

Interactive comment on “Nitrous oxide fluxes from tropical peat with different disturbance history and management” by J. Jauhiainen et al.

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The paper presents a potentially interesting dataset, result of several years of work in tropical peatlands with different managements. The work could be very welcome as it reports data which are scanty in the published literature and we are aware of the difficulty to have such kinds of data for many tropical areas. Unfortunately the paper presents first of all two main limits for publication in the present state. Firstly, the English is very poor and does not help the reader to follow the discussion. Secondly, the analysis of the dataset could be significantly improved and presented in a more efficient and convincing way. There are many points which could be significantly improved. Other that are not clear at all. Moreover also the design and methodology should be better explained. MS TEAM REPLY: Compliments on data usefulness are appreci-

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ated. Referee has noted the low amount of data published on tropical peat N₂O fluxes, and sees the potential usefulness of this study. Addressed issues and suggestions for improvement are carefully considered for improving quality of this presentation. Modified version will be checked by professionals (native English speaker) at the University language services centre.

Introduction The introduction is too general and reports well known concepts which do not add anything to the more specific problem of N₂O emissions in tropical peatlands. The introduction might be widened adding more specific comments and information related to what is known relatively to N₂O emissions in these ecosystems (no papers are mentioned although some work has already been produced), to mechanisms and processes which are expected to be involved in N₂O production and that might be modified by land use change, some more information in terms of impacts and numbers on peat management and deforestation. The objectives of the work should be stated more clearly. MS TEAM REPLY: Introduction is revised and appended by new paragraphs addressing nitrogen mineralisation influential factors at various peat land uses in the tropics. In order to avoid repetition, information from the other few studies and references for tropical peat systems are dealt mostly in Discussion. Information on impacts and numbers on peat management and deforestation is added to Introduction. Objectives of the study are rewritten.

Materials and Methods 2.2 Sample collection, analysis and data processing It is not well clear what you mean by “closed-chambers installed on low topography (hollow) surfaces. MS TEAM REPLY: This phrasing is removed during text revision. Air sampling procedures are partly rewritten for increased clarity in Methods section sub-section “2.2.1 Sample collection” and information concerning monitoring locations is rewritten in sub-section “2.2 Study sites.”

Also, if hummocks and hollows are both features of the peatland shouldn't they be both analysed? MS TEAM REPLY: Practical and field site peat environment related reasons for selecting only one surface type for the study is explained in Methods sub-section

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“2.2 Study sites” and also discussed in Discussion in new sub-section “4.5 Challenges and opportunities in N₂O data collection and processing.”

To select a specific area of the peat, which has very different characteristics compared with others might bias the results and lead to wrong conclusions. In hummocks the effect of roots decomposition following the cut due to chamber insertion might be solved inserting the base everyday in a different area as the decomposition process wouldn't affect the result in the first hours after chamber insertion in the soil. In any case given that measurements have been already taken you should discuss how the selection of specific areas of the site could affect your results in terms of site average flux. MS TEAM REPLY: This approach (“inserting the base everyday in a different area”) was not applied in this study because then it would not have been possible to follow spot level variation in N₂O flux. In addition, there is no proof how much prior to each air sampling event inserted collars may influence emissions from the spot. In general, all N₂O data from tropical peat is spatially limited, and this is discussed in new sub-section “4.5 Challenges and opportunities in N₂O data collection and processing.”

Some comments on the effect of keeping the internal part of the chamber without vegetation on N₂O fluxes. . .indeed you might get into the same problem you wanted to avoid in the hummocks. . .how do you avoid the growth of the vegetation inside? Cut the above ground biomass? Then you have decomposing roots?..just clarify. MS TEAM REPLY: It is explained that the selected soil surface was in general and naturally vegetation free (sub-section “2.1 Study sites”) and information concerning procedures made for minimizing existence of possibly found vegetation is added (sub-section “2.2.1 Sample collection”).

More information on the gas chromatographic technique should be provided. Carrier gas, flow rate, eventual traps for CO₂ or water, temperature of ECD and oven, etc. You state that chambers were closed for 20 minutes and gas was sampled every 5 minutes. Given that fluxes are quite low, were 20 minutes sufficient to have a good estimate of the flux? Can you give us some info on the detection limit of you methodology, i.e.

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which is the minimum flux you can detect being sure it is a flux and not a fluctuation around ambient values? MS TEAM REPLY: Information on data selection criteria added (new sub-section “2.2.2 Sample analysis”). Citations (Nykänen et al., 1995 and Maljanen et al., 2007) are inserted in the MS. We find it unnecessary to repeat published GC details in current MS.

You should better indicate how were your chambers distributed compared with the canal positions and also give us information on how do conditions change moving away from the canal. MS TEAM REPLY: Information on flux monitoring chamber locations from the possible drainage systems, impact of canal, and chamber general arrangement is added to sub-section “2.1 Study sites” and in Table 1.

Specify why water table level logger was installed at the most far-off gas flux sampling location from the canal at the DF and DBP sites. How many water table meters there were per site? How does the water table changes over the site (spatially)? Is one table logger representative? And how its position is able to be representative for the conditions under the chambers located in different spots over the field? MS TEAM REPLY: Arrangements made for water table monitoring and data analysis and outcome are explained in detail in added paragraph (in new sub-section “2.2.3 Water tables at sites”).

Lines 1-5 of page 5430 are not clear. MS TEAM REPLY: Information concerning sampling intensity at monitoring sites is revised and is available in sub-section “2.2.1 Sample collection” and in Table 1.

To select arbitral flux level “cut off” points for dividing highly deviating fluxes from typical flux levels at the sites is an unclear passage. What do you mean by arbitral? There are statistical approaches to define what is within a certain range of values with a scientific meaning. If this was just a mistake please clarify otherwise use a precise statistic approach. MS TEAM REPLY: As it was pointed out by the referee and also by the other 2 referees, use of arbitrary cut points are difficult to reason. Therefore,

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new cut points for the highly deviating emission values, based on statistical criteria, are applied. The new selection is based on 75% quartile limit i.e. the highest 25% of the emission values are included in the group. Results, graph and discussion is based on the new approach. New added table (Table 3) includes these cut point values among other summarized main flux characteristics.

Overall all the paragraph from line 1 to 10 of page 5430 is not clear and should be rewritten. Also lines 11-15, same page, should be rewritten in a better way. MS TEAM REPLY: This paragraph is rewritten and the content is now part of sub-sections "2.2.1 Sample collection" and "2.2.4 Data analysis".

Results Lines 18-19 page 5430: the concept is absolutely unclear. The data analysis of paragraph 3.1 could be improved. The "scatter" of data is somehow not interesting if the shape and characteristics of the distribution are not discussed. MS TEAM REPLY: Section is rewritten and provides now shortly the main flux characteristics (linked to new Table 3). Description of findings on flux scatter at specific water table depth conditions is reduced but outlined in order to support the use of Table 3 and Fig 2.

Paragraph 3.2 shows interesting data however is so badly written that it is very difficult to follow the discussion. The arbitrary cut of data as previously discussed is not clear and should be either modified or better supported. In this paragraph transects of chambers from the channels inwards are mentioned and discussed. However, this design has not been well presented before. In this paragraph you could also better present the analysis of data for the quantification of cumulative fluxes, briefly presented in the methods section. This is crucial for a good interpretation of the cumulative data. MS TEAM REPLY: Text is checked and revised for better flow. Arbitrary 'cut points' are replaced by statistical 75% quartile' limits, and the results are revised accordingly to match small changes at DBP site data and larger change at DF site data.

Data of paragraph 3.3 are poorly discussed. MS TEAM REPLY: Discussion concerning section 3.3. is revised (in added new paragraph to section 4.3) in order to clarify

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cumulative emissions at the study sites and in published literature on the topic.

Discussion In the discussion the authors introduce a lot of details about the sites to try to give some explanation for observed fluxes (litter decomposition, peat quality, porosity and thickness, mineralization, etc). None of these data however is reported in the paper and we can only "believe" to what authors say. It would be advisable either to introduce ancillary data which are used for the discussion or to stick the discussion mostly on the information gathered in this study. MS TEAM REPLY: Added table (Table 2 in revised MS) provides ancillary data on Peat depth, Water table, Peat bulk density, C-content, N-content, C:N-ratio and pH at the sites. Presented N₂O fluxes are interlinked to this additional background data in discussion.

Also some other study already published in the same plots which reports ancillary data might be mentioned if needed. The discussion basically makes a lot of speculation on data which are poorly presented in the results. Several comparisons are presented with previously published data. This is good but the comparison would have a better effect if the similarities/differences between this study sites and others are discussed as the fact that sites are tropical peatlands is not a reason to give expect similar results per se. MS TEAM REPLY: Quoting our own previously published ancillary data and referring studies made by other groups is enhanced in Discussion. If some N₂O flux data is available from same or relatively similar conditions, it is now better indicated. However, in some cases comparisons to available other published data is restricted by methodological differences in data collection or insufficient reporting of data in referred publications. All published N₂O studies (in international peer reviewed journals) on tropical peat are referred.

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