

Interactive comment on “A new dataset of soil Carbon and Nitrogen stocks and profiles from an instrumented Greenlandic fen designed to evaluate land-surface models” by Xavier Morel et al.

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Thank you very much for your review and your constructive comments on this manuscript. I hope that the explanation given below, and the changes to the manuscript, will provide an adequate response. Referee comments are indicated as “RC” and author responses as AR.

RC: I had the opportunity to review the manuscript entitled “A new dataset of soil carbon and nitrogen stocks and profiles from an instrumented Greenlandic fen designed

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to evaluate land-surface models” by More and collaborators. This study presents a dataset on soil carbon and nitrogen stocks on two transects in a monitored site for CO₂ and CH₄ fluxes in a Greenlandic fen. Thus, the authors suggest that the presented dataset could be include in models for C fluxes. I agree with the authors that this dataset will help to this end, but also could be relevant for other research objectives.

AR: Great ! It would be helpful if you could share the other research objectives you have in mind

Main comments: RC: The authors conducted two transects in Nuuk Research Station. However, it is not clear how these two transects were selected (based on previous information; topographically?) and with which objective (some plots are selected close to the automatic chambers, but the others?).

AR: As the reviewer guessed, the first transect was chosen so that the first samples would be taken at the same location as the automatic chambers. This allows to document the carbon stocks responsible for the CO₂ and CH₄ emissions measured by the chambers. But we also wanted to know if this part of the fen was representative of the whole fen. This is why we extended the 1st transect beyond the automatic chambers and down to the stream and chose a 2d transect. The second transect was taken along the length of the fen to the right of transect 1. This allowed co-location with the existing temperature probes. Time constraints didn't allow to sample the fen on the left side of T1.

RC: In P10, L31-32 only profiles from T1-0 to T1-20 are considered to be useful to be include in the models, why to sample other plots? This is not well justified.

AR: We agree this sentence is too short. We mean that when performing a detailed 1-dimensional evaluation of the litter and soil carbon together with the CO₂ and CH₄ emissions simulated by a land-surface model, it is best to use the carbon profiles corresponding to the automatic chambers. The measured CO₂ and CH₄ fluxes correspond to this soil C (and moisture). It is likely that the locations with profiles exhibiting sim-

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ilar water and C content would emit/absorb similar amounts of CO₂ and CH₄ but not certain. The text is now rewritten

RC: In line 24-25, the authors referred to GEM open access repository where data of the site is available. I would like to read a small description on what are the soil-related variables available in this database (e.g. soil temperature, chemistry?) and in which period/frequency. Because one of the main goals of the paper is to use the dataset for modelling purposes, this will help to spread the use of the dataset presented.

AR: The available data is detailed on line 1-3 of p 4. We will however rewrite this section in order to assess other reviewers' comments. We will also add the period covered by the measurements and the frequency.

RC: Some statements need references (e.g. P2; L1; P2, L18; P2, L22; P2, L30; P4; L9, P4, L24 etc.)

AC: p2 l1 Xu et al, 2018; p2 l18-22 this has been rewritten; p2 l30 Raich & Schlesinger, 1992; P4 l9, removed;

RC: If the formatting of the journal allows, I suggest to merge results and discussion in only one section. This will make the text easy to follow. As it is now, both sections are mixed (e.g. references included in the results section).

AR: done

RC: Also, the first section of the results P7 L1-L18 mostly belongs to Material and Methods section, please consider to move it there (or almost part of it).

AR: done

RC : In the results section, there a lot of tables and figures but some data is not presented (e.g. water content and nitrogen stocks). It is only referred to the figure content e.g. P7, L6-7. Main results should be described in the text. I am particularly interested to see the description on nitrogen stocks since this was announced on the title of the

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paper.

AR : We will add a small paragraph on water content and add N stocks in Table 3 and 4

RC: The manuscript presents some style issues: - use of capital letters is inconsistent through the text e.g. arctic (P1,L10)/Arctic (P,L25)- I prefer the second option; Nitrogen (title)/nitrogen-better the second option... ; Nuuk Research Station (P3, L18) vs Nuuk research station (P3,L25); Greenlandic (L4) should be capitalized - references should be cited at the end of the sentences (e.g. P3, L32) - abbreviations are not consistent along the text; e.g. carbon is referred as C (P1, L18) but hereafter appears as “C” or “carbon” - the use of one sentence as a paragraph is not usually advised (e.g. P7, L28-29; P8, L2-3; etc.), please check that through the manuscript

AR: OK, we will correct this

RC: minor comments –

P1, L8 briefly provide a description of the transects :

AR : “Measurements were made along two transects, 60 and 90m long, co-located with the greenhouse gas measurements and the soil temperature probes”

RC : P1, L9 better provide range of values for carbon density.

AR: “Soil carbon density ranges from 6.2 kgC/m³ to 160.2 with a mean value of 50.2 kgC/m³”

RC : P2, 14-17 long sentence and difficult to understand. Please, rephrase

AR : this paragraph is rewritten.

RC : P2, L27 provide the name of acronyms for HWSD and NCSCD.

AR : done

RC : P3, L9 how does soil sampling affect emissions measurement? Maybe provide

more info on the methods and material section.

AR : For the sampling done in the vicinity of automatic chamber fluxes measurements (plots T1-0 to T1-20), the soil coring was done approximately 20 cm away from the automatic chambers in order to not disturb the soil column below the chamber fluxes. We didn't detect any change in the fluxes compared to the previous days

RC : P3, L11 I am not sure how this paper validates the presented database, please rephrase. AR : this sentence is dropped by request of referee n1

RC : P4, L1 particular

AR : done

RC :P5, L18 thanks for noting the potential shortcomings of the methods applied.

AR : done, also asked by referee n°2

RC : P5, L24 please provide a short summary of the method used (not only refer to the citation).

AR: We add the following sentence: For each sample, volume and mass were carefully measured following the method of Chambers et al, 2010 by removing a known-volume sample of peat using a volumetric sampler and weighing it in a crucible in order to determine the samples density

RC : P7, L15 heterogeneity

AR : OK

RC : P7,L15-L18 provide reference for "normalized distance from OMI". Also to help to understand this metric add something like "values greater than 100 represents depths below OMI"

AR : We don't believe a reference is needed for the normalized distance since we give the equation that defines it, but we will add the sentence explaining the values greater

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than 100.

RC : P7, L30, tend to show

AR : OK

RC : P8, L3, clarify what the proportions referred in Yu (2012) refer to (northern peatlands)

AR: OK “They can approach 50 %, which is coherent with the proportions given in Yu (2012) for northern peatlands”

RC : P8, L15-16 the authors exclusively attributed the high value to bad sampling. If so, I suggest to remove the value from the dataset. If not, provide alternative explanation. If not important, leave the value and not mention it

AR : We chose to leave the value and not mention it as it is not important

RC : P8, L28-30 this corresponds to method section

AR : yes, we moved this part to the methods

RC : P9; section 4.5 please refer figures and tables that the text refer to.

AR : yes we added “With a mean value of 21.6 (Figure 7.d) . . .

RC : P10, L14; r^2 refers to what type of relationship? (lineal?)

AR : we rewrote this sentence, it is actually a correlation with the Hossain relationship

RC : P10, 31-32 this sentence could easily be moved to the material and methods. I do not think that is appropriate for a final sentence in the discussion since there is no justification of that, so I guess authors suggest that only because of the location of the plots...is that right?

AR : we agree this is not really a discussion – it is an advice given to modelers – we will move it to the methods

RC : P10 L17; “same order of magnitude”- “right” is a tricky work to be used in science

AR : ok

RC : Consider to include appendix A in the material and methods -

AR: We will include the appendix in the material and methods

RC : Figure 1. Please include the location of automatic chambers and other equipment of interested such as temperature probes.

AR : we will add them in the figure 1

RC : Also, the location of the fen on a Greenlandic map would help to geographically contextualize the study site.

AR : we will redo the figure 1 to add an insert of a Greelandic map.

RC : Also, consider to highlight the plots that might be useful to combine with C fluxes dataset (T1-0 to T1-20; according to P10 L32).

AR : As location of automatic chambers are now highlighted in the figure 1, the plots useful to combine with GHG fluxes

RC : Table 1. An extra column stating if data is freely available.

AR : Done.

RC : Table 2: lowest decile; highest decile; C/N ratio (molar/weight ratio?)

AR : Changed to “lowest” and “highest”. For the C/N ratio, it is a weight ratio. We will add it to the text and tables.

RC : Figure 5: C/N ratio (molar/weight ratio?)

AR : For the C/N ratio, it is a weight ratio. We will add it to the text and tables.

RC :Figure 8 red shaded area represents. . .

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AR : Red shaded area represents the 95% confidence interval, as stated in the legend of figure 7. We will make it more precise in the text.

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