

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 : The manuscript by Morel et al. describes a valuable dataset that can be used to parameterize and validate land surface models when they are tested on the small

C1

scale of a single site. As the authors note, not many of these datasets exist from the same area as where fluxes are measured, which makes this dataset very valuable.

AR : Thank you for your comment.

RC : While the manuscript is scientifically sound, it appears to be written too quickly. Some sentences are unclear, and there are many grammatical errors and typos present in the text. I advise the authors to have their text checked by someone with a thorough understanding of the English language. Otherwise, I only have some small remarks which need to be dealt with.

AR : We agree that the number of grammatical errors and typos is important. We will have the paper corrected by a professional native speaking editor when the reviewers agree with its content.

RC : Page 2, line 1: 3% of the global terrestrial surface?

AR : Yes, of the global terrestrial surface. We added the word "global" for clarity.

RC : Page 2, line 6-7: It seems that some words are missing from this sentence. What do you mean?

AR : Sentences had been changed to "Thus, peatlands play a major role in the global carbon cycle (Harenda et al., 2018). During the Holocene, peatlands have been regulating the greenhouse gas (GHG) concentration by consistently sequestering carbon although at variable rates between the beginning and the end of the period (Yu et al., 2011)"

RC : -Page 2, line 13-14: This statement appears counterintuitive, that peatlands will remain a sink for carbon but turn into a positive climate feedback. Is this due to increases in methane emissions? If so, please specify. This is of course also dependent on the time scale chosen for the global warming potential of methane.

AR : As other reviewers noted, this statement was indeed not clear enough. We rewrote

C2

it into "Recent projections suggest that peatlands may remain a carbon sink in the future, although a weaker one (Gallego-Sala et al., 2018)."

RC : Page 2, line 14-15: I'm not sure whether I follow this sentence. Because the size of natural carbon fluxes is large, this means that a large feedback will be triggered by temperature increases? The paper by Schuur et al. is about permafrost carbon, which is quite different from the Fen studied here and it's not a global study. A warming may have quite different impacts on ecosystems in other parts of the globe. I suggest that this sentence be clarified or removed.

AR : We removed this sentence.

RC : Page 2, line 24: 'These regions'. Which?

AR : Was changed into "In peatlands regions"

RC : Page 5, line 20: I appreciate the honesty on keeping the samples under sub-optimal conditions, which is often the case when working at remote locations. But was there an attempt made to store the samples in an oxygen-free or oxygen-limited environment to halt decomposition? If not, it would be good to speculate on how this may have affected the samples.

AR : We did not mention in the original text that each soil sample was stored in a small sealed plastic bag just after being extracted from the gouge auger, in order to prevent decomposition. We added a sentence in the revised text. The maximum elapsed time between sample collection and laboratory deposit was three days. Since characteristics decomposition times of labile organic matter are in the order of magnitude of some weeks, the carbon content of the samples could not have been significantly impacted by decomposition during three days.

RC : Page 6, line 17: please indicate the location of the Center for Permafrost

AR : We added Center for Permafrost (CENPERM – University of Copenhagen – Denmark).

C3

RC : Page 8, line 15-16: was this outlier included in your calculations? How does it affects the numbers if it is excluded?

AR : This outlier (taken at the point T2-20, at 50 cm depth) was not excluded in our calculations. We mentioned it because of its particularly high value in carbon density (160,2 kgC.m⁻³), clearly visible in Figure 9.b. However, this sample is not an outlier for other variables such as bulk density (0.26 g.cm⁻³), carbon massic percentage (22%). Not including this single point over n=135 samples does not change significantly the numbers and results of this study. Excluding it for : - the calculations of the soil carbon stocks (eq. 5) leads to a carbon stock from peat core T2-20 of 45.3 kgC.m⁻² instead of 53.6 kgC.m⁻² (Table 4) and a mean carbon stock over the second transect of 29.7 kgC.m⁻² instead of 30.7 kgC.m⁻² (Table 4)

- the calculations of the mean soil carbon density leads to 50.0 kgC.m⁻³ instead of 50.2 kgC.m⁻³.

RC : Page 10, line 13: without reading Hossain et al., which correlation is discussed and what does it mean?

AR : The discussed correlation is an exponential relationship between bulk density and carbon content, . To add clarity, we rewrote the sentence as : "We find a similar exponential behavior (Figure 9.a) between bulk density and carbon content with a strong correlation between our measured bulk density and Hossein's exponential ($r^2 = 0.801$, Table 5)"

RC : And here are the most important grammatical mistakes I spotted, but there are many smaller ones that also need to be corrected. I urge the authors to do a thorough language check.

AR : Thank you for taking the time to list the most important grammatical mistakes. As mentioned earlier, we are having the manuscript checked by a profesional english speaker editor.

C4

RC : - Page 3, line 20: change 'to several' to 'in several'
AR : done

RC : - Page 3, line 28: change 'cold winter temperature' to 'cold winter temperatures'
AR : done

RC : - Page 3, line 31: Change 'Datations' to 'Dating'. (I assume this is the word you're looking for)
AR : done

RC : - Page 4, line 3: Instead of 'isolated' it's better to use 'sporadic' if the measurements are not done regularly.
AR : done

RC : - Page 4, line 8: remove 'the' in front of 'saturated'
AR : done

RC : - Page 4, line 9: 'Fen fronters'. What do you mean? The border of the fen?
AR : Yes, we changed fronters to border

RC : - Page 5, line 2: 'Extinction' is incorrect, since the fen is still there. I assume you mean 'end'?
AR : Yes, we changed it accordingly.

RC : - Page 5, line 14: insert 'in' before 'diameter'
AR : done

RC : - Page 6, line 4: Don't you mean this: 'The almost liquid texture of the water-saturated samples made it difficult to measure the sample volume'
AR : Yes, we changed it accordingly.

C5

RC : - Page 6, line 9: 'significative' should be 'significant'
AR : done

RC : - Page 6, line 10: 'mixed-appearance' should be 'mixed-appearance'
AR : done

RC : - Page 6, line 13: change 'determine' to 'determined'
AR : done

RC : - Page 7, line 29: change 'as it should be' to 'as expected'
AR : done

RC : - Page 7, line 30: change 'do show' to 'to show'
AR : done

RC : - Page 8, line 23: change 'coherently' to 'concurrent'
AR : done

RC : - Page 8, line 25: remove the 's' at the end of 'increases' and 'decreases'
AR : done

RC : - Page 9, line 19: add an 's' to 'ratio'
AR : done

RC : - Page 10, line 5: remove the 's' at the end of 'measurements'
AR : done

RC : - Page 10, line 7: what does 'aleas' mean? I can't find it in an English dictionary
AR : We meant any uncertainties or hazards on the handling of the sample. Sentence was changed into "On the other hand, mass carbon percentage are independent of

C6

any uncertainties or hazards in the sample handlings, such as sample compaction."

RC : - Page 11, line 11: insert 'to' before 'further'

AR : done

RC : - Page 11, line 11: 'devlopments' should be 'developments'

AR : done

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