

Interactive
Comment

Interactive comment on “Effects of N and P fertilization on the greenhouse gas exchange in two nutrient-poor peatlands” by M. Lund et al.

Anonymous Referee #2

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General Comments:

This paper explores the importance of nitrogen and phosphorus on ecosystem carbon cycling (GPP, NEE, respiration) in two peatlands – one in a high N deposition area and one in a low N deposition area. Understanding the controls on carbon cycling in peatlands has important implications for the global carbon cycles, and, while there has been previous work on the role of N and P, this project contributes to this understanding. As hypothesized, in the low N deposition area, N had effects on GPP and respiration while P stimulated GPP in the high N deposition peatland. There were few treatment effects on the vegetation community at either site. There is some indication that N fertilization increases N₂O flux, but the evidence here is a bit weak.

The writing in this paper could be tightened. There are a number of awkward phrases

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throughout and a solid editing would be helpful.

My major hesitation with this paper is that the main story is not clear. The ‘meat’ of the data interpretation is included in Table 1 and Table 2 and in both cases I found it difficult to get the big picture. Table 1 gives no information about what treatments drive the response variables or in which direction (positive or negative). Table 2 lacks statistics – which treatments are different? Could these be combined? Perhaps a multi-paneled figure? Also, did you see significant time * treatment interactions in your RM-ANOVAs?

Consider some discussion about the relevance of the nitrogen and phosphorus treatments used here. The HN treatment is roughly 3-times higher than the deposition at a high nitrogen deposition site. I fully understand that treatments are designed to push the system and generate responses, but are they at all realistic for these bogs?

This is a minor point in this particular case, but Reco should include CH₄ flux as well. It is a tiny proportion here, but this is not always the case. Do you suspect that CH₄ was oxidized at this site as the fluxes seem quite low?

Specific Comments:

P4804; L11. In the sentence beginning “In addition, a short” specify which site you’re referring to.

P4804, L16. The final two sentences of the Abstract are very awkward.

P4805, L5. This should read methanogenic “microbes” – methanogens are archaea, not bacteria.

P4805, L15. I was surprised to see no discussion of the potential toxicity effects of nitrogen on Sphagnum.

P4807, L2. All greenhouse gases are not measured here. The key ones are, but there are many more.

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P4808, L2. I am not sure how low N deposition in and of itself indicates N limitation.

P4808, L13. The sentence reading “In 2007, the amount of P...” is confusing. What is meant by “the quotient between fertilization water concentration and soil water concentration was higher for N than P”. Are you comparing the ratio of N:P in the control and in the HNHP plots?

P4810, L2. I might add a bit more detail about your vegetation measurements given that they receive so much weight in the results and discussion. Another sentence describing the vegetation categories used, for example, might be helpful.

P4810, L12. This seems like an incredibly low r^2 value to call linear. Typically, I expect to see numbers more like >0.9 when looking for linear flux. Values of >0.8 make me nervous, and >0.7 seems like a very generous threshold to use. Perhaps some evaluation of the distributions of r^2 values would be helpful here. How frequently were r^2 values >0.9 , for example?

P4812, L1. Have you previously defined PFT? I didn’t see it anywhere.

P4814, L5. “Complex and nonlinear responses to nutrient additions for CH₄ exchange” seems to me a bit of an overstatement. In reality you see no treatment effect on CH₄ exchange except for a near significant response at one site.

Figure 2. Could asterisks be used to show days where there were significant treatment effects?

You might consider making Figures 2 and 3 more easy to interpret in black and white. I realize that color is a publishing option online, but I printed the paper out and had a hard time reading the graphs.

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