

Seasonal dynamics of dissolved organic matter along an intertidal gradient in semi-arid mangrove soils (New Caledonia)

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Response to Reviewers

Reviewers' comments:

RC #1:

General comments

This paper explores the dynamics of dissolved organic matter (DOM) in a semi-arid mangrove of New Caledonia, along a land-sea transect through three habitats during two characteristic seasons (dry, and warm and wet). The field and lab work were considerable, and the study gives many results on various parameters, such as pH, salinity, redox potential, as well as optical properties of the DOM. It identifies two main controlling factors for the DOM dynamics: the first is the habitat (characterized in this case by the distance to the sea and the vegetation), and the second is the season.

The paper stresses the need for more work on this specific type of mangroves, which are less studied than humid tropical mangroves despite their specificities. Thus, it raises many questions and needs for further research, especially to improve the knowledge on the origin of the OM. It was overall very nice to read, although some indices should be introduced more clearly to help the reader interpret the results.

We sincerely thank Anonymous Referee #1 for their time and constructive feedback, which have helped improve our manuscript. We have carefully considered all the comments and revised the manuscript accordingly.

Regarding the comment on the introduction of some indices, we agree that clearer explanations will improve the readability and accessibility of the manuscript. In the revised version, we will provide clearer definitions of the optical indices used in the Methods section to better guide readers in understanding their significance.

Specific comments

L.137: how did you know the reaction was complete?

We thank the reviewer for this relevant comment. The reaction was considered complete when no visible effervescence was observed after successive additions of H_2O_2 , suggesting that the majority of reactive organic matter had been oxidized. This point has been clarified in the revised manuscript L. 138 by adding '*was gradually added per beaker until no further effervescence was observed*'. A color change in the sample was also observed to complete the previous observation.

L.160: just to clarify, for TOC measurements, you only measured one core per site (same one used for XRD), that's right?

We thank the reviewer for this clarification request. TOC analyses were performed on all collected cores (three per site), not only on the core used for XRD analysis. The sentence aimed to indicate that the same preparation procedure was applied, *i.e.*, dried and ground samples, as for XRD measurements. We clarified this point in the revised manuscript to avoid any misunderstanding by adding L. 165: '*The same dried and ground samples prepared for XRD were used for TOC analysis.*

We also dried and grounded samples from the two other cores to complete our triplicates sample set'.

L.171: we could use a definition of E2 and E3. Same for 'SUVA': what does it mean? More generally, when you introduce indices, you could give their range and meaning of extreme values (as you did for HIX).

We thank the reviewer for this helpful comment. We agree that clearer definitions and interpretation ranges of the optical indices will improve the readability of the manuscript. In the revised version, we have defined E_2/E_3 as the ratio of absorbance at 250 nm to 365 nm, and $SUVA_{254}$ as the specific UV absorbance at 254 nm normalized to DOC concentration. We also clarified the interpretation of high and low values for each index, as indicators of molecular weight, aromaticity, and humification degree, similarly to what was done for HIX. We added to L. 177-179: *'Higher value of E_2/E_3 suggest lower molecular weight and lower aromaticity. The Specific UV Absorbance ($SUVA_{254}$), a proxy for aromaticity and humification is calculated as the ratio of absorbance at 254 nm to the concentration of DOC. A higher $SUVA_{254}$ value is associated with more aromatic and humified CDOM.'*

L.187: I don't fully understand the difference between what is given by PARAFAC and what is given by CORCONDIA. But it may not be of significant importance for the understanding of the paper.

We thank the reviewer for this helpful comment. We improved our explanation in the revised version to clarify the distinction between the two approaches. PARAFAC was used to decompose the EEM dataset into independent fluorescent components, whereas CORCONDIA (Core Consistency Diagnostic) was applied to validate the appropriate number of components and assess the robustness of the model. We clarified this distinction in the revised manuscript to improve methodological clarity L. 194-196: *'The optimal number of components in the PARAFAC model was validated using the CORCONDIA (CORE CONSistency DIAGnostic) algorithm, with values exceeding 60% considered optimal (Zhao, 2011).'*

L.224: how is land-derived OM brought to the salt-flat, as there is not vegetation on it and you state L. 96 that Bouraké is "unaffected by external terrigenous sediments and organic inputs, with no direct freshwater input from rivers"? Is it only OM coming from the soil organisms, and not vegetation? Or maybe I am misunderstanding something here.

We agree that the term "land-derived OM" may have been misleading in this context. The Bouraké site is indeed not influenced by external terrigenous or riverine inputs. In this study, "land-derived OM" refers to organic matter produced locally within the upper intertidal zone, including soil microbial production, benthic biofilms, and organic matter stored in substrate, rather than external continental inputs. We clarified this formulation in the revised manuscript to avoid any misunderstanding. We replaced "land-derived OM" by *'soil-derived OM (C1)'*.

L.229: in the caption of Figure 2, you could add a word on how to interpret the names of your samples, as you display them on the graph. I guess the beginning stands for Season-Habitat-, then - Depth-Core or -Core-Depth? Also, on the figure, we don't know yet what a254, a350, a442 stand for: it is only introduced (and only for a350) in L.309: perhaps you could explain it now, or maybe say it will be detailed in section 3.4.

Thank you for this helpful comment. We agree that additional clarification in the figure caption will improve readability. In the revised version, we have specified how sample names are structured

(Season [W or D] - Habitat [Sa, Av or Rh] - Core replicate [1, 2 or 3] - Depth [a, b or c]) to facilitate interpretation of the PCA plot.

We also added a word on the a_{254} , a_{350} and a_{442} : “Absorption coefficients a_{254} , a_{350} , and a_{442} correspond to CDOM absorption (m^{-1}) at 254, 350, and 442 nm, respectively. Sample codes follow the structure Season-Habitat-Core replicate-Depth (e.g., W-Sa-1-a corresponds to Wet season, Salt-flat, core 1, surface layer).”

L.259: I think you inverted the seasons: “ $62.9 \pm 1.2\%$ during the dry season vs. $60.7 \pm 2.4\%$ during the wet season” --> 62.9 is wet season and 60.7 is dry season, I guess?

We thank the reviewer for this observation. We have carefully rechecked our dataset, and the reported values are correct: the mean water content in *R. stylosa* soils is 60.7% during the wet season and 62.9% during the dry season. These values are presented in Figure 4 and in Appendix Table A3. In semi-arid climate, *R. stylosa* develop at the lowest elevation in the intertidal zone, and in their thus immersed at all tides. The relatively stable water content between seasons in this habitat likely reflects the near-permanent tidal inundation of this zone whatever the season, which maintains consistently high soil moisture regardless of seasonal rainfall variations.

L.311: as already said for the Material & Methods L.171, we need more information in the text to understand the results regarding $S_{275-295}$, E_2/E_3 and SUVA: what are the min and max values these indices can reach by definition? What do they mean?

We agree that additional information would help readers interpret the reported values of $S_{275-295}$, E_2/E_3 , and SUVA. We added this information in the method section in the revised manuscript (L. 189-192) to clarify the definition and interpretation of these indices. Although these indices do not have strict theoretical minimum or maximum values, their variations are commonly interpreted in terms of DOM molecular weight, aromaticity, and degree of humification. In the revised manuscript, we provided typical ranges reported in the literature, in order to facilitate interpretation of our results. L.173: “Previous studies have reported $S_{275-295}$ values in the range of $0.010-0.020 \text{ nm}^{-1}$ for coastal waters respectively and $0.014-0.018 \text{ nm}^{-1}$ for wetlands (Hansen et al., 2016; Helms et al. 2008).”

L.178: “A higher $SUVA_{254}$ value is associated with more aromatic and humified CDOM. For example, $SUVA_{254}$ values for plant leachates typically range from 2.9 to $4.1 \text{ L mg}^{-1} \text{ m}^{-1}$, whereas algae-derived DOM generally shows lower $SUVA_{254}$ values around $1.7 \text{ L mg}^{-1} \text{ m}^{-1}$ (Hansen et al., 2016).”

L.336: is the photodegradation signal (C4) identical regardless of the origin of the OM that is degraded (terrestrial, mangrove, marine)?

We thank the reviewer for this relevant comment. Indeed, the C4 component is interpreted as a photodegradation-related signal; however, it does not allow us to determine the original source of the degraded organic matter (terrestrial, mangrove-derived, or marine). It rather reflects a transformation process affecting DOM, independently of its initial origin.

L.342: how do you explain the absence of changes in C3 (marine humic-like fluorescence) between habitats? One would expect it to be higher in *R. stylosa* > *A. marina* > salt-flat.

We thank the reviewer for this comment. Although C3 is commonly described as a marine humic-like component, our results show no clear spatial gradient across habitats, suggesting that this signal may be largely homogenized along the transect by tidal exchange and mixing, or may reflect a broadly distributed background pool of marine humic-like DOM rather than a habitat-specific source.

In addition, similar fluorescence signals have been described as “microbially derived matter” (Hong et al., 2021), as “microbial origin” (Wauthy et al., 2018), or associated with “marine environments with biological activity” (Smith et al., 2021). These similarity with our C3 component and literature are presented in Table A5. Therefore, component C3 may also arise from *in situ* microbial processing of DOM, which could contribute across habitats depending on local environmental conditions.

The significant increase of C3 in the *A. marina* stand during the wet season may reflect enhanced DOM production and mobilization under warmer and wetter conditions (e.g., increased microbial activity and leaching/solubilization), leading to a higher contribution of humic-like fluorophores in this habitat during that season. As described in the manuscript L549-555.

L.399: You stated in your Methods section that ‘HIX values ranged from 0 to 1, with higher values reflecting a greater degree of humification’, but you are now displaying ‘HIX > 30’. Maybe HIX and BIX got mixed up?

We thank the reviewer for pointing out this point. The statement in the Methods section indicating that HIX ranges from 0 to 1 was incorrect and was corrected in the revised manuscript (L. 200-203). Higher HIX values indicate a greater degree of humification, and values may exceed 1. We confirm that HIX and BIX were not mixed up in the Results section. The Methods description was revised accordingly.

The sentence was modified as follows: “Higher HIX values indicate a greater degree of humification and DOM maturation and values <4 are associated with less humified DOM (Luz-Santos et al., 2025).”

L.409: you suggest that a lot of photodegradation happens in the salt-flat: shouldn't this lead to a higher C4 signal?

We thank the reviewer for raising this very interesting point. To explain the strong humification of DOM observed in the salt-flat, we initially proposed several degradation processes that could lead to the formation of highly transformed and humified DOM, as reflected by the C1 component. However, we acknowledge that the C4 component is described in the literature as being associated with photodegradation processes, and is often referred to as a “photo-product” (Hong et al., 2021; Amaral et al., 2020; Chen et al., 2017; Lambert et al., 2016).

Nevertheless, C4, which has spectral characteristics distinct from C1, does not appear to be more abundant in the salt-flat and shows relatively homogeneous contributions across the three habitats along the intertidal gradient. Although the highly humified C1 component may partly result from solar degradation processes, given the strong exposure of this habitat to solar radiation, we agree that this hypothesis should be considered with caution. Other processes may also contribute to the transformation and humification of DOM.

We therefore revised the manuscript to present the potential role of photodegradation in the formation of C1 more cautiously, and acknowledge that additional processes may also contribute to the production of this highly humified DOM (L410).

L.484: so, C1 and C4 would both indicate photodegradation?

We thank the reviewer for highlighting this potential ambiguity. C1 and C4 do not indicate the same information. C4 is interpreted as a photodegradation-related component (Table A5), whereas C1 corresponds to a humic-like, highly transformed DOM pool (i.e., a more “mature”/humified signature). Photodegradation may contribute to the formation of such humified material, especially in the highly exposed salt-flat, but other processes (such as microbial processing and selective preservation/accumulation) may also contribute. We revised the text to avoid implying that C1 and C4 both directly trace photodegradation. L501: *“Taken together, these patterns suggest that: i) C1 likely reflects highly transformed DOM pool of humic substances; ii) C2 is associated with mangrove-derived OM; iii) C3 indicates microbial activity; and iv) C4 corresponds to photodegradation but lacks spatial variability.”*

Technical corrections

L.171: you can add comas for better clarity: ‘The SUVA, a proxy for aromaticity and humification, is calculated as [...]’.

Thank you for this suggestion. The comma was added L. 190 in the revised manuscript for clarity.

L.468: typo in ‘adsorbion’

It was corrected in the revised manuscript (L. 517).

L.583 : ‘regulated’

The wording was corrected in the revised manuscript.

RC #2:

The manuscript entitled “Seasonal dynamics of dissolved organic matter along an intertidal gradient in semi-arid mangrove soils (New Caledonia)” by Mouras et al., is a nicely presented case study on dissolved organic matter dynamics along a tidal elevation gradient during contrasting seasons. The flow of the manuscript is very clear and well structured throughout, making it easy to follow the work. The data are well prepared and presented and my comments only relate to minor corrections and clarifications. I do suggest the authors to carefully assess the manuscript for minor punctuation and spelling mistakes (in many cases related to plural or tense).

We sincerely thank Anonymous Referee #2 for their time and constructive feedback, which have helped improve our manuscript. We have carefully considered all suggestions and carefully revised the manuscript to correct punctuation, spelling and grammatical errors in the revised version.

Abstract Lines 21-22: What do you mean by “...DOM also originates from biological activity, ...”? All DOC does. Be specific about what differentiates the DOC here to that in the *Rhizophora* stands.

We thank the reviewer for this comment. We agree that our sentence was too general. What we intended to highlight was the stronger contribution of microbially produced/processed DOM in the salt-flat and *Avicennia* stands compared to the *Rhizophora* stand. We therefore revised the sentence to clarify that this difference is supported by higher BIX values and enhanced microbially

derived fluorescent components. We added, L. 22: "DOM show a stronger contribution from microbial production, as evidenced by enhanced microbially-derived fluorescent component".

Visual abstract: By substituting the title question with the conclusions, you can save space and be direct about what you found. Something like: Intertidal habitat position impacts seasonal DOC quantity and quality in understudied semi-arid mangroves.

Thank you for this suggestion. We have modified the graphical abstract by replacing the title question with a statement highlighting the main conclusions, as suggested. We added then: *Intertidal habitat position impacts seasonal DOC quantity and quality in understudied semi-arid mangroves*.

MethodsL128-130: Was the cleaning method for DOC and DOM vials the same?

Thank you for this clarification request. The same cleaning procedure was applied to both DOC and DOM vials. All glass vials were cleaned with 10% HCl, rinsed three times with Milli-Q water, and combusted at 450 °C for 6 h prior to use. We clarified this point in the revised manuscript (L. 130).

L157-164: Which instrument was used for which analysis? It may be easier to follow if you list the methods one after the other.

Thank you for this suggestion. We agree that the description of the analytical methods could be clearer. The paragraph has been reorganized in the revised manuscript to explicitly distinguish the instruments and procedures used for DOC and TOC analyses (L. 157-166).

L161: Repetition of triplicate sampling can be removed.

Thank you for this suggestion. The repetition has been removed in the revised manuscript.

ResultsI would suggest structuring the results in the same way that you structure the methods section. This basically only relates to the multivariate analysis, but I find it confusing that you list the methods one way and then start the results another. I can understand the reason to put the multivariate results first, to pre-empt differences between habitats and seasons and for a reason to drop the depth results, however, personally, I would appreciate it more at the end of the section to tie the univariate results together and provide a nice overview.

We thank the reviewer for this helpful suggestion. We chose to present the multivariate analysis (PERMANOVA) at the beginning of the Results section because it allowed us to first assess the relative influence of the tested factors and justify focusing the subsequent analyses on habitat and season, while depth was not retained due to its non-significant effect. This approach was intended to clarify why depth was not further investigated and presented in the figures. However, we appreciate the reviewer's suggestion and have clarified this point in the revised manuscript (see answers to next question).

Regarding the reporting of statistical results, we agree that providing more detailed information would improve transparency. The full ANOVA tables with the degree of freedom and the F-test have therefore been added to the supplementary material (Table A8).

Table A8: Results of statistical tests for habitat differences (between salt-flat: Sa, A. marina: Av and R. stylosa: Rh) for each measured parameter at each season. Parametric data were analysed using ANOVA, while Kruskal-Wallis tests were applied for non-parametric distributions. Then post-hoc tests were used to identify the differences (Mann-Whitney or Tukey).

Significance levels are indicated as follows: $p < 0.05$ (*), $p < 0.01$ (**), and $p < 0.001$ (***) ; N.S = not significant.

Season	Parameter	P_value	Significance		Test used	Ftest	Df	
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				Parametric test				Post-hoc Result
WET	pH	0.0000	***	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh ; Av vs Rh
DRY	pH	0.0001	***	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh ; Av vs Rh
WET	Eh	0.0001	***	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh ; Av vs Rh
DRY	Eh	0.0000	***	Yes	Tukey	513.0811	2,24	N/A
WET	Salinity	0.0000	***	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh ; Av vs Rh
DRY	Salinity	0.0000	***	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh ; Av vs Rh
WET	Temperature	0.0000	***	Yes	Tukey	33.6267	2,24	N/A
DRY	Temperature	0.0013	**	No	Mann-Whitney	NA	NA	Sa vs Rh ; Av vs Rh
WET	a254	0.0005	***	Yes	Tukey	10.6521	2,24	N/A
DRY	a254	0.0001	***	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh
WET	a350	0.0001	***	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh
DRY	a350	0.0001	***	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh
WET	a442	0.0002	***	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh
DRY	a442	0.0001	***	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh
WET	S275-295	0.0214	*	No	Mann-Whitney	NA	NA	Sa vs Rh
DRY	S275-295	0.0022	**	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh

WET	S350-400	0.0003	***	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh
DRY	S350-400	0.0002	***	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh
WET	SR	0.0015	**	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh
DRY	SR	0.0050	**	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh
WET	E2E3	0.0011	**	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh
DRY	E2E3	0.0002	***	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh
WET	E4E6	0.1327	N.S	Yes	Mann-Whitney	2.1995	2,24	N/A
DRY	E4E6	0.2982	N.S	Yes	Mann-Whitney	1.2732	2,24	N/A
WET	water_content	0.0000	***	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh ; Av vs Rh
DRY	water_content	0.0000	***	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh ; Av vs Rh
WET	Density	0.0000	***	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh ; Av vs Rh
DRY	Density	0.0000	***	Yes	Tukey	130.3442	2,24	N/A
WET	FI	0.0123	*	No	Mann-Whitney	NA	NA	Sa vs Rh ; Av vs Rh
DRY	FI	0.0002	***	Yes	Tukey	12.9619	2,24	N/A
WET	HIX	0.0000	***	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh ; Av vs Rh
DRY	HIX	0.0001	***	Yes	Tukey	14.1610	2,24	N/A
WET	BIX	0.0001	***	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh ; Av vs Rh
DRY	BIX	0.0001	***	No		NA	NA	

					Mann-Whitney			Sa vs Av ; Sa vs Rh ; Av vs Rh
WET	COD	0.0088	**	No	Mann-Whitney	NA	NA	Sa vs Av
DRY	COD	0.0001	***	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh ; Av vs Rh
WET	Clay	0.4859	N.S	Yes	Mann-Whitney	0.7439	2,24	N/A
DRY	Clay	0.0135	*	No	Mann-Whitney	NA	NA	Av vs Rh
WET	Silt	0.0254	*	Yes	Tukey	4.2947	2,24	N/A
DRY	Silt	0.0005	***	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh ; Av vs Rh
WET	Sand	0.6358	N.S	No	Mann-Whitney	NA	NA	N/A
DRY	Sand	0.0058	**	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh
WET	SUVA	0.6366	N.S	Yes	Mann-Whitney	0.4602	2,24	N/A
DRY	SUVA	0.0000	***	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh ; Av vs Rh
WET	TOC	0.0000	***	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh ; Av vs Rh
DRY	TOC	0.0000	***	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh ; Av vs Rh
WET	C1%	0.0000	***	Yes	Tukey	26.3349	2,24	N/A
DRY	C1%	0.0008	***	Yes	Tukey	9.7685	2,24	N/A
WET	C2%	0.0586	N.S	No	Mann-Whitney	NA	NA	N/A
DRY	C2%	0.0048	**	No	Mann-Whitney	NA	NA	Sa vs Av ; Sa vs Rh

WET	C3%	0.0027	**	Yes	Tukey	7.6662	2,24	N/A
DRY	C3%	0.3052	N.S	No	Mann-Whitney	NA	NA	N/A
WET	C4%	0.2549	N.S	No	Mann-Whitney	NA	NA	N/A
DRY	C4%	0.1854	N.S	No	Mann-Whitney	NA	NA	N/A

L230-233: This is a valid result and merits a mention in the study. I wonder, however, if there may be subtleties that are masked by the multivariate analysis which may be interesting to some readers. I would suggest including the depth results in the supplementary materials and briefly summarise them in the results section. It is fine not to further discuss them in the manuscript. Also, right now is not clear which depth samples you carried forward into the analysis. Do you only report the surface samples? Or at depth? Or did you pool the results from all depth layers and report the average values?

We thank the reviewer for this helpful suggestion. As recommended, depth-related results have now been included in the supplementary material (Figures. A4-A8). These figures present the variations of the main parameters across the three soil depth layers (0-10, 10-20, and 20-30 cm). A brief reference to these results has also been added in the Results section (L. 260-265).

Because soil depth did not show a significant effect for most parameters, and to simplify the presentation of the main patterns, the values reported in the main figures correspond to averages across the three depth layers. This clarification has been added to the manuscript L246-248. *Therefore, values presented in the main figures correspond to averages across the three sampled depth layers (0-10, 10-20, and 20-30 cm). Results exploring depth-related variations are provided in the supplementary material (Figs. A4-A8)."*

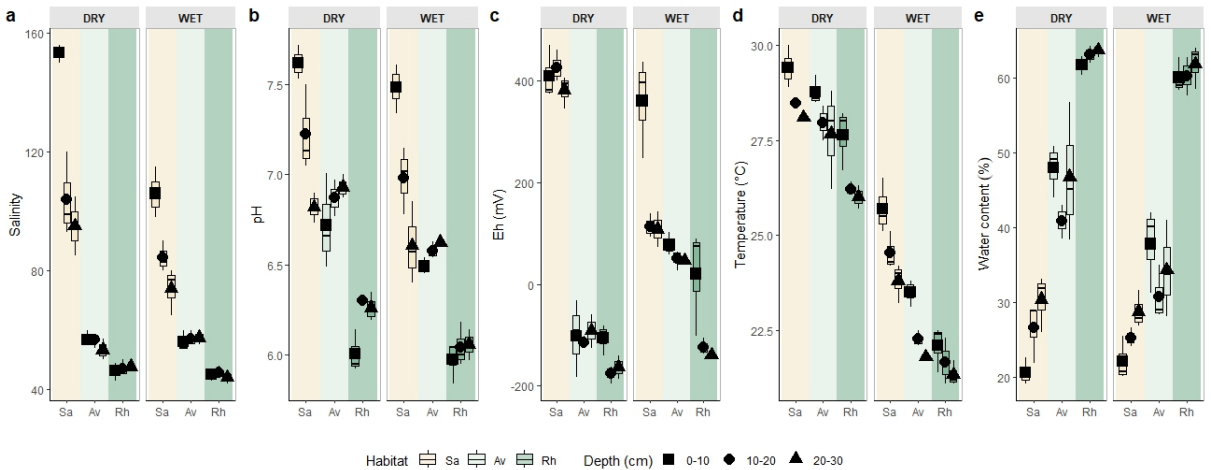


Figure A4: Seasonal and spatial variations of physico-chemical parameters (salinity, pH, Eh, temperature, and water content) in salt-flat (Sa), *Avicennia marina* (Av), and *Rhizophora stylosa* (Rh). Symbols represent soil depth layers (squares: 0-10 cm; circles: 10-20 cm; triangles: 20-30 cm).

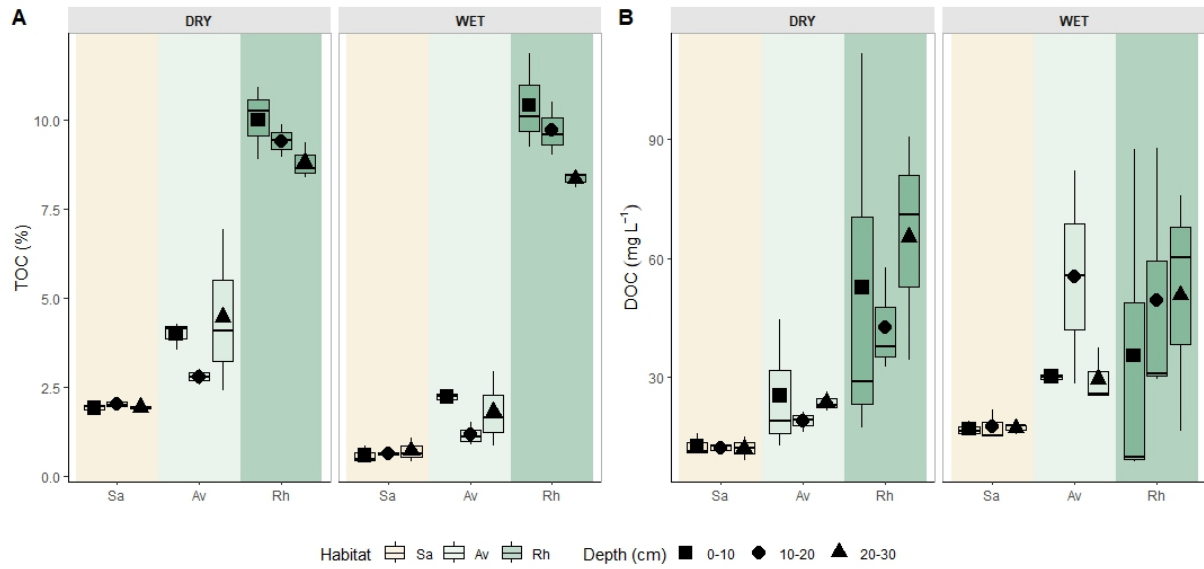


Figure A5: Seasonal and spatial variations of TOC (%) (A) and DOC concentrations (mg L⁻¹) (B) across a land-sea gradient in salt-flat (Sa), *Avicennia marina* (Av), and *Rhizophora stylosa* (Rh). Symbols represent soil depth layers (squares: 0-10 cm; circles: 10-20 cm; triangles: 20-30 cm).

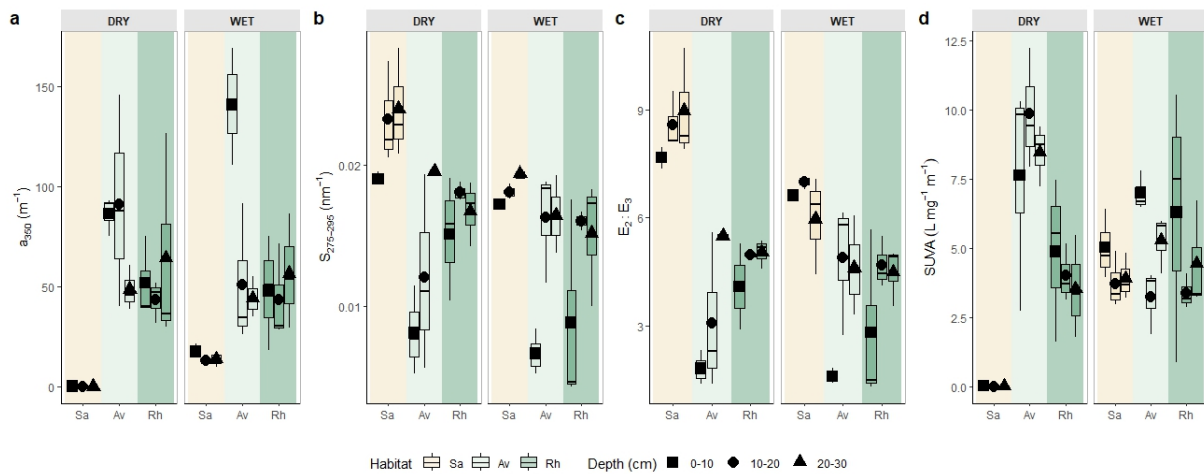


Figure A6: Seasonal and spatial variations of CDOM indicators (a_{350} [a], $S_{275-295}$ [b], E_2/E_3 [c], and SUVA[d]) across a land-sea gradient in salt-flat (Sa), *Avicennia marina* (Av), and *Rhizophora stylosa* (Rh). Symbols represent soil depth layers (squares: 0-10 cm; circles: 10-20 cm; triangles: 20-30 cm).

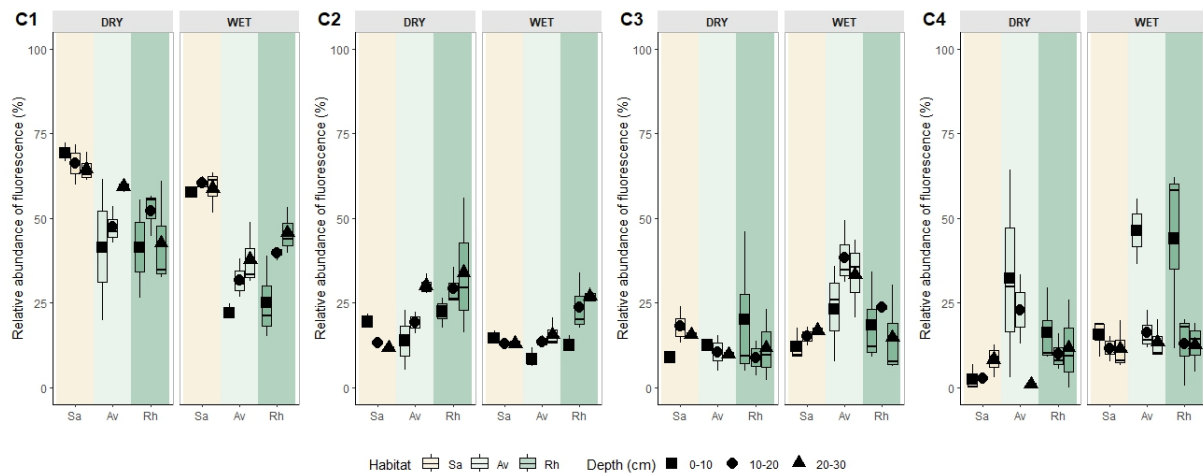


Figure A7: EEM contour plots of the four PARAFAC components (C1, C2, C3, C4) and seasonal variations in their relative fluorescence abundance (%) across a land-sea gradient in (salt-flat (Sa), *Avicennia marina* (Av), and *Rhizophora stylosa* (Rh)). Symbols represent soil depth layers (squares: 0-10 cm; circles: 10-20 cm; triangles: 20-30 cm).

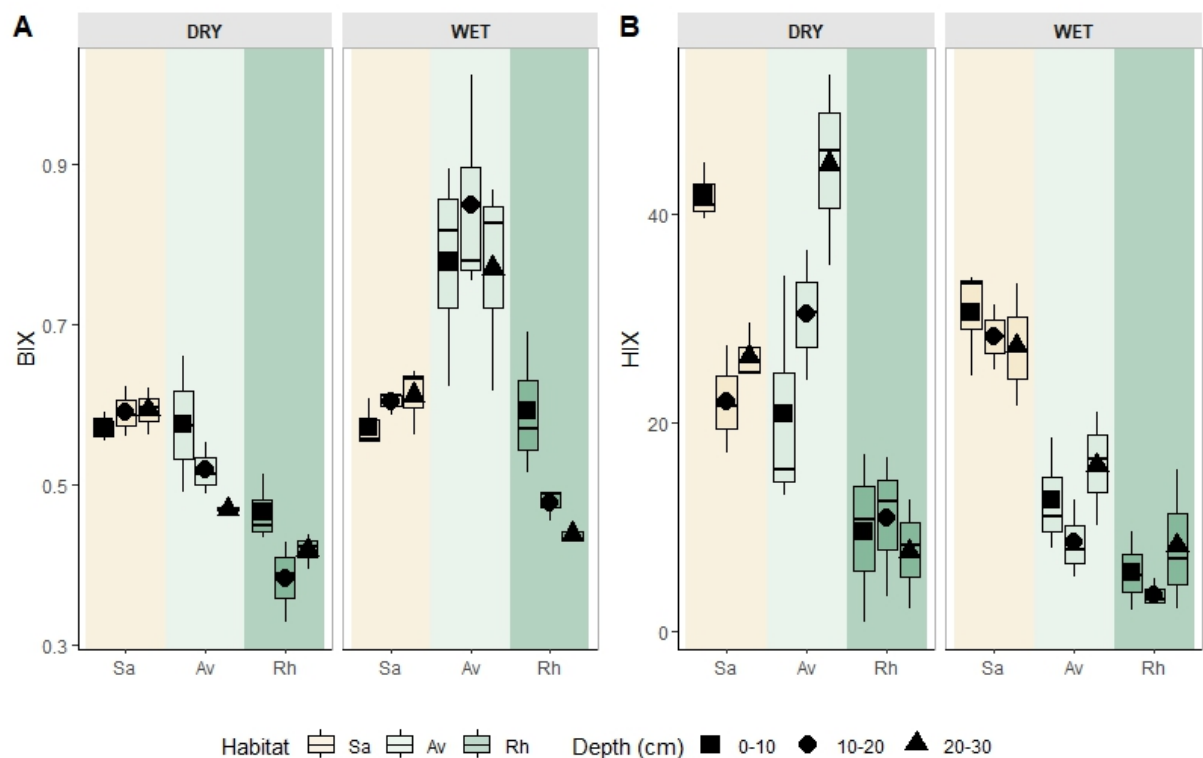


Figure A8: Seasonal and spatial variations of the Biological Index (BIX) [A] and Humification Index (HIX) [B] across a land-sea gradient in (salt-flat (Sa), *Avicennia marina* (Av), and *Rhizophora stylosa* (Rh)). Symbols represent soil depth layers (squares: 0-10 cm; circles: 10-20 cm; triangles: 20-30 cm).

L291-292: This seems like a repetition of the previous paragraph.

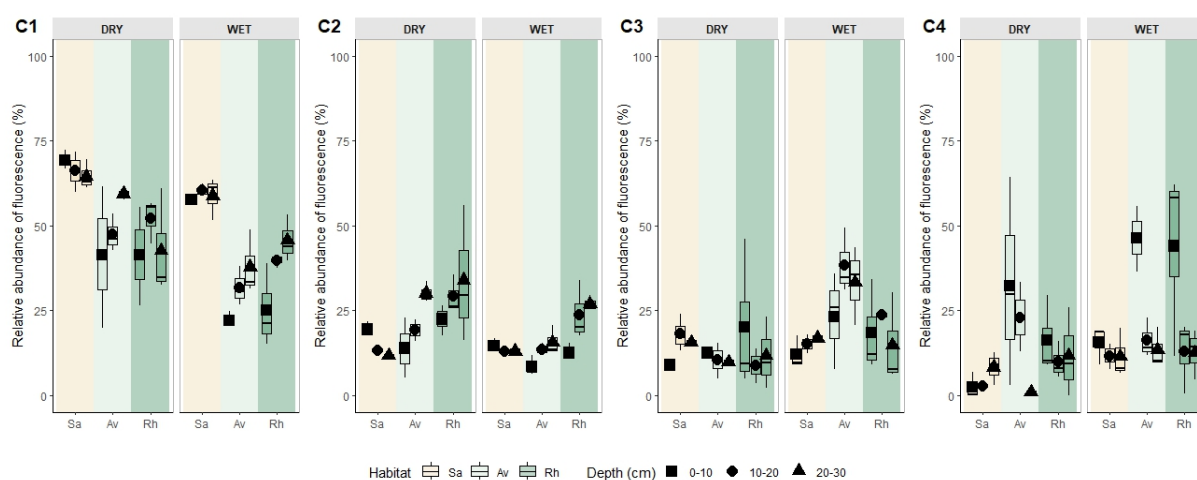
Thank you for this comment. The sentence has been rephrased in the revised manuscript to avoid repetition (L. 335).

L345: Explain somewhere (probably the methods) what C % is. Is C1 % relative to the other three C peaks or is it relative to the overall emission values?

Thank you for this comment. We have clarified this point in the Methods section. L197-199: “The relative abundance of each component (C%) corresponds to the ratio between the fluorescence intensity of a given PARAFAC component and the sum of the fluorescence intensities of all identified components (C1-C4).”

DiscussionL460-468: This is an interesting thought. You should be able to see some evidence of this at depth in the *Rhizophora* samples. Did the FDOM profile change much with changing depths? And did this correspond to redox, or mineralogy?

We thank the reviewer for this insightful comment. Depth-related variations of FDOM were examined and are now presented in the supplementary material (Figure A7). However, no significant differences in the fluorescent components were observed with soil depth in the statistical analyses.



L469: Which stand is meant here? *Rhizophora*?

Thank you for this comment. We confirm that the *Rhizophora* stand was meant here, and this has been clarified in the revised manuscript (L. 518).

L500: Check the figure reference.

Thank you for pointing this out. The correct reference is Fig. 4, not Fig. 3. This has been corrected in the revised manuscript (L. 551).