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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.

Anonymous Referee #7

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Review report on MS No.: essd-2019-225 by Xavier Morel et al.

The manuscript presents a data set of soil C and N contents from a Greenlandic fen site, which is a setting for long-term gas flux measurements of methane and carbon dioxide. In principle, these kind of data are valuable for C modeling community. However, I am not sure if this rather small dataset is sufficient for publication in ESSD, and have to leave it for editorial judgement. In any case, in the current stage, the reasoning related to the value and rarity of the current dataset is not fully convincing. Also, the manuscript text is not of very good quality, with respect to both logical structure and

correct use of scientific English. I do not think the manuscript is ready for publishing yet, and significant improvements are needed in order to reach publishable quality.

***Major comments

RATIONALE AND CONTEXT OF THE STUDY - The rationale and discussion are written on a very general, even shallow level, and does not include the two aspects of the data I find most interesting: 1) that it is a report of a Greenlandic fen particularly, and 2) most importantly, that the data include also N stocks alongside the C stocks.

1) Greenlandic fens are typically small and shallow (and often young?), and distinct by their characteristics from many other northern peatlands. Instead of the clearly incomplete summary of C stock estimates from northern flux sites presented in Table 1, the authors should provide a good summary of soil C & N sites across Greenland, and present also the results of the Nuuk site in the context of other Greenlandic data. According to my understanding, there is not whole lot of such data available, so summarizing the previous data from Greenland would be a good way to "sell" this data set, and facilitate its meaningful use. The introduction section would also greatly benefit of a summary of Greenlandic fens in general – how abundant they are, how they can be characterized, what are the main gaps in knowledge.

2) While C stocks in northern soils have been studied extensively, N stocks in northern soils have gained much less attention, e.g. there is no proper estimate (but a clear need) for a N stock estimate for northern permafrost soils. With this in view, I find it a little odd that the authors have decided to give so little emphasis on their N data in this report. Nitrogen is mentioned in the title and presented as figures, but close to nothing is said about nitrogen in abstract, introduction, results text or conclusion. Nitrogen is a limiting factor for plant growth and microbial activities in northern soils, and this has been acknowledged recently by many modeling studies that deal with the C and N interactions in soils. E.g., Kicklighter et al. (2019) & Luan et al. (2019) and give some insights to this topic. Also, there are reports of increased N2O release from northern

soils with permafrost thaw, (Elberling et al. 2010, Voigt et al. 2017), also emphasizing the importance of such soil N and C/N ratio data.

I recommend revising the manuscript fully with these issues in view.

TOTAL C AND N STOCKS - The total C and N stocks on kg C m-2 basis are a key results of this study, since they are the usual outcome of soil C inventories and can be very intuitively associated to gas fluxes that are also expressed on square meter basis. Despite this, they are not reported as a part of the public dataset, not reported in the abstract, and not sufficiently compared with similar ecosystem types. Although the depth of the sampled soil profiles was quite variable (as stated on page 9, lines 1-15), the authors could e.g. report the C stocks in the peat profile to make them comparable with each other, and then based on the few mineral soil measurements in this data and relevant literature estimate how much this might underestimate the total C stock down to 1 m.

QUALITY OF THE REPORT TEXT – The language and structure of the report needs still some work to reach publishable quality. The manuscript would benefit from a proper language check, since it has quite a lot of wordings and expressions that are not typical for good English scientific writing (e.g., P1 L16: northern latitudes wetlands instead of northern latitude wetlands, P3 L1: modelisation instead of modeling, P3 L30: datations instead of datings, P4 L10: the use of verb doted, P5 L2: the use of verb extinction).

Also, the text should be checked for logical structure, now the method part includes results (P4 starting from L26), and the results section starts with text (P7 L1-18) that should be partly moved to methods, and partly discarded: Instead of describing the contents of each figure and table specifically, it would be much better to refer to tables and figures in parenthesis after sentences describing the results in question. The results section is referenced also there is a separate discussion section – why not combining these to one?

The text should also summarize better the dataset to facilitate the reader to get a good overview: e.g., describing the length of transects, depth of sampled profiles and total amount of samples in the abstract would be critical for such a dataset description, and the flux and auxiliary data available from the site should be much better described in order to make it attractive for modelers (P4 L1 ->): which gas fluxes are measured, for how many years, which seasons, which other parameters are available (meteodata, energy fluxes, water fluxes, LAI, plant biomass etc.). All in all, the text needs much more time and thought to make it easily readable and logical, and a good complementation for the datasets it describes.

With these substantial changes I now suggest to the manuscript, I do not find it meaningful to give more specific comments, in addition to those good ones already given by other reviewers.

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