

***Interactive comment on “Direct contribution of nitrogen deposition to nitrous oxide emissions in a temperate beech and spruce forest – a  $^{15}\text{N}$  tracer study” by N. Eickenscheidt et al.***

**Anonymous Referee #2**

Received and published: 6 January 2011

**General comments**

This paper presents results from a  $^{15}\text{N}$  tracer experiment studying the direct effect of N deposition on  $\text{N}_2\text{O}$  emissions in temperate spruce and beech forest soils. The paper includes evaluation of the short-term and long-term responses of  $\text{N}_2\text{O}$  emissions to the N deposition, processes involved in the  $\text{N}_2\text{O}$  production, and an evaluation of the methods used to estimate emission factors for temperate forest ecosystems. This paper is well within the scope of the journal, however, in parts the language could be markedly improved. The use of the  $^{15}\text{N}$ -tracer in the experiment is an asset and provides with new information on the relations between N deposition and  $\text{N}_2\text{O}$  emissions.

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However, there are few weaknesses that should be acknowledged. One of them is that the frequency of the  $\text{N}_2\text{O}$  emission measurements is too low to capture the temporal variability in  $\text{N}_2\text{O}$  emissions. Hence the annual emission estimates and as follows the emission factors are highly uncertain. Also, as the referee 1 pointed out, the use of only two control chambers in the study adds up a large uncertainty in the calculation of the  $^{15}\text{N}$ -tracer emissions. I suggest that these two points are recognized for instance in the discussion as potential error sources in the study. I suggest that the paper will be accepted after a revision based on the following points.

Specific comments Page is referred as P, Row as R:

P8351, R11: what was the purpose of the pressure sensor? Did you recognize a pressure drop due to gas sampling? Was any data discarded based on the pressure changes?

P8351, R14: was the development of the  $\text{N}_2\text{O}$  concentration always linear? Did you test for the linearity or test other flux calculation methods (non-linear)?

P8351, R15: Do you mean a “cumulative annual emission”?

P8352, R11 (formula): check the upper indexes ( $^{15}\text{N}$ )

P8352, R18-21: Were there a lot of negative  $\text{N}_2\text{O}$  fluxes? Were these included in the annual  $\text{N}_2\text{O}$  budget calculations?

P8353, R3-5 (formula): check whether it is correct. Should the  $\text{Nt}$  be replaced by  $m^{15}\text{NNt}$ ?

P8353, R11-14: I would add more details of the method such as “...this approach does not account for the peak emissions due to the fact that the emissions were measured one week after the irrigation...” and “leading potentially to an underestimation...”

P8353, R16-25: Although this method is not shown later, please, give more details. I do not fully understand how the short-term data was used to calculate the relative

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proportion of the tracer emission. More specifically, R19: what do you mean by “the whole period”? Two weeks, or one year? R20: change “sequent” to “consecutive”, R20: the “relative proportion” to what?

P8356, R5-7: Please, clarify this sentence.

P8356, R8-11: I do not understand this paragraph. In the Fig. 2 there are clear differences in the  $^{15}\text{N}$ - $\text{N}_2\text{O}$  emissions between the  $\text{NH}_4^+$  and  $\text{NO}_3^-$ -labeled treatments.

P8357, R14: Please, give the range or percentage of recovered fraction of applied  $\text{NH}_4^+$  here.

P8357, R21-22: Please, indicate more clearly which EF calculation method you use. I.e. specify always whether it is based on modeled (regression) or measured data.

P8357, R22-24: The formula is in an arbitrary place. Please, move to the end of the sentence.

P8358, R18-21: Are these results (Wolf and Brumme 2002; Brumme et al., 1999) from the same measurement site? If they are, please explain that in the text. I would also “soften” this paragraph with words “may explain...”, “may create...” since this was not studied in this experiment and hence can only be speculated.

P8359, R5-7: This sentence is unclear. Where does the word “this” refer to: to the 3-week elevated  $\text{N}_2\text{O}$  emissions? Do you mean “immobilization of the added N...”?

P8359, R10: What is a “medium-term” effect? Longer than 3-weeks?

P8359, R22-27: Please, separate better what are the results of this study and what of other studies. Were some of the referred studies (e.g. Brumme and Beese 1992) conducted at the same forest sites?

Technical corrections

P8352, R3: change “detected” to “measured”

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P8358, R17: change “built” to created

P8360, R1: change “to process...” to “to oxidize the applied  $\text{NH}_4^+$ ...”

P8361, R3: Remove repetition “in our study”. Also, write the EF(fb) open here as it appears for the first time in the discussion.

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Interactive comment on Biogeosciences Discuss., 7, 8345, 2010.

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