

## ***Interactive comment on “Distinctive effects of allochthonous and autochthonous organic matter on CDOM spectra in a tropical lake” by Luciana Pena Mello Brandão et al.***

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Dear Referee#2,

We appreciate your suggestions for improving our manuscript and we will certainly be able to include all of them. We can better highlight in the Introduction and Implications the importance of our work in this tropical lake by extrapolating the findings to tropical lakes in general (we answered this in the last reply below). The answers to each comment are listed below.

RC: 54-59: How does TSS or turbidity differ in tropical lakes? Greater terrestrial pro-

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ductivity and its subsequent leaching to the aquatic system should increase the turbidity of the water and potentially offset the impact of the higher light availability. Let's make sure greater light availability means "in water" rather than just on surface. AC: 54-59: The input of allochthonous material in these lakes occurs during the rains in the summer. However, by temperature difference this material remains in the hypolimnion until the mixing water in the winter. Therefore, the turbidity in these lakes increases only in a drought mixing periods, when we observed greater productivity of the systems, greater phytoplankton and zooplankton abundances and less transparency of the waters. Thus, even with high turbidity, the aquatic systems of this region are not limited by light.

RC: 60: Reverse the order of the sentence so that tropical environments are mentioned first. Line 89: Maybe ": :ways" to "... pathways" . AC: We agree.

RC: 100 and method 2.2: Leachate from leaves are known to produce lots of labile DOM that have protein-like optical properties. Maybe add a sentence to show that the week long incubation should remove most labile DOM from the leaves and detritus. AC: Yes, we can include a sentence explaining that.

RC: 206: Temperature of the mesocosms should be in the method section (or at a different place in the results section). AC: We agree.

RC: 215: Missing a ")" somewhere. AC: Yes, thank you.

RC: 259: Rather than starting with how this study confirms previous findings, start with something that is unique to this study. AC: We could start with the paragraph about changes in spectral indices "Although additions of allochthonous OM and nutrients both contributed to higher DOC concentrations, divergent effects of these additions were evident in the quality of carbon assessed by optical indices (S250-450 and SR). S250-450 and SR decreased significantly after addition of allochthonous OM (Fig. 2F, H). The decrease in the slope S250-450 was related to the increase of a higher molecular weight carbon, which lowered the values of S275-295 and consequently of SR

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(Helms et al., 2008). In this context, our results showed that small changes in the amount and quality of allochthonous contribution to lakes, either due to changes in rainfall or land use change, may cause considerable changes in the optical quality of the aquatic systems, as alterations in the water transparency by changes in the UV and PAR absorbing. This corroborates other studies that claim that tropical lakes are highly sensitive to climate changes, causing serious modifications of lake physical and chemical conditions (Jeppesen et al. 2014), with ultimate effects on lake productivity for example (O'Reilly et al. 2003)."

RC: 267: Redfield ratio was not based on freshwater phytoplankton. Could you cite a freshwater reference? AC: Yes, we will cite a freshwater reference.

RC: 270: Photodegradation of terrestrial DOM can also increase the amount of labile DOM. Look at works by Rose Cory. If sunlight is indeed stronger in the tropics, photostimulated respiration or release of labile substances from photodegradation would also be an explanation for what's happening here. AC: Certainly phytoplankton may be benefiting from photodegradation products. We can include this explanation in this section.

RC: 339: Implications – Most of the findings in this study is not unique but supports previous findings. Thus, there should be a greater emphasis on why this study matters in the context of this ecosystem. Aside from the land use change in surrounding forest, why should readers care about tropical lakes in the first place? Are they a great contributor to atmospheric CO<sub>2</sub>, source for fishery product in the region, source for drinking water in areas with growing population, or transient storage for terrestrial DOM to the oceans? It only would take a few sentences in the introduction, discussion, and implications to make sure that the readers are fully aware of the importance of tropical lakes. AC: We can better highlight in the Introduction and Implications the importance of our work in this tropical lake by extrapolating the findings to tropical lakes in general. We believe that our study in this particular lacustrine system is important because: The tropical lake that we conduct our study belongs to one of the three most important lake

systems in Brazil and is inserted in the Atlantic Forest biome. While less than 8% of the pristine Brazilian Atlantic forest remains, several important freshwater ecosystems in this biome are under threat by human-mediated changes in land use, mainly related to deforestation and changes in the frequency and intensity of precipitation events. Many of these lakes are used by the local population both for water supply for human consumption and for water use in economic activities such as agriculture, livestock and large mining companies present in the region. Fishing is also an important activity in this region. In this way, experimental studies such as ours simulate impacts (such as eutrophication and disturbances in the allochthonous input caused by changes in the hydrological regime or alteration of the land use in the surroundings), which the lakes of the region are susceptible. We show with our results the spectral changes in water after these impacts and we try to predict the possible impacts to communities and biogeochemical cycles, which will certainly alter the quality of the waters for consumption and for use in the economic activities mentioned. Besides that tropical lakes are considered hot spots for biodiversity and greenhouse gas cycles, and furthermore they are believed to be highly sensitive to climate changes causing profound changes of lake physical (ie volume, area, stratification) and chemical (ie dissolved oxygen, nutrients, organic matter) conditions with ultimate effects on regional carbon cycling.

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