cape Bounty represent something unique about the high Arctic? This is very interesting and I'm curious as to why secondary filtration wasn't attempted? It is still a great deal of samples removed from the data set – 25 out of 55! What would have happened if they were incorporated into the study, but marked appropriately?

Page 9 Line 19 and Figure 7: Suggest plotting SUVA next to AcDOM350 to add to this figure.

Page 10 Line 1: Subheading suggestion: Nature of the DOM concentration and composition relationship across the terrestrial Arctic OR just add the word concentration into the title

Page 10 Line 2: Delete “as found” in this sentence.

Page 10 Line 7-9: Revise for stronger wording: “However, this relationship is not always strong for ecosystems where DOM is strongly altered...” Here's a question: Can't a photodegradation argument be made for your sites during the summer?

Page 10 Line 10: Is this insinuating that the DOM you are tracking may be directly a result of leaching or disturbance from 0-30cm or 100cm depths? Are these permafrost links?

Page 10 Line 26: Is fresh (less altered) referring to less microbially and photochemically altered? So freshly produced? Higher aromaticity = fresh material? And prone to degradation? Higher aromatic freshly produced material – is coming from what? And prone to what kind of degradation? This is an interesting point and should be clarified.

Page 10 Line 28-29: A great point to make about sampling smaller catchments and describing their impact in a changing Arctic climate. This point should be made up front and supported throughout.

Page 11 Line 1 and section: This section seems to be more important up front before the current 5.1 and 5.2 sections. Consider reorganizing the order of these discussion points.

Page 11 Line 11: Fresh DOM is high SUVA? An explanation should be discussed here. Is this freshly produced? Or freshly released? And the next sentence describes fresh as low autochthonous production. Fresh as in – newly introduced?

Page 11 Line 16-20: Check with figure. Both symbols are circled in these groups and a clear relationship is not apparent.

Page 11 Line 22: Please add a comma after “intensity”

Page 11 Line 27: What kind of degradation?

Page 11 Line 28: Deeper in the active layer? Of what? Soil? Permafrost? These are important points to continue to tie together throughout the manuscript. And it suggests that rainfall mobilizes different types of C.

Page 11 Line 30: Please add the word concentration after DOC

Page 11 Line 31-32: Indicative of more decomposed material – meaning the mobilization of more decomposed material from???

Page 12 Line 4: What isotope?

Page 12 Line 6-7: Delete “after the first one” and add “later”. Also, what’s important about this timing to the DOM story?

Page 12 Line 9-10: Was that trend reflected in your data?

Page 12 Line 16: Please add the word concentration after DOC and delete the word “there”.

Page 12 Line 18: The definition of fresh seems to be changing. Consider a usage of it to indicate mobilization.

Page 13 Line 1: Provide a definition of labile here to improve clarity.

Page 13 Line 1-2: You showed that stormflow alters flow pathways? This seems like an overstatement.

Page 13 Line 5: What kind of degradation?

Section 5.3.2: Much improved. Again, the whole 5.3 section should be 5.1 and reordered.

Page 13 Line 14: What kind of degradability?

Page 13 Line 18-19: The objective was therefore to... doesn’t make any sense. Can you elaborate here? Our objective was therefore to investigate the upstream to downstream patterns in smaller coastal catchments to understand...? Tie in the information from the previous sentences.

Page 13 Line 20: Please add a comma after SUVA

Page 13 Line 21: Please add a comma after 295

Page 13 Line 20-21: So what does that mean? What kinds of C are coming in, transforming, whatever?

Page 13 Line 23: This information of the tributary is really important. Add it to the figure.

Page 13 Line 33: This sentence looks cut off. What's the point to be made with these ideas?

Page 14 Line 2: Add the word concentration after DOC

Page 14 Line 5: Use the past tense here.

Page 14 Line 15: Consider ending this section with comparative low and high arctic themes and impact.

Page 14 Line 18: A note on the strength of the message. Permafrost disturbance is continuously happening but exacerbated with rainfall events? Are they connected or not? That message might be good up front and then supported here; it is lost throughout the text.

Page 14 Line 22: And C quality, right?

Page 14 Line 26: Please add a comma after 295

Page 14 Line 27: How can your measurements describe C prone to degradation?

Page 14 Line 28: Streams or rivers? And why is this useful tool for assessing downstream patterns important to your study? Drive the message home?

Page 15 Line 12: Please add a comma after H.L.

Page 15 Line 13 and 14: Typo. Analyzes should be analyses.

Page 15 Line 14: Please delete the comma after analyses and add the word and. Also, correct the word visualized to interpreted.

Page 15 Line 15: Please add a comma after S.L.

Page 15 and 16: The authors fluctuate with usage of lab and laboratory. Please correct the usage of lab to laboratory where appropriate.

Figure 1: Greatly improved. Are the subzones discussed in the text? Is it important in this figure? Please add a comma after West River in Line 6 Figure 1 caption.

Figure 2: What would CB's data look like if the eliminated samples were added to this figure? A few times in this manuscript the words absorbance and absorption are interchanged. Consider using only one version of this word.

Figure 3: In (b) it is difficult to see the data behind the blue dots of ICW downstream. The gray and orange data points are covered. Can they be overlaid for easier visualization? Define what the two groups are in (c) in the caption. As mentioned earlier, these two groups encompass both circles and triangles so what is special about these groups if not water type?

Figure 4: It might be worth noting that SUVA is calculated at A254nm. Please add a comma after the word downstream in Line 4. Use consistent language for water type – circles and triangles. In this caption, please edit dot to circle. In (b) it is difficult to see the data behind ICW downstream, similar to Figure 3.

Figure 5: Might it be helpful to mark tributaries on the Herschel Island figure? Didn't that feature change some of the measurements?

Figure 6: Annotate which direction the data goes for the gaps in S in (e) or describe the 6x increase or whatever amount of increase or decrease in the caption.

Figure 7: Delete the word "to" in Line 4 before the word "high". This part of the data still gives pause, since other values are around 40, but with higher DOC concentrations. Can these really be excluded? Consider adding SUVA as a second panel to this figure.

Table 1: Soil organic carbon content in the table can be abbreviated to SOCC. This table is a nice tie in with Figure 1, with annotations regarding the subzones. Can more of that be incorporated into the text so that the reader is reminded that the different rivers correspond to different vegetation types?

Table 2: Add a comma after pH in Line 3 and standing waters in Line 4. Are the significant differences highlighted in the table discussed in the main text?