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Biogeosciences
Discussions

Interactive comment on "Effects of nitrification inhibitors (DCD and DMPP) on nitrous oxide emission, crop yield and nitrogen uptake in a wheat-maize cropping system" *by* C. Liu et al.

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The manuscript (Effects of nitrification inhibitors (DCD and DMPP) on nitrous oxide emission, crop yield and nitrogen uptake in a wheat-maize cropping system) introduces results from annual measurements of nitrous oxide fluxes from an arable soil using an approach with a high temporal resolution. It compares the fluxes from a treatment fertilized with urea, with urea + DCD and from a treatment with urea +DMPP.

The high temporal resolution of the measurements as well as the presentation of a complete annual data set on the effect of nitrification inhibitors (NIs) on trace gas fluxes substantially contribute to scientific progress within the scope of BGD, the work is new

and the presentation of the results is clear and well structures. Few aspects need to be revised. However, I think this can be done easily and quickly.

General aspects

I was also working with a near continuous sampling system for trace gas fluxes. One of our bigger problems during data analysis was the data handling in cases where one or two of the four replicated chambers did not work properly. Thus the missing values then resulted in changes of the mean nitrous oxide flux rates as compared to the mean flux values of all four chambers due to different background emissions or different event responses of the single chambers. Unfortunately, the authors did not describe their procedure to handle such missing values.

The authors discus the results of their measurement system with a high temporal resolution but they did not discuss with references to literature. And there are many published experiments with similar systems which provide examples for the optimum timing of manual measurements in order to minimize the error of diurnal flux patterns, for the optimal planning of trace gas sampling schemes, and for the comparison of the measured cumulative emissions of Liu et al. with current literature (i.e. Alves et al. 2012. Soil Biol Biochem 46, 129-135; Laville et al. 2011. Agr Forest Meteorol 151, 228-240; Šimek et al. 2010. Plant Soil Environ 56, 451-457; Yao et al. 2009. Atmos Environ 43, 1888-1896; Flessa et al. 2002. Geoderma 105, 307-325; Yamulki et al. 2000. Rapid Commun Mass Sp 14, 1356-1360). I recommend inserting some of that literature into the discussion part!

The authors compare the results of single-factor and multiple linear regression analysis and report that . . .. The correlation coefficients of regressions between multi-factors and N2O flux were higher, which proved synergistic effects of soil temperature, moisture and . . ..! I don't agree. It seems to me as if there is a correlation between soil moisture and the temperature. This inter-correlation leads to an overestimation of the degree of explanation when running a multiple regression analysis. I suggest running

a stepwise multiple regression in order to exclude errors from correlations between the independent variables.

Although both may occur simultaneously in soils, nitrification and denitrification are two different microbial processes and they rely on different substrates. For the calculation of linear regressions I therefore suggest using the nitrate contents and the ammonium contents separately instead of the sum (as inorganic N).

Smaller remarks and suggestions

p. 713, l. 13: NIs do not exclusively inhibit the AMO of Nitrosomonas spp. Further organisms (Nitrosospira, Nitrosovibrio etc.) as well as probably archaea are also able to oxidize ammonium!

p. 715, l. 3: . . . fertilizer rates were 250 kg N ha-1. . . The sum of N fertilizer in table 1 was 60 + 120 +250 = 430 kg N! Clarify!

p. 716, l. 5: in the text: Wang et al., 2012. In the reference section: Wang et al., 2013! Check citation!

p. 721, l. 1: Specify the time of the measurement of the four flux rates to calculate the error for manual gas sampling! Use the morning values or those from the late afternoon, because those are the sampling dates with soil temperatures near the mean daily soil temperature! This procedure description probably belongs to the 'material and methods' section!

p. 722, l. 17-18: What is the reason for the different slopes for the linear regression lines in the NI treatments on one side (DCD and DMPP) and in the U treatment on the other side? I assume the reason is the use of the sum of inorganic N. Or is there any evidence that i.e. the response for nitrate is different in the treatments with NI when compared to the U treatment without NI?

p. 723, l. 8: A better inhibition with DMPP versus DCD is reported. Is there any statistical evidence?

Table 2: The temporal pattern of nitrous oxide fluxes from soil is often not normal distributed. Therefore I suggest including the median fluxes in the table.

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