

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

**Anonymous Referee #1**

Received and published: 8 July 2008

General comments:

In this paper the exchange of ammonia (NH<sub>3</sub>) between the biosphere and the atmosphere is investigated. Doing so, this paper focuses on an important aspect: on the different behaviour of several grass species in a sward canopy towards NH<sub>3</sub> exchange. It uses the apoplastic method to identify different NH<sub>3</sub> compensation points in intensively managed grassland within the framework of an NH<sub>3</sub> focused field study. Additionally to delivering interesting results on the NH<sub>3</sub>-compensation points, it introduces the tissue NH<sub>4</sub><sup>+</sup> concentration as a possibly useful 'bio-indicator' for the potential NH<sub>3</sub> emission of a species. The study looks carefully conducted and is of high quality so that this

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paper should be published in BG. However, the referee has some comments to form and content. They are listed below.

Specific comments:

#1 p.2584 Abstract: 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. It could be useful to include why you do focus on ammonia.

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

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

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

#5 p.2586 2.1 Description of the measurement site: It is recommended that the authors introduce some more aspects of the study site in this section to put the study into the 'bigger picture'. What about climate, soil (you refer to Ellenberg later on! Soil type, nutrient availability etc), other measurements (micrometeorology, NH<sub>3</sub>)? Framework of the project, season, date, weather conditions? What about the history of the sward? Its actual management, its management during the study? Later in the paper it becomes clear that there is information about these aspects, why not summarize them here? Also the reference to the overview paper (containing maybe also information on climate) would be a valuable addition to the study site paragraph.

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

#7 p.2587 L.9: "leaves were carefully blotted dry" After some internet search, the re-

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**BGD**

5, S1044–S1047, 2008

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viewer thinks that the term "to blot" could be from molecular biology?! It might not be common to every BG reader.

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

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

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

#11 p.2589 see comment #5

#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

#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 NH<sub>4</sub><sup>+</sup> levels in the apoplastic solutions (not 30 times). Please use identical units in the figures to facilitate comparison

#14 p.2590 L.26: Maybe consider to include the reference to van Hove's study again

#15 p.2591 L.7-12: "the sward was 4 years old" - "but decline with age of the sward (Whitehead 1995)." To the reviewers opinion this aspect is more likely a part of the site description and the paragraph about the species diversity a part of the results rather than a discussion opener.

#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.

#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).

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#18 p.2592 L.13: (and p.2593 L.13) Do apoplastic pH and  $\text{NH}_4^+$  concentrations show seasonal variability? What month did the sampling take place and how do the results compare to other studies in similar conditions?

#19 p.2593 L.1ff: The mismatch between the relation of compensation point and ambient  $\text{NH}_3$  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?

#20 p.2595 L.4: I could not follow your argumentation concluding that "three species had  $\text{NH}_3$  compensation points and a total abundance high enough to contribute to the  $\text{NH}_3$  emission of the whole field". Do you take an 'abundance-weighted' mean of the compensation points or how do you approach this 'extrapolating' problem?

#21 Figure 2: "growing on the experimental site before cutting" Is that the time when the sampling was performed? Or was the sampling performed some other time? Since the reader does not have any information on the history or on the management of the experimental site, for this study only the status quo when sampling is of importance. See comment #5

#22 Figure 3: see above

#23 Figure 4: see above

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