

## ***Interactive comment on “Nitrous oxide emissions from a peatbog after thirteen years of experimental nitrogen deposition” by Sarah R. Leeson et al.***

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This manuscript presents N<sub>2</sub>O emissions from a peatbog following 13 years of simulated wet or dry N deposition. Compared to most studies in which very high doses of N were applied, this study adopted much mild N doses. The estimation or prediction of N<sub>2</sub>O emission is a challenge largely due to notoriously high spatial and temporal variation and complex controlling factors as well. By providing long-term responses of N<sub>2</sub>O fluxes to mild dry and wet N deposition, the dataset of the manuscript is undoubtedly important and interesting. The manuscript is generally well written and the methodology is fine. However, I doubt whether the manuscript provided enough novelty relative to its companion paper, i.e., Sheppard et al. (2013). The main results of both papers

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are similar, or the same, i.e., N<sub>2</sub>O emission was stimulated by ammonia but not by ammonium or nitrate. The previous study covered a period of eight years of N addition, but this manuscript reported the results over another five years. Whether this difference supports a new publication in Biogeosciences needs to be well addressed. Similarly, the three objectives were mostly covered in the previous paper. So they should not be used as the main objectives. Specific comments are as below:

Statistical analysis Page 4, Lines 14-16: How did you judge that the four points were outlying measurements?

Results Please present only the results or description of data in the result section and exclude any discussion. Page 5, Lines 16-18: Did you exclude the measurements which were close to the detect limits of the technique? If not, there should be large uncertainty in the data since most of measurements were close to the detect limits.

Discussion

Page 6, Line 9: The reference should be cited as Sheppard et al. (2013). Page 6, Line 14: NH<sub>4</sub>+NO<sub>3</sub> is misused as NH<sub>4</sub>+NO<sub>3</sub>. In addition, there are lots of similar misuses, such as NO<sub>3</sub><sup>-</sup> as NO<sub>3</sub>, especially in the figure titles. Page 7, Line 2: but both have limited capacities for uptake of what? Page 7, Line 4: Data in (Sheppard et al., 2013, Figure 7)? This is wrong in edit. Page 7, Line 5: What do you mean by saying below-ground vegetation? Roots? I can't see that there is such information in Figure 7 in terms of all the additional N deposited on the wet treatment plots accumulated in the top 10 cm of peat and belowground vegetation. In the method section, N accumulation in vegetation was not presented. In addition, I checked the article (i.e., Sheppard et al., 2013), it seemed that there also was no such information. Page 7, Line 5: If most of the added N was accumulated in the top 10 cm of peat, there should be substantial N<sub>2</sub>O production. Is there evidence showing that no N<sub>2</sub>O production in the peat layer?

Figure 3. This figure is about the responses to different forms of N inputs. It is confusing that 1) all the panels showed dry and wet N deposition, 2) when ammonium and nitrate

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were applied, the rates should be 16, 32 and 64 kg N ha<sup>-1</sup> yr<sup>-1</sup>, 3) “Dotted lines show the emission predicted with the IPCC default emission factor”, but where is the dotted line?

Figure 4

The figure should be stand alone, so please provide the necessary explanation.

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