In this manuscript, Chupakov et al. investigate the degradation (bio- and photo-) of DOC in boreal waters. The findings are mainly discussed based on spatial and temporal trends, CO2 production and concentration of trace metals. Given the current trends in global surface temperature, there is the potential of increasing DOC degradation in surface waters from the Arctic regions, which has strong implications for global C cycling. Thus, the findings presented here could be of interest for the scientific community in the field.

In general, the manuscript is well-structured. However, scientific consistency and clearness can be substantially improved. For example, the authors investigate two different biogeochemical processes (biodegradation and photodegradation), at four contrasting locations (piezometer, peatland pool, stream and lake), and using different time intervals. The interpretation of the dataset is then presented in three sections: rates and UV/fluorescence indexes, CO2 production, and trace elements. The discussion of the latter seems rather unnecessary, as the main research question appears to be the degradation rates. In fact, the relationship between trace elements and DOC cycling is barely mentioned in the introduction (*lines 142-145*), even after the stating the hypothesis. I would encourage the authors to remove this section of the manuscript (*section 4.3 and related figures*) and instead focus on explaining the drivers of DOC degradation and improving readability. Perhaps the discussion of the trace elements could be moved to the supplemental material.

Comments:

1. Is there something missing in the title of the manuscript? In my version the title shows as "*High seasonal and spatial dynamics of bio- and photodegradation in boreal humic waters"*
2. Why were the water samples filtered for the biodegradation experiments? Filtration removes particulate attached microorganisms that play a major role in DOC removal from the water column; there is a vast amount of literature on this topic. Please check Keskitalo et al. *Environmental Research Letters,* 2022.
3. Please indicate the temperature in line 186.
4. Please correct Specific Conductivity in line 211.
5. Please clarify the exposure time in line 241 because the incubation time for the biodegradation experiments was 21 days, not 16 days (line 202). Why were different time periods used for both experiments?
6. Please indicate the meaning of GET.
7. Please indicate the units of the green/blue scale in figure 1.
8. Figure 4 can be misleading as the reader can interpret zero degradation for Dec-May or Oct-May. No data is presented for those months. Please improve the figure.
9. DIC and nutrient data are not discussed.
10. Please include *F* and *p*-values where ANOVA was used.
11.

Please provide a plausible explanation for the positive degradation rates in figure 2b during October at Lake Temnoe. In line 527 onwards, it is mentioned that there was not photodegradation. Instead, an increase in DOC concentration is observed. What are the possible mechanisms that could led to an increase in DOC concentration under those experimental conditions?

12. Please indicate the analysis that support the statement that water temperature is of secondary importance for DOC biodegradation (*line 491-495*). On this note, I wonder why the authors did not carry out a regression analysis to try to explain the main drivers of DOC degradation using, for example, the data presented in Table 1.
13. Some figures in the supplemental material should be moved to the main text. In particular, those related to DOC degradation.
14. Some error bars are outside the scale limits in figure 6a and 6d.
15. The authors assumed that all CO2 is produced by biodegradation. Is this actually the case? Are there any other sources of CO2 in the Lake? Please clarify, I think the authors need to present some isotope data to support this statement at the very least. Please also check the statement in line 646.
16. Please use an alternative word for "destruction" in line 543.
17. Please standardise units throughout the manuscript (g or mmol of C?)