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Biogeosciences Discussions

Interactive comment on "Contribution of different grass species to plant-atmosphere ammonia exchange in intensively managed grassland" *by* M. Mattsson et al.

M. Mattsson et al.

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We thank referee #1 for the evaluation and detailed comments. In consideration of the suggestions given by the reviewer we have made the following changes:

#1 p.2584 There is a gap in the chain of arguments between general aspects of species diversity in grassland in regard to nitrogen supply and the focus on ammonia.

The following sentence was inserted: Conversely, species diversity may also impact the build-up of soil and plant nitrogen pools. One important pool is NH3/NH4+ which also can be exchanged between plant leaves and the atmosphere.

#2 p.2584 L.8: Maybe name the species of investigation at this point and add 'in our

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plot'.

Species names have been inserted

#3 p.2585 L.16ff: see #1, For the sake of clarity, it is suggested to give an overview on existing NH3 exchange investigation methods first (micrometeorological and plant level investigations), then describe why micro-meteorological methods are not suitable for the focus of investigation - go to plant level observations, cuvette studies, their findings and then to the method applied.

We have clarified the description, taking advantage of the fact that relevant methods are covered by other papers in the special issue. We do not think that an overview of existing NH3 exchange methods will be within the scope of the present paper.

#4 p.2586 L.5-7: It appears to the reviewer that this is a literal citation, but it is not cited as such.

The sentence was modified to more clearly show the relevance of the cited papers: However, there is a limit to how simple things can be made as the total N content of the leaf tissue seems to be an inadequate parameter for prediction of the potential NH3 emission from rye grass leaves (van Hove et al., 2002).

#5 p.2586 2.1 More detailed description of the measurement site.

A sentence has been inserted, refering to first paper of the special issue (Sutton et al., 2008) where all the wanted information can be found.

#6 p.2586 L.17: Is there no reference on the sample method?

The following reference has been inserted: R. Ed. Sampling methods in taxon analysis in vegetation Science. Handbook of Vegetation Science 1. Part 4. Hague: Junk; 1984

#7 p.2587 L.9: "leaves were carefully blotted dry" After some internet search, the reviewer thinks that the term "to blot" could be from molecular biology?! It might not be common to every BG reader.

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Sentence changed to: After infiltration, solution on leaf surfaces was removed by use of paper towels, whereupon the leaves were packed into plastic bags.

#8 p.2587 L.23: Reference missing (Husted and Schjoerring (1996)

Reference was added

#9 p.2587 L.24: What was the actual canopy temperature and how was it measured?

The following information has been inserted: The canopy temperature, as measured by attached sensors as well as infra-red detection, was 16.7 and 20.7 °C around noon on the 24th and 25th of May, respectively.

#10 p.2588 L.6: It seems that C was also analysed. Why is it not in the headline?

Inserted

#12 p.2589 L.13: "almost infertile sites" seems to the reviewer an inappropriate expression for Ellenberg N value of 3. We suggest using "nitrogen low sites" or "nutrient-poor sites" instead.

Correction inserted

#13 p.2590 L.14: Comparing the two figures mentioned in the text, the bulk leaf tissue concentrations were more about 25 times higher than the NH4+ levels in the apoplastic solutions (not 30 times).

Correction made

#15 p.2591 L.7-12: Sentence modified as suggested

#16 p.2591 L.12ff: The success of the method and the way to check for contamination should be included into the results and maybe into the methods (description of "MDH" with reference). Furthermore, the reviewer would include the text up to line 22 in a different part of the paper, not in the discussion section.

Suggested modifications have been followed

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#17 p.2592 L.9: The authors refer to the same experiment, when some management was done to the experimental site. It would be helpful if a short overview on the experiment was given and the situation when sampling was done was clarified (comment #5).

Reference inserted

#18 p.2592 L.13: (and p.2593 L.13) Do apoplastic pH and NH4+ concentrations show seasonal variability? What month did the sampling take place and how do the results compare to other studies in similar conditions?

The present work did not focus on seasonal variability, but the Discussion of the results by van Hove et al. (2002) is relevant with respect to comparison of the magnitude of the measured parameters. Information about measurement time has been inserted in Materials and methods.

#19 p.2593 L.1ff: The mismatch between the relation of compensation point and ambient NH3 concentration (which would indicate emission) and the measured small deposition flux (micrometeorological measurements) is shown. After studying the papers of van Hove et al (2002) and Wichink Kruit et al (2007) the reviewer does not find a straight forward connection between them and this actual problem. Neither of them compared compensation points derived from apoplastic measurements with fluxes derived by meteorological methods. Why are they described here? What are the errors of flux and compensation points? How big is the difference? And is it significant?

There seems to be a misunderstanding here. The papers by van Hove et al. (2002) and Wichink Kruit et al. (2007) were not cited in order to compare different methods, but just to discuss the variability of NH3 fluxes between grass canopies and the atmosphere.

#20 p.2595 L.4: I could not follow your argumentation concluding that "three species had NH3 compensation points and a total abundance high enough to contribute to the NH3 emission of the whole field". Do you take an 'abundance-weighted' mean of the

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compensation points or how do you approach this 'extrapolating' problem?

The conclusion has been claried: Three species (Lolium perenne, Festuca pratensis and Dactylis glomerata) had sufficiently high NH3 compensation points and abundance to contribute to the bi-directional NH3 fluxes recorded over the whole field recorded prior to cutting of the grass. The other 5 grass species had NH3 compensation points considerably below the atmospheric NH3 concentration and were thus not likely to contribute to NH3 emission but only to NH3 uptake from the atmosphere.

#21,22,23. Dates of experiment and cutting date have been included in Materials and methods.

Interactive comment on Biogeosciences Discuss., 5, 2583, 2008.