Biogeosciences Discuss., 11, C2654–C2656, 2014
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Biogeosciences
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Interactive comment on "Soil-atmosphere exchange of ammonia in a non-fertilized grassland: measured emission potentials and inferred fluxes" *by* G. R. Wentworth et al.

Anonymous Referee #2

Received and published: 18 June 2014

General Comments: I find this is a well-written manuscript that describes a nitrogen flux study for an unfertilized northern grassland location. This is an important paper in that there are limited data for non-fertilized natural systems. The results (gamma values) appear to be in a reasonable range, but I have a few specific questions and comments that I hope can be addressed by expanded discussion.

Specific Comments: 1. Page 5, lines 17-25: Another study that explicitly measured soil flux under a crop canopy is: Walker, J.T., Jones, M.R., Bash, J.O., Myles, L., Luke, W., Meyers, T.P., Schwede, D., Herrick, J., Nemitz, E., Robarge, W., 2013, Processes of ammonia air-surface exchange in a fertilized Zea Mays canopy, Biogeosciences, 10, 981-998.

The authors also estimate the portion of the emission that is taken up by the canopy and the portion that is emitted out the top of the canopy. I'm not sure I agree with your statement in lines 23-25.

2. Section 2.1: Please add a description of the precipitation regime and the typical percent canopy cover.

3. Page 8, line 30: Why did you choose .25% KCL solution? The issue of the appropriate NH4+ extraction is discussed in the supplemental information section of Cooter et al (2010) and in Flechard et al. (2013) both of which are already in your references.

4. Section 2.4: You do not mention wet and dry atmospheric N deposition. I would not expect there to be very much deposition at this location, but a little extra N as opposed to no N addition at all can make a difference. If you do not have any measurements, are there estimates or model simulated values? If not, can you discuss the role of atmospheric deposition in N flux from natural (non-fertilized) systems?

5. Section 3.1: Precipitation is important to note as well as temperature. The role of precipitation events and emission pulses is discussed in Cooter et al. (2010) and Walker et al (2013)(see above). Rain (.4mm) occurred on the day of your peak observation on August 13. The August 28th observation occurred 1 day after 54mm of rain was reported. You generally expect an emission pulse following a rainfall event. If there is any atmospheric N available for wet removal (NH3 or NH4+), that would also act as a small N addition.

6. Page 12, lines 10-12. If the "nearby site" is not one referenced in Van Hove et al., 2002, then please provide a reference for this study.

7. Pg 12: I believe the ammonium concentration to be used in computing gamma is the concentration of NH4+ in the soil water. How do you get that concentration from your extraction method with no consideration of soil water? Do you assume that the soil is always saturated? If so, then your gamma values may be too low.

8. Pg 12 lines 29-31 and page 13 lines 1-14: Your table 1 suggests a somewhat higher soil pH in August than in September (.5 units). Is this a significant difference? If it is significant, then what is the source of the temporal change?

9. You mention the importance of temperature. It is roughly the air temperature (unless you adjusted to the leaf surface) for the leaf exchange and soil temperature for the soil exchange. At what depth was the soil temperature shown in figure 3a sampled?

Interactive comment on Biogeosciences Discuss., 11, 7541, 2014.