

***Interactive comment on* “The fate of ¹⁵N-nitrate in mesocosms from five European peatlands differing in long-term nitrogen deposition rate” by K. Zając and C. Blodau**

Anonymous Referee #1

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The authors show that a legacy of high N deposition reduces N retention in Sphagnum-dominated ombrotrophic peatlands, as well as increases porewater inorganic [N] and transfer of N to shrubs, though Sphagnum N absorption was still high at sites characterized by high N deposition. Contrary to other studies, mosses preserved their capacity to filter N at deposition levels $>1 \text{ g N m}^{-2} \text{ yr}^{-1}$. The gradient approach utilized in this study may better inform responses of ecosystem function to increased N deposition, as opposed to fertilization studies that may occur over a short timespan. Overall, the paper falls within the scope of BG and contributes significant new knowledge regarding peatland N dynamics, but could be improved to increase clarity to readers. The following changes/clarifications will help improve this paper.

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Perhaps shift the focus of aim 1 to specify which transformations were assessed (ie. NO₃⁻ to NH₄⁺) since some were not addressed (ie. organic N).

Regarding aim 2, the N deposition gradient is referred to throughout, which led me to expect regression figures of responses across the gradient.

I would have liked to see more connection between results and their broader significance, perhaps in the scope of changing N deposition rates. Perhaps bring some of the ideas from the intro back into the end of the paper.

I don't know that you need to address this in the paper, but I'm curious as to whether you think high N deposition increases lateral N movement (perhaps when the water table is raised?) in peatlands and how this could play into N transformations in the field.

16928 and Fig. 4 – Retention efficiency of peat and vegetation pools was lowest at intermediate N deposition, but it's unclear to me from the discussion why retention efficiency peaks at this level and why this response is limited to NO₃⁻.

16929, 20 – It is suggested that Sphagnum mosses still filter inorganic N under high N deposition perhaps by forming more biomass. . . This whole section of the discussion is really interesting and could be stronger if you show data on biomass production.

16931, 25 – Reword. Seems like words are missing (1st sent of 4.2)

16933 - Not sure that I'm following the last paragraph.

Figure units? ie. Fig. 1 - mg N per g of. . . ?

Table 2 – Is this porewater N? Could clarify this in the caption.

Fig. 6 – It may be helpful to the reader if the caption notes that the scale of the X-axes vary across panels to improve clarity. It also appears that font size is smaller for site labels within the bottom panels.

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Fig. 7 – Again, may be useful to note the differences in the scale of X-axes.

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