Biogeosciences Discussions, 2, S408–S411, 2005
www.biogeosciences.net/bgd/2/S408/
European Geosciences Union

Biogeosciences Discussions

Interactive comment on "N_2O, NO and CH_4 exchange, and microbial N turnover over a Mediterranean pine forest soil" *by* P. Rosenkranz et al.

P. Rosenkranz et al.

Received and published: 9 August 2005

p. 678, l. 7: To determine NO/NO2 fluxes dynamic chamber systems were used. Such systems are flow through systems. For this NO/NO2/O3 concentrations are determined at the inlet and at the outlet of the chambers and the difference in concentrations between both measuring points as well as the exchange rate are used for calculating fluxes. Since NO/NO2 measuring instruments are expensive and in addition one wants to correct for possible wall effects, it is common to use a reference chamber which is closed to the bottom. Concentrations of NO/NO2/O3 measured for the reference chamber represent the influx concentration, whereas the values measured for "normal" measuring chambers represent the outlet concentrations. Measurements are performed alternatively, i.e.: 6 min reference chambers, 6 min measuring chamber 1, 6 min reference chamber, 6 min measuring chamber 2, 6 min reference chamber,

.... A high exchange rate, e.g. $>$ 2 the volume of the chambers, is normal. This is done to avoid to high concentrations of NO/NO2 in the measuring chambers. At higher concentrations of these gases one may get above the compensation point of the soil microbes for these gases, i.e. one would not observe the real flux, but a somewhat lower flux. To avoid pressure effects due to the high exchange rates the site opposite to the gas outlet has 9 approx. 2 cm wide holes in the wall. To ensure turbulent mixing also a fan is installed in the chamber. The entire principle has been described earlier e.g. by Meixner et al. (1997) and Butterbach-Bahl et al. (1997). These references are now given at the beginning of the paragraph describing the NOx measurements.

p. 678, l. 21-22: The continuous soil and air temperature measurements explained in page 677, line 14 and presented in Figure 1 and 2, were recorded by a climate station, which was close to our measuring site and also collected data at times where no gas flux measurements were performed. In addition, we also collected soil/air temperature data with our automated measuring systems. Some additional remarks are now provided to clarify that two different systems for temperature measurements exist.

p. 678, l. 24: Additional explanations are now provided: "The measuring system for determination of N2O and CH4 fluxes consisted of five static measuring chambers (side lengths: 0.7 m x 0.7 m; height: 0.3 m; all chambers where gas-tightly fixed on stainless steel frames which were driven approx. 0.15 m into the soil), an automated gas..."

p. 678, l. 25: At the beginning of the field measurements we installed two sets of collars for each chamber. Chambers were moved routinely between both positions at least every 14 days. There were no differences between the placements. The practice of moving chambers between positions is described in the second last paragraph of section 2.2: "The ten measuring chambers were installed in five pairs of one dynamic and one static chamber close to each other. These pairs were distributed randomly over the experimental area. At latest after 14 days the position of each chamber was changed to ensure a representative monitoring of the study site and to minimize the

BGD

2, S408–S411, 2005

influence of the chambers on soil conditions."

p.678, l. 28: We used normal tap water for the watering experiment. It contained some N in low concentrations. No significant differences in fluxes existed between the chambers prior to watering. Watered chambers were excluded from the calculation of site specific mean fluxes. We added some sentences at the end of paragraph 2.2 to provide this information: "For watering normal tap water was used (NH4+N: 0.11 mg l-1; NO3-N: 1.71 mg l-1). It should be mentioned that prior of watering no significant differences in fluxes of N2O, NO, NO2 or CH4 existed between the individual chambers. Furthermore, for calculation of site specific mean fluxes results obtained for the watered chambers were excluded."

p. 684, l. 18: The value provided was calculated from the mean value of N2O flux during both measuring campaigns. This information is now provided: "The mean annual N2O uptake for the pine forest at San Rossore - as calculated from the mean value of both measuring campaigns - was estimated to be approx. 0.5 kg N ha-1." We now also provide estimates for annual fluxes of NO (0.5 kg N) and CH4 (5.8 kg C) in the discussion section.

p. 687, l. 11: Soil moisture was measured continuously with TDR probes at the close by climate station. We now include WFPS data in figure 1 and 2. In the discussion section we now mention that in several cases an optimum soil moisture for NO emissions has been observed.

p. 688, l. 1: NO can be quickly oxidized to NO2 in the presence of O3. The produced NO2 is than deposited to soil or plant surfaces. We now give this explanation in the discussion section: "Although NO2 deposition correlated significantly with NO emission rates - which is due to the fast oxidation of NO with O3 to NO2 - there was neither a significant influence of simulated rainfall nor significant differences between the two seasons."

p. 689, Conclusions: We added some sentences about NOx and CH4 to the conclusion

BGD

2, S408–S411, 2005

section: "Furthermore we showed that the site investigated in this study was a net sink for NOx as well as for CH4. With regard to NOx we demonstrated that NO2 deposition dominated over the rather weak NO emission."

Table 1: N is the number of chamber positions not the number of measuring days. This explanation is now explicitly given in the Tables legend. We experienced some NOx instrument failures, so that data could not be evaluated. For that reason the number of chamber positions is different for NO as compared to N2O.

Table 3: We have checked the lettering and provide now an improved footnote description.

Figures 1 and 2: Here we do not agree here with the referee, since the time resolution chosen for the N2O plot allows the reader to get an impression of short term changes in N2O fluxes, which were less pronounced for the other gases. For that reason we stayed with the previous time resolution.

Figure 2: The reason for lack of NO2 data was a break down of the photolysis converter.

Technical suggestions were adopted as suggested by the referee.

References:

Butterbach-Bahl, K., Gasche, R., Breuer, L. and Papen, H.: Fluxes of NO and N2O from temperate forest soils: impact of forest type, N deposition and of liming on the NO and N2O emissions, Nutr. Cycl. Agroecosys., 48, 79-90, 1997

Meixner, F. X., Fickinger, T., Marufu, L., Serca, D., Nathaus, F.J., Makina, E., Mukurumbira, L., and Andreae, M.O.: Preliminary results on nitric oxide emissions from southern African savannah ecosystem, Nutrient Cycling in Agroecosystems, 48, 123-138, 1997

Interactive comment on Biogeosciences Discussions, 2, 673, 2005.