

Comment on bg-2021-263

Jonathan von Oppen (Referee)

Referee comment on "Changing sub-Arctic tundra vegetation upon permafrost degradation: impact on foliar mineral element cycling" by Elisabeth Mauclet et al.,
Biogeosciences Discuss., <https://doi.org/10.5194/bg-2021-263-RC1>, 2021

Mauclet et al. present leaf mineral micronutrient analyses from two arctic tundra sites, in the light of potential vegetation changes with ongoing permafrost degradation. The sites represent one experimental and one observational system, with contrasting vegetation dynamics upon soil permafrost thawing. The authors convert measured leaf nutrient contents into foliar stocks and maximum potential foliar fluxes to assess the effect of potential vegetation shifts on future nutrient cycling.

The study is timely and thoroughly conducted. The authors well explain the general study background and give a detailed description of the methods and results. The methodology appears overall sound and well justified, with some minor inaccuracies as outlined below, and the authors discuss some important implications of their findings.

However, from my perspective, the study does not fulfil its potential, as the extensive amount of detail given as well as a confusing structure make it difficult for the reader to extract the most important messages. This includes, but is not limited to (i) repetition of methodological details that could be avoided if it had been explained more clearly in the first place; (ii) inconsistencies of figure contents vs. order of paragraphs in the manuscript, resulting in thematic jumps; (iii) the lack of a clear line of argument within most paragraphs and sections; (iv) complex sentence structure; and (v) language errors and unfitting use of expressions (while I acknowledge that English might not be the lead author's first language). These drawbacks also impede a proper evaluation of technical and argumentative details, particularly in the very long results/discussions section (and especially 3.1 – 3.3).

I would therefore suggest thorough revision of the manuscript with the aim of a more concise language, including considerations of which details could be left out, and the establishment of a clear red line of argument. One potential way to achieve this could be a more hypothesis-based structure. Clearly reasoning and stating the expected findings at the outset would help the reader to follow the line of argument, and could provide the

authors with a consistent structure to follow for the rest of the manuscript. As much of the confusion arises from parallel evaluation of the two different study sites, the authors might also consider focusing on either the experimental or the natural gradient site.

In summary, I do think this study has the potential to make a valuable contribution for Arctic research eventually. However, I encourage the authors to extensively and carefully revise the text to help guiding the reader and support the transfer of their findings and implications.

Below I am listing some detailed comments that I hope will also be relevant and helpful for a revised version:

Introduction:

- The introduction is generally well structured, but contains much detail that is perhaps not necessary. I recommend starting each paragraph with a clear statement of what information it contains, and wrapping each paragraph up with a summarising statement which supports transition into the next point.
- As mentioned before, I suggest ending the introduction with a clear hypotheses statement as a guideline for the reader and to help structure the text later on.

Material and Methods:

- The methods section gets very complex by the methodological differences between the gradient and the experimental sites. This applies especially to the "Data treatment" section. As I suggested above, focusing on one of the two sites could help to reduce complexity.
- The methods contain a detailed description of the CiPEHR treatments, yet I don't see the effects of these being evaluated in detail in the results and discussion. I suggest to either discuss the effects of the different warming treatments, or to remove

unnecessary detail from the methods description.

- If keeping the details on treatments, presenting data on their effectiveness (e.g., soil temperatures across warmed seasons) in the supplementary material could help the reader assess treatment effects on the vegetation. The same goes for vegetation biomass data: even if that has been published previously, it is very central to the argumentation and interpretation of the results of this study.
- I could not find any reasoning why the number of species sampled differed between the gradient and the experimental site.
- Likewise, I suggest to assist the reader with understanding of where the number of leaf samples arises from (L166). I cannot see a clear relationship with the number of sites or species.
- I am missing an evaluation of the model assumptions for applying a parametric test. Homogeneity of variances is briefly mentioned in the supplementary material, but does not receive consideration in the main text.
- L229: how could an interaction between treatments be included in the model if “treatment” represents a single factor?
- Numbering of the Methods subsections should be 2.x instead of 1.x
- Figure 1 is currently not referenced in the text.

Results and Discussion:

- Though I like the use of numbers in the text, I would recommend to not present every detailed result for every species and response. This makes the reader tired and distracts from the main messages. Instead, I would recommend to focus on the most important findings and the overall picture for every analysis.
- I would suggest to follow the structure *One figure, one paragraph/section* – don’t come back to different panels later on (e.g. Fig. 3 and sections 3.2.1 and 3.3.1). Instead, group both paragraphs and figures thematically and consistently.
- Alternatively, as mentioned above, focusing on either the gradient or the experimental site might help with streamlining the text.
- The intermingled structure of results and discussion in sections 3.1 to 3.3 makes it hard to distinguish descriptions of results from discussing statements, especially as the authors frequently refer to detailed results from other publications. In such cases, I suggest separating results and discussion into consecutive paragraphs.
- I suggest to carefully consider the importance of individual findings. Presenting the most important results first will help the reader to extract information.
- I had the impression that the depth of discussion was not well balanced across all findings. Some results were discussed in much detail and with a lot of references (e.g. section 3.1), while others were described in great detail, but only briefly evaluated (e.g. section 3.2.2). In both cases, focusing more on the most important aspects for the general picture might help in creating that balance.
- I would also recommend not to bring up methodological details in the discussion again – for instance L270f, “In 2009 (before any experimental warming), as in 2017 (after eight years of experimental warming)”. If clearly described in the Methods section, this will not be necessary.
- The last, synthesising part of the discussion reads well! I think it would benefit from making it more concise and to the point as well, but it sums up the study implications

nicely.

- The same goes for the conclusion, which should also be shortened considerably to emphasise the most important points. There's no need to recap the methodology in such a detailed way here, that only takes the focus of the reader away from the important outcomes.

Language remarks:

- I suggest to carefully revisit the use of "the" throughout the manuscript. For instance, it should be used when referring to specific subsites ("at *the* Gradient site").
- Similarly, I would advise not to use commas excessively as they tend to break the reading flow. (There are some good overviews of comma rules available online, such as https://owl.purdue.edu/owl/general_writing/punctuation/commas/extended_rules_for_commas.html)
- I also recommend to refer to the degradation stages of the gradient site as e.g. "the Moderate *thaw* area" instead of just "Moderate area" throughout the manuscript to enhance clarity.
- To my knowledge, the expression "vegetation species" does not exist in English, and it might even create confusion in whether the authors are referring to the vegetation as the entity of species or communities across an area, or to separate species as such. Assuming the latter, I think that using "plant species" or simply "species" should do in most instances.
- If using an expression like "A was explained by B", I would expect that this relationship was by some means statistically tested. If, like for instance in L395, referring to a matching pattern or logical reason for a finding, I would rather phrase this like "A mirrored B" or "A followed B" to avoid confusion. But that might be a matter of taste :)

Other minor points:

- The authors might want to check consistency of reference formatting. E.g. L479 "Chapin et al. 2005" vs. L373 "Chapin III et al. 1980".

As the text will need thorough revision throughout, I hope the authors and editor will understand that I don't give more detailed comments on phrasing of specific passages at this stage. I will be happy to provide these once the authors have revised the overall structure of the manuscript.

Jonathan von Oppen

Aarhus, 29 Nov 2021

jonathan.vonoppen@bio.au.dk