

Interactive
Comment

Interactive comment on “Ammonia emissions from beech forest after leaf fall – measurements and modelling” by K. Hansen et al.

Anonymous Referee #2

Received and published: 29 January 2013

This manuscript presents important data on NH₃ fluxes above a senescing forest measured by relaxed eddy covariance. The NH₃ concentration from a regional NH₃ model is also compared to measured concentrations, comforting the hypothesis of local NH₃ emissions leading to increased NH₃ concentration. The authors suggest that the emission fluxes observed following leaf fall were due to both possibly increasing NH₃ emissions from leaf litter and diminishing NH₃ emissions from leaves.

However the authors do not give substantial elements allowing to weigh which process may be dominant (increase in litter emissions and/or decrease in leaf absorption). The increased emissions may indeed be due to a combination of increased litter emissions, decreased (zero) leaf absorption, but also decreased turbulent transfer in the canopy with a decreased LAI. The authors should discuss further (and also provide a graph)

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the change in canopy turbulent resistance induced by the change in LAI.

The manuscript anyway reports very rare data - on NH₃ fluxes over a defoliating forest - which are essential to publish. I would therefore recommend publication of the manuscript.

Minor comments should be answered:

- Section 2.2. I wondered whether these LAI measurements should take account of allometric distributions? Any comment on that?
- Page 5 Line 2: Could the authors be more detailed expansive on the material used for meteorological measurements?
- Page 5 Line 10: What is a “micrometeorological relationship”? This is very vague. The authors should be more precise here.
- Page 5 Line 20: The “proxy scalar” is heat ($\rho C_p T$), please precise.
- Page 5 eq. (3) and Page 6 Line 1: Please rather use H for the heat flux symbol as it a more common symbol.
- Page 6 Line 5. Why choosing $b_0 = 0.6$ when the range is 0.4-0.6? 0.5 would have been more logical. Please justify.
- Page 6: Lines 9-11: Does the height difference between the sonic and the WEDDs make a problem? Please comment on this.
- Page 6: Line 21: Is it NH₃ or NH₄⁺?
- Page 6: Line 30: Was the symbol CRNH₃ defined already?
- Section 2.5: A mention to Martin Ferm would be appropriate in this section as he is the “father” of NH₃ denuders.
- Page 7: Lines 13-16: I do not follow the reasoning there. Please rephrase and explain what you are meaning.

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- Page 8: Line 20: “2-5°C during the rest”
- Page 9: Liens 5-9: This is a critical part of the manuscript: The authors should show the trend of the canopy aerodynamic resistance R_{ac} and R_b (as modelled with measured LAI) during the experimental period.
- Page 10: Lines 4-5: Explain why the model has “difficulties” to handle low friction velocities, and why also it is sensitive to changes in stability conditions (why not only “stability conditions” rather than “changes in ...”).
- Page 10 Lines 14-15: But autumn is also a season when leaf absorption is nil.
- Page 10: Lines 17-18: The observed emission is a combination of increased emissions and/or decreased deposition. The data shown here does not allow concluding. Please moderate the sentence.
- Page 11: Line 16: ‘at crucial’ should read ‘as crucial’ I guess.
- Page 11: Line 21: I would suggest changing ‘in large part’ by ‘during most’.
- Page 11: Line 22: Is evaporation the right term for NH_3 ? What is the mechanism?
- Page 11: Lines 27-30: This should be more discussed and also based on Figures of R_{ac} and R_b .
- Page 12: Line 18: Is there any other acid playing a role in this area?
- Page 12: Line 31: ‘gabs’ should read ‘gaps’.
- Page 13: Line 29-30 and 31-32: The causality between observed emissions and litter fall may be a bit more tempered: This is a combination potential litter emissions, diminished leaf absorption, and canopy aerodynamic resistance.
- Table 1 and 2: explain how the uncertainty was estimated.
- Table 2: Give definition of symbols in the legend : $CRNH_3$ $CdNH_3$ $CmNH_3$ and DL

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- Figure 3: what does 'Bub' mean? Please explain.
- Figure 4: indexes in 'NH₃' and exponents in 'yr⁻¹'
- Figure 6 and 7: I would suggest joining these two figures and also adding a figure of Rac and Rb on top to help interpreting the data.

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