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Interactive comment on "Preferential protein depolymerization as a preservation mechanism for vascular litter decomposing in *Sphagnum* peat" *by* Hendrik Reuter et al.

Tim Moore (Referee)

tim.moore@mcgill.ca

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This is an interesting manuscript which explores the fate of N during the early stages of decomposition of plant litter under anaerobic conditions. In essence, the authors examine the depolymerisation of N in litters and substrates of varying N content and FTIR is adapted to provide identification of the chemical changes in the decomposing litter, with an estimate of the microbial uptake and depolymerisation components and stoichiometric relationships.

The manuscript is well structured and written and provides some insight into the depolymerisation process, which has been proposed for several years, but which has

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been difficult to analytically identify. I hasten to add that I have a very limited knowledge of the dark art of FTIR spectra analysis, so look to other reviewers to evaluate the veracity of the FTIR section of the manuscript. I have noted some grammatical/typographical and stylistic errors and suggestions, and place them in the pdfs, which are hopefully attached.

I provide the following more detailed comments and suggestions for consideration by page and line number:

1, 0 While I think that the preservation of vascular litter in Sphagnum peat is a useful product of the work, I think it has a broader impact, and most litter entering Sphagnum (and other) peats decays initially under aerobic conditions, rather than the anaerobic burial used in this experiment. Thus I would suggest a more generic title, emphasizing the more original approaches taken.

1, 2 What does 'relative' mean here? It could be N accumulation relative to N (implying a lowering of the C:N ratio) or it could be a larger N mass, relative to the initial litter. Please clarify.

4, 25 The experiment was conducted under anaerobic conditions, or at least litter placed in containers into which substrates had been added and presumably under saturated or waterlogged conditions. I think this is important, partly because of the conditions created (anoxic) and, as I note above, most peatland vascular litter does not decompose initially under anaerobic conditions. Thus, I think the experimental details of these containers and substrates/litter need to be better described. Also, were they incubated at 'room temperature'? Furthermore, are the results of this study likely to be repeated, quantitatively or qualitatively, if the experiment was to be repeated under aerobic conditions, which is probably the situation in many wetlands. Of course, one could argue that the initial aerobic decomposition is followed by anaerobic, as the litter becomes buried and goes beneath the water table.

Table 1. I was a bit confused by * decomposition in home soil. I would have thought

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the ‘home soil’ would be high-N leaf with high-N substrate, medium with medium etc., but this is not the pattern observed. I wondered why.

7, 4 Litter bag experiments usually entail the early stages of decomposition, in this case 21 to 45% over 75 days. One wonders what the patterns may have been if the study allowed sampling earlier and later: in other words, are the processes identified here time-dependent in the decomposition path?

7, 8 Litter quality involves several attributes of the initial litter influencing decomposition rate, of which the C:N ratio is frequently cited. It was not borne out here, possibly because decomposition was under anaerobic conditions. Were there any other attributes of the litter which might explain this deviation, such as P content, lignin content etc.?

Table S1 While nitrate was essentially non-existent in the porewater from the three substrates, there was a major difference in NH4 and also DOC, the latter implying a large variation in dissolved organic nitrogen (DON), referred to p 18, l6. In Sphagnum peatlands, DON dominates the pore water, often forming 60-90% of the total dissolved nitrogen (TDN). It appears that TDN was not measured (allowing an estimate of DON) but could there be more consideration of DON in the understanding of the processes involved?

I found it a little bit confusing that C and N ratio was expressed atomically, whereas everything appears to be on a mass basis; while atomic units are common in stoichiometric studies, most decomposition studies use mass.

Sequence of reference citations seems to vary between alphabetical and chronological and the format used in the References is variable.

In case the Supplement does not load, oxycoccos is mis-spelt and it is Electrical conductivity.

Tim Moore

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Please also note the supplement to this comment:
https://www.biogeosciences-discuss.net/bg-2019-176/bg-2019-176-RC1-supplement.pdf

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