

Interactive comment on “Laboratory measurements of nitric oxide release from forest soil with a thick organic layer under different understory types” by A. Bargsten et al.

Anonymous Referee #1

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General comments:

This paper studied the NO release from the organic layer of Norway spruce forest soils vegetated with different small plants. The release rates were measured as function of NO mixing ratio and soil moisture, so that the NO release could be parameterized in great detail giving not only the net release rates per mass unit of soil, but also production rates, NO consumption coefficients, and compensation mixing ratios. These parameters were used to compute the net potential NO flux, which is flux per unit area, for two temperatures and a range of soil moistures. The paper is another one from Meixner's group which is giving detailed NO turnover parameters that are useful for

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modeling NO source/sink strengths under field conditions. The investigation of organic surface layers is very important but has so far largely been neglected. Hence, I found the paper very useful. It was also relatively easy to follow and comprehend. Nevertheless, I have a few comments intended for improving the manuscript.

Specific comments:

1. The method for measuring gravimetric soil water content has not been described in the methods section. The water content is given in numbers between zero and 4, which is odd. I would have expected units of volume water per mass soil or per volume soil, but cannot figure out how these would amount to a value of 4. Please clarify!
2. The soil was incubated in batches of 100 gram inside Plexiglas cuvettes. This is a rather large amount. Was the rate of NO release under these conditions still proportional to the amount of soil; at all the different water contents? If not, then only part of the soil acted as the reactive body exchanging the NO with the gas phase. If the soil layer in the cuvette is too deep, then the NO produced in the lower layers will not be exchanged with the gas phase but be (partially) consumed during diffusion to the surface. This is analogous to the incubation of a soil core or to flux measured under field conditions. The reference of NO release, production or consumption to 100 g soil mass may then not be correct.
3. A negative relationship between NO production and pH has been observed before, as discussed. This negative correlation does not only hold true for NO production by nitrification but also for denitrification, see papers by Koskinen & Keene (Soil Sci.Soc.Am.J. 46, 1982, 1165) and Nagele and Conrad (Biol. Fertil. Soils 10, 1990, 139; FEMS Microb. Ecol. 74, 1990, 49). There is also an enhanced chemical NO production from nitrite at low pH (VanCleemput & Baert, Plant&Soil 76, 1984, 233), which can happen even if nitrite does not accumulate to detectable amounts (it is nevertheless produced during both nitrification and denitrification).
4. Referring to P.228, L.15, the effect of tree species on N₂O turnover has been re-

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ported by Menyailo (Biology Bulletin 33, 2006, 492) and Menyailo & Hungate (Global Biogeochem.Cycles 20, 2006, B3025, doi:10.1029/2005GB002527).

5. The ms frequently uses the term "fumigation". I found this term awkward. This term is normally used in soil science when treating the soil with toxic fumes in order to sterilize it. I think a term such as "gassing" or "flushing" would be more appropriate.

Technical corrections:

6. The paragraph 2.6 (calculation of Q10) would be better placed after paragraph 2.8. Otherwise, the reader does not yet know what net potential NO flux is.

7. P.211, L.14: Jopt is probably wrong and must be replaced by J(teta). Please check!

8. Typo in P.206, L.6: centimeter instead of centimeter

9. Typo in P.206, L.19: Deschampsia not Descampsia

10. P.206, L.23: better replace "in this direction" with "in this respect".

11. P.208, L.25: Using a spade normally does not allow taking soil cores. This requires a corer.

12. The abbreviations PTFE and PC (P.210) are not explained. I would simply use the full name,

13. Typo in P.224, L.18: Therefore, not Therefor.

14. P.226, L.13: The significance level for the correlation NH4 with NO consumption coefficient is not shown in Table 4.

15. Table 3: Clarify whether it is NH4+ and NO3- or NH4+-N and NO3-N.

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