

Biogeosciences Discuss., referee comment RC2
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Comment on bg-2021-325

Anonymous Referee #2

Referee comment on "Greenhouse gas fluxes in mangrove forest soil in an Amazon estuary" by Saúl Edgardo Martínez Castellón et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2021-325-RC2>, 2022

General comment

The manuscript "Greenhouse gas fluxes in mangrove forest soil in the Amazon estuary" examines CO₂ and CH₄ fluxes from mangrove soils and evaluates topographic and seasonal variations. Moreover, environmental drivers such as vegetation structure and soil characteristics are studied. I highly agree with the comments made by RC1. The topic of the paper is timely and fits the scope of Biogeosciences. The study design is appropriate, and the data set sufficient to answer the stated research questions. However, the manuscript is hard to follow and should be streamlined. It would be helpful to put some of the results (e.g., detailed statistical analysis of all parameters) into a supporting information and report only relevant findings. The general structure and story line should be more focused.

Specific comments

Abstract

L 13 – 14 First time reading "especially in a scenario of global climate change" I thought you would test the impact of climate change on GHG in mangroves. Maybe rephrase as "to assess their impact on climate change".

L 17 – 18 Delete this part of the sentence and use the extra words to give more

quantitative results, such as gas fluxes.

L19 – 22 Write how much higher (x-times higher) fluxes were between sites/seasons. Do never start a sentence with "only". Change this throughout the manuscript.

Introduction

L28 – 30 Move this sentence to the study site description or the aim paragraph of the introduction. Then start with (tropical) mangroves in general. Consider restructuring the first paragraph by starting with carbon storage in mangroves and benefits for climate change. Then state that it is important to consider GHG outgassing as offset of the carbon storage.

L41 Change "attributable" to "driven by".

L50 Write "CO₂ outgassing" instead of "CO₂ production to the atmosphere". Make clear which statements in this and the next paragraph are specific to mangrove and which to estuaries/coasts/vegetated coastal wetlands. Preferably use only mangrove publications, there are enough publications to underline each of your statements.

L55 Confusing statement. Consider rephrasing.

L61 How does reduction of sulfate produce CH₄?

L67 Be more specific what you mean by spatial and seasonal variation.

L70 Remove years but describe in more detail which drivers you were testing.

Methods

Please add GPS coordinates of your stations in the text.

L77 "exclusively untouched mangrove forests" use "pristine mangroves". Consider splitting this sentence.

L86 Use tidal "amplitude" instead of "height".

L109 – 111 This sentence is not a part of the study site. Put it into "Flux measurements". Is suggest putting "Greenhouse gas flux measurements" as 2.2, since this is your focus.

L120 When did you conduct the floristic survey? Report dates.

L130 Why did you take only very shallow soil cores? It sounds like you measured pH and redox at the same spot where you took the soil sample. I hope it was just next to it. Please clarify.

L137 I personally would not capitalize all parameters, but wright "Organic matter...".

I agree with RC1 that the abbreviations should be changed.

L150 When did you conduct the soil sampling? Report dates.

L160 Also add dates of chamber sampling.

L164 I personally would have measured above the mangrove roots since these are important parts of the mangrove ecosystem. At healthy mangroves, spots without roots are rare, thus including them yields more representative flux rates for mangrove soils. Something to consider in your next study.

You need to add more info about the flux measurements. How often did you measure per

month? One or more rings? Did these rings stay at the same spots?

Consider matching headings with the results headings. The wording and also the order.

Results

The results section is very hard to read. I would only report values of each parameter and describe general trends without using any statistics. Then add a section where you look at the statistics, but only in regard to the GHG not of the statistics between the drivers.

3.1 Carbon dioxide and methane fluxes

- Fig 4 (put table 1 in SI)
- Describe values and trends for CO₂ and CH₄ in sperate paragraphs

3.2 Weather data

- Fig 2 + Fig 3

3.3 Soil characteristics

- Table 2 + Table 3

3.4 Vegetation structure and biomass

- Table 4

3.5 Drivers of greenhouse gas fluxes

- Table 5 (also add correlation of all other parameters, to shorten the table you could only keep significant correlations and mention in the text which parameters were not significantly correlated to the GHG)
- I would not distinguish between single months for the correlations, but focus only on wet and dry seasons

Alternatively, you could only use subsections 3.1 – 3.4 from above. Start each subsection with describing values and trends of each parameter. The second part of each subsection should briefly report the stats between the GHG and the parameters (not amongst parameters!).

In all tables use mean \pm standard error instead of mean(standard error).

Discussion

Generally, try to link your results with the literature more closely. Often you have one sentence about one study and then an vaguely related sentence about your study. You need to link those “bigger/smaller than, similar to, supported by/contradicting to...”

Possibly use the following structure:

4.1 Carbon dioxide and methane fluxes

- Compare fluxes to literature and discuss differences
- Separate CO₂ and CH₄ in paragraphs

4.2 Drivers of greenhouse gas fluxes

- Possibly get subheadings for parameters similar to results section
- Discuss drivers and find literature backing up your statements, only focus on significant differences but do not repeat statistics

L 309 Add a, b, c, and d to the figure. Reduce scale for c and d.

L294 – 295 To speculative – delete.

L 295 – 299 Also needed in results section, here only short repetition. What do you mean by total carbon rate? Separate CO₂ and CH₄.

L 301 Sulfate reduction? Explain.

Make sure that all studies you compare your results to used similar methods and did not examine water – air fluxes instead of soil – air fluxes.

Calculate all GHG fluxes in the discussion in the same unit to make comparisons easier.

L318 What was expected?

4.2 Mangrove biomass: would only focus on the impact on GHG. This section interrupts the flow of the manuscript.

L336 Larger flood volume during ebb tides? Explain.

L433 – 435 I do not understand your general focus on sulfate reduction. This is an alternative process to methanogenesis. Always focus on CO₂ and CH₄ production.

The difference between different topographies can probably be explained by differences in

chemical soil characteristics.

L493 Which authors?

Conclusion

495 – 498 Be more specific. What seasonal trends? Rainfall compared to climatology?

Add a sentence about the general relevance of the study.