Main Comments:

RW2: The methods lack information on precision and trueness of TOC, DOC and metals measurements. EEMs are introduced in the results only. I understand the reasoning, but it still comes as a bit of a surprise and lacks important information on measurements. This should be more detailed and go into the methods section. In my view the rationale can be mentioned without giving away too much of the results.

Author: We inadvertently omitted the methods description for absorbance and fluorescence which will now be provided:

"*Due to the highly colored nature of the Great Dismal Swamp DOC, we diluted subsamples of pre-incubation standards by a factor of 10 using dilutant from the same salinity treatment while we diluted the filtered post-incubation supernatant by the same factor using ultrapure water + NaCl (Sigma Aldritch, 99.5% purity) to match sample salinity. All solutions were degassed with N_2 and samples handled in an anaerobic chamber. We performed absorbance scans at 2 nm intervals (270 – 750 nm) for all replicates using a Thermo Scientific Evolution 220 UV-Vis spectrophotometer. Specific ultraviolet absorbance at 280 nm ($SUVA_{280}$), an indicator of DOC aromaticity, was calculated from this data by dividing decadic sample absorbance at 280 nm by the DOC concentration ([DOC]) (Hansen et al., 2016). We then generated three-dimensional excitation-emission matrices (EEMs) using a Horiba Jobin Yvon FluoroMax-3 spectrofluorometer (for sample replicate A only) at 5 nm intervals (250 – 600 nm) for excitation and 2 nm intervals (250 – 600 nm) for emission. Fluorescence spectra were corrected for inner-filter effect and Raman scattering using the drEEM toolbox version 0.2.0 (Murphy et al. 2013) in MATLAB (v. 2017b). Parallel factor analysis (PARAFAC) was used to deconstruct the fluorescence signal into underlying fluorescence components, or fluorophores, that relate to differences in DOC composition (Murphy et al., 2010; Lapierre and del Giorgio, 2014).*"

Metal measurements are reprinted in Appendix Table B1 from Pinsonneault et al. (2021). Details of the methods are given in the earlier paper, which we will note in the table legend:

"*Table B1 Tidal marsh surface characteristics and soil characteristics for 0 - 40 cm depth including standard error. This table is presented as primary data in Pinsonneault et al. (2021) who present full descriptions of sample techniques and measurement methods.*"

RW2: The Instant Ocean salt origin (is it sea salt, or mineral salts mixed) and composition should be mentioned in the methods.

Author: Instant Ocean is a mineral salt mix and we will provide a citation for its composition:

"*The treated concentrate was divided into four sub-stocks that we amended with Instant Ocean aquarium salt (a synthetic sea salt) to produce four salinity treatments: 0 (no instant ocean added), 10, 20, and 35 on the practical salinity scale (no units). The typical ionic composition of Instant Ocean is reported by Christy and Dickman (2002).* "

RW2: pH measurements are mentioned, but I could not find the data in the results. Both, pH and Instant Ocean salt composition (specifically the divalent cations) should have an influence on adsorption-desorption properties of DOM. The data should be presented and discussed accordingly.

Author: As previously reported by Pinsonneault et al. (2020), pH increased in all incubations. A summary of their results will be provided in the discussion all with their implications:

"Increasing pH also increases DOM absorbance (Gao et al., 2015), and postincubation pH increased in all our incubations from 4.6±0.09 in the standards to 6.74±0.03, 6.64±0.04, 5.15±0.05 and 6.94±0.10 for Kirkpatrick, Taskinas, Jug Bay and Wachapreague soils (respectively) (Pinsonneault et al., 2021). The increase in pH did not have an important effect on postincubation absorbance since specific absorbance decreased during the incubation, the opposite direction from what would be expected from the pH change alone."

RW2: Assuming that DOM only interacts with leachable (poorly crystalline) iron and aluminum, it should be easy to evaluate whether the amount of leachable metals suffices to adsorb these huge amounts of concentrated DOM. There are plenty of experimental estimates on metals:carbon ratios and it would be an interesting calculation exercise in my view. Again, additional factors may play a role like divalent salt cations, arsenic or perhaps DOM aromatic-aromatic interactions.

Author: This is an interesting point that is mainly relevant to the net exchange of carbon with the soil which is the subject of our previous publication by Pinsonneault et al (2021). This previous report presents an in-depth discussion of the relationship of net sorption to leachable iron and aluminum content of the tidal marsh soils, we refer interested readers to that publication.

Specific Comments:

RW2: Section 3.3, line 281 "the spectral characteristics of DOC are a robust proxy…" is a bold statement considering the EEMs results in this manuscript. On the contrary, it seems that optical properties are limited to assessing CDOC behavior including absorbance and fluorescence. Consider rephrasing this and including a few sentences in the discussion on why there is so little additional insight.

Author: We agree that the statement is out of place, as also pointed out by Reviewer 1. As stated in the response to the other review, we will rephrase the sentence and move it to the second paragraph (see response to Reviewer 1).

RW2: Section 3.3, lines 292-293 "the average increase was slightly greater (…) than less for …" I think the "less" can be removed.

Author: This was a typo and will be corrected:

"*Interestingly, the average increase was slightly greater for S=20 (0.017) and less for S=35 (0.014).*"

RW2: Acknowledgements, lines 490-491 "We would also like to thank the staff of the United States Department of Energy Environmental Molecular Science Laboratory for conducting the FT-ICR MS measurements." I'd be happy to see those data, but I guess the line is from another (future?) paper. Please conduct a final cross-check for typos and inconsistencies throughout the manuscript.

Author: Good catch, we are not reporting FT-ICR measurements in this article, so this will be removed. Hopefully, we can provide those in the future.

Reference:

Christy, M. and Dickman, C.: Effects of salinity on tadpoles of the green and golden bell frog (Litoria aurea), Amphibia-Reptilia, 23, 1-11, 10.1163/156853802320877582, 2002.