Biogeosciences Discussions

Biogeosciences Discuss., referee comment RC3
https://doi.org/10.5194/bg-2021-46-RC3, 2021
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Comment on bg-2021-46

Anonymous Referee #3

Referee comment on "High greenhouse gas fluxes from peatlands under various disturbances in the Peruvian Amazon" by Jaan Pärn et al., Biogeosciences Discuss., https://doi.org/10.5194/bg-2021-46-RC3, 2021

PaÌ□rn et al., 2021 report greenhouse gas fluxes from peatlands under various disturbances in the Peruvian Amazon. The investigated peatland sites covered (1) a slash-and-burn manioc field, (2) a 12-year-old secondary forest grown over a fallow pasture and a banana plantation, and (3) a natural swamp forest. While I very much acknowledge the scientific effort of data collection from a strongly understudied region of the world, I am afraid that the manuscript suffers in its current form from insufficient structural and scientific quality. This is a pity, since the additional laboratory analyses to quantify N2 potential from soil cores from the studied sites are novel and interesting.

Generally, the introduction is weak and does not clearly introduce why studying greenhouse gases from peatlands under various disturbances is important. The introduction mentions nowhere methane which is probably the most important greenhouse gas in these ecosystems and only a couple of lines are spent on carbon dioxide. Moreover, the data coverage is poor; Only 9 sampling sessions, over a period of 7 months (Sept 2019 to March 2020) were conducted at two sites (swamp forest; manioc field) and only four sessions during two consecutive days in Sept 2020 were conducted at the remaining secondary forest site. The reader is left with no explanation on why this irregular sampling strategy was chosen. Lastly, the discussion section does not contextualize the findings with other scientific literature, especially the aspect of disturbance. The word disturbance does not even appear in the discussion. Again, methane as an important greenhouse gas in these ecosystems is barely discussed. Given these substantial drawbacks of the study I recommend rejection of the paper in its current form.

Specific comments:

Abstract

General: The Abstract suffers from vague statements and needs to be more concise.

Line 22: Which ‘changes’? Land-use? Climate?

Line 25: At which frequency?

Line 26: moderate compared to? Give concrete flux numbers.

Line 27: ‘slight water table drawdown’. Pls be more specific. From inundated conditions? How much is ‘slight’

Line 29: ‘Nitrifier-denitrification was the likely source mechanism’ based on which underlying data? This is too speculative.

Introduction:

Line 42-45: How do these numbers relate to each other? Does that mean that these peatlands are a hotspot within the Amazon rainforest hotspot?

Line 54: This sentence is out of context.

Line 59: There is no transition to the C cycle and related CO2 emissions.

Line 62: Can you give a reference for this statement. Drought first and foremost reduces photosynthesis and consequently less assimilates are available for autotrophic and heterotrophic respiration.

Line 65: consider a better transition to the soil part of the intoduction

Materials and Methods:

General: No structuring into subsections

Line 76: suggest renaming site to ‘Swamp primary forest’

Line 76: suggest renaming site to ‘Swamp secondary forest’

Figure 2: what is the Pastaza-MaranÌ□on Basin? This should be mentioned in the text as well.

Line 85: How many chambers were installed at the swamp site?

Line 85: stations? Why not calling them plots?

Line 86: How long before gas sampling where the collars installed?

Line 92: How much gas was sampled and how? With a syringe and needle through a septum?

Line 100: How was CO2 measured? How was the GC calibrated?

Line 104: How much of the data was affected by this quality check?

Line 128: A ~7cm by 6cm soil core is not very representative.

Line 137: How were the samples taken from the continuously flushed vessel?

Line 137: How was this done exactly? N_2 is not easy to measure. How was the GC calibrated?

Line 138: Give equation.

Results and Discussion

Line 154-159: Can the water table change be illustrated graphically along with the actual fluxes of CO_2, CH_4, and N_2O?

Line 155: 'slope forest' is not the same site name as specified in the methods. Same for 'palm swamp'.

Line 165: dry station? I assume the authors refer to the toposequent stations? This needs to be clarified in the method section. Line 166: which site is the 'young swamp forest'?

Line 167: Why does the dry station represent the optimal moisture for soil respiration?

Line 172: Which site is the swamp peat?

Figure 4: Not been referred to in the text. I guess this should be done in line 173.

Figure 5: Why not CO_2 flux instead of soil respiration. That would be more in line with the other fluxes.

Line 176: I assume the authors refer to the eddy covariance technique.

Line 180: prevail --> dominate

Line 188-194: 6 lines of discussion for CH_4 only. This needs to be extended.

Line 195-198: Sudden switch to N2O fluxes with mentioning of soil respiration. Hard to follow the discussion.

Line 200: From what do the authors conclude at this point that N2O was produced from NH4?

Line 211-227: Very speculative paragraph.

Line 235: toe-slope swamp forest? Same as site 'slope'?

Line 238: Are there any other papers which investigate N2O reduction to N2 in tropical systems? What are the implications for the N cycle?

L251: Upscaling paragraph lacks info on CH4.