

Dear Sara,

We only received the pdf with the reviewer's comments now, but not with your previous message. Now that we have received the comments, we improved the manuscript accordingly. Please find our answers to all comments below.

In addition, we improved the sentence you mentioned, and carefully checked the whole manuscript again, and improved the structure of some sentences.

We also moved section 4.5 and the end of section 4.2 up to the beginning of the Discussion in order to have a straighter structure in the discussion. (These sections are now marked as new text in the document with tracked changes, although they have only been moved up.)

We thank you and the reviewer very much for the constructive comments!

Kind regards,

Marie

Title: Carbon, nitrogen, and phosphorus stoichiometry of organic matter in Swedish forest soils and its relationship with climate, tree species, and soil texture

Author(s): Marie Spohn and Johan Stendahl

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General comments:

The revised manuscript now appears in a much-improved state. Errors and mistakes have been corrected and unclarities have been clarified. The authors have followed recommendations from the different reviewers as conscientiously as could be expected. I will, however, maintain my initial remark that increase productivity due to climatic factors, growing season, the balance between decomposition and addition of organic matter is the main reason for positive correlation between N stocks and MAT, not increase in N₂ fixation as the authors maintain. This set aside, I still recommend that the manuscript should be published. Some revision is needed before publishing, see comments below.

We thank the reviewer very much for the positive evaluation of the revision. The balance between decomposition and addition of organic matter is now mentioned in the beginning of the Discussion (**lines 276-278**), in the following way *"The positive relationship between the organic layer stock and MAT (Fig. 2b) suggests that plant productivity (Fig. 2d) increases more strongly than decomposition from North to South Sweden, which is likely due to differences in the temperature regime among the plots."*

We also added some lines about the role of decomposition for the latitudinal differences in the N stock in the Discussion on page 10 (**lines 317-320**), which read as follows. *"Third, it could potentially be that the net N mineralization rate is negatively related with MAT, and thus is lower in the South where the C:N ratios are comparatively low (Fig. S1) than in the North of Sweden. However, the net N mineralization rate in the organic layer of temperate and boreal forests is usually negatively related with the C:N ratio (Parton et al., 2007; Moore et al., 2011; Heuck and Spohn, 2016) which rather suggests a high N mineralization rate at sites with high MAT and low C:N ratio, as also discussed recently by Högberg et al. (2021)."*

L203-204 “the C:N ratio of the mineral soil in spruce forests was on average 1.8 times higher than in deciduous forests and 1.2 times higher than in pine forests” Figure 3d does not show this it shows that pine>deciduous>spruce (spruce and pine should swap places in this sentence).

Thank you! We corrected this.

L208-209 “The C:P ratio of the organic layer in spruce forests was on average 1.3 times higher than in both deciduous and pine forests (Fig. 3e).” Again figure 3 e does not show this it shows pine>deciduous>spruce, - spruce and pine should swap places in this sentence as well.

Thank you! We corrected this.

L387-388 “thin organic layers that consist largely of relatively young organic matter have a higher K concentration than massive organic layers that mostly consist of old, K-poor organic matter.” There is no reason to assume that a thin organic layer consists largely of relatively young organic matter. A thin organic layer may reflect 1) low input or 2) high decomposition rate and may span from low to high productive forest system - only in the high productive systems would a thin organic layer mostly consist of relatively young organic matter. If your data distinguishes between Oi, Oe or Oa then age could be more relevant to include in the discussion.

We agree that thin organic layers do not necessarily have to consist of young organic matter, and we removed the part of the sentence that referred to age. The sentence now reads as follows “*The reason for this negative correlation could be faster leaching of K from thinner than from more massive organic layers (Osono and Takeda, 2004; Schlesinger et al., 2021).*”

L390 (Figs. 4 and b) correct to (Figs 5a and b) We corrected this.

L390 -391 “--agreement with the relationship reported by Stendahl et al. (2017) between the C stock of the organic layer and both its K and Mn concentration” The discussion of K could be more comprehensive - If it is in agreement with Stendahl et al 2017 why not also use their discussion. K can be related to better conditions for decomposition, or it could be related to water balance –and productivity? Trees in drought prone areas have lower K content than trees in areas with ample access to water - see e.g. Sardans J et al 2012. Stendahl et al. (2017) say that K limitation of decomposition “seems unlikely for a majority of the data”. We added the following sentence to our manuscript “*K has also been reported to be related to the decomposition rate of needles in Scots pine forests, yet the underlying mechanisms are not well understood (Laskowski et al., 1995; Stendahl et al., 2017).*” The mentioned paper by Sardans et al. is about Mediterranean forests, and we feel that it would be quite a stretch to claim that the pattern observed there with respect to aridity can explain our findings.

L600 - 605, Table 1 and 2 I agree the p values should be included but I think the tables would be easier to read if only the p values that differ from the most prevalent are included.

We would like to keep the p values in the table for clarity; also because we only give the p value in the text if it differs from $p < 0.001$ (as also stated in Material and Methods).