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Biogeosciences Discussions

Interactive comment on "Nitrous oxide emissions from a beech forest floor measured by eddy covariance and soil enclosure techniques" *by* M. Pihlatie et al.

M. Pihlatie et al.

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Comments to Referee 1

The authors wish to thank the anonymous referee 1 for valuable comments to improve the manuscript. We have addressed below each of the comments point by point. Whenever the referee is cited, the text is written inside quotation marks.

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"My main concern here is only that the EC set-up was running close to its detection limit and that the coefficient of variation is unexpectedly high (see Table 1). It would have been nice to see such a comparison for a site with higher fluxes and with a more pronounced temporal change in N2O emissions. However, I do agree with the author that for the given conditions the EC-TDL system showed its usefulness to estimate

fluxes of N2O from the beech site. Also the conclusion that chamber based estimates of N2O emissions will have a higher uncertainty if scaled to the ecosystem level as compared to EC measurements is correct and is due to the fact that chamber only cover small areas. Due to the inhomogeneity of soil properties, microbial processes, root system etc. chamber fluxes will therefore often show a huge spatial variability. “

The authors agree with the referee that the measurements close to the detection limit of the EC measurement systems decrease the reliability of the comparison with the chamber techniques. We have addressed this subject both in the introduction and in more details in the discussion of the revised manuscript.

Minor comments: 1. “A scheme showing the technical set-up of the entire EC-TDL system would be helpful.“

A scheme showing the technical set-up of the TDL system was included in the first manuscript but that part was removed according to the suggestions of one referee (phase of technical corrections). Since a complete scheme is already presented in Edwards et al. (2003), we have now included a simplified version of such a scheme (Figure 2).

2. “Is there any rational why to use a N2O reference gas with 2000 ppmv, which is nearly 4 magnitudes higher in concentration than ambient N2O concentrations.“

The calculation of the sample N2O concentration is based on comparison of the absorbance in the sample gas to the absorbance of the reference gas. The high reference gas concentration is needed because the reference gas travels through a reference cell that is only 4 cm long as compared to the sample gas that travels through a 1.5 m long absorption tube to the sample cell. Only a high concentration of the reference gas can guarantee the needed absorbance of the laser beam. The absorption peak to which the laser is tuned can only be selected if the absorption by the reference gas is high enough (approximately 50%).

BGD

2, S567–S570, 2005

3. “Give rational why diurnal variations should be expected in view of the fact that diurnal changes in soil temperature are rather low.”

The anonymous referee is right in that the diurnal variations in N2O emissions should be low in places like our forest site where the changes in soil temperature are very low. One contradictory publication by Maljanen et al. (2002) reported clear diurnal variation in N2O emissions from agricultural and forest soils, the maximum emissions occurring during afternoon. The day and night-time N2O fluxes are presented in the results section, however, in the discussion we rephrased the text in a way that no diurnal changes in the measured N2O fluxes were expected.

4. “Give additional reasons for technical failures and provide a statement on the visibility of such a set up for longterm studies (can you run the system for one year continuously and how much time for maintenance would be required).”

Technical failures can include breaks in the power or failures in the TDL (TGA-100) program to run the algorithm. In such cases the measurements turn off automatically and try to start itself after stabilization. The start up does not always succeed itself and may need operation by a technician / researcher. The TDL measurement system can practically be run continuously for extended periods, several months to years, given that electricity and twice a week delivery of liquid nitrogen is provided. To avoid gaps in the data, the measurement system should be checked twice a week at minimum. The subject was addressed in the end of the discussion chapter.

5. “Fig. 5 is not strictly necessary, since this information (no correlation) can be given in the text.”

The correlation coefficients and p-values between the soil NO3 / NH4 and N2O fluxes were given in the Figure 5. Despite the low correlations between these soil variables and fluxes, the trend is visible and this was the reason to leave the Figure in the manuscript.

BGD

2, S567–S570, 2005

6. “Have the different chambers be sampled for nitrate, ammonium etc. and does observed differences explain the spatial variability in chamber fluxes?”

Soil samples were taken approximately 1 m around each chamber. The soil NO3 and NH4 taken adjacent to each chamber do not explain the spatial variation in soil N2O emissions.

7. Page 583, line 10: change “consequent” to “consequently” 8. Page 583, line 17: change “in ecosystem level” to “on ecosystem level” 9. Page 583, line 26: The authors should be aware of the fact, that chambers can also be operated automatically. Please reword this sentence 10. Page 584, line 14: Please correct “Cristensen” to “Christensen” 11. Page 584, line 22: Please correct “a five” to “the five”

The technical corrections were made to the points 7-11 as suggested.

References:

Maljanen M., Martikainen P., Aaltonen H. And Silvola J.: Short-term variation in fluxes of carbon dioxide, nitrous oxide and methane in cultivated and forested organic boreal soils. Soil Biol. & Biochem., 34, 577-584.

Interactive comment on Biogeosciences Discussions, 2, 581, 2005.