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Biogeosciences Discussions

Interactive comment on "Nitrous oxide emissions from European agriculture; an analysis of variability and drivers of emissions from field experiments" *by* R. M. Rees et al.

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General comments

This paper reports several years of measurements of N2O emissions from European agricultural soils under different management interventions. Generally, the paper is well written, it allows for assessing the combined effects of management practices and climatic variables on N2O emissions; and that is shows the importance of management practices on N2O emission rates. However, due to the differences in the N2O flux measurement methods (e.g. chamber designs, number of replicate chambers, frequency of measurements, flux calculation etc.), the comparison of N2O emission rates between

different measurement sites remain very uncertain. This aspect should be clearly clarified and the potential errors, or at least uncertainties, in the measurement method should be acknowledged. Because of the high uncertainty related to the methods, the focus should be more on evaluating the effects of different management practices on N2O emissions, and further, to discuss the potential mitigation strategies.

Specific comments

Page 9264, lines 6-12: The description of the N2O flux measurements is inadequate. For instance, how many replicate chambers were used? How many gas samples / chamber closure were taken? What is the "standard methodology" in flux calculation? If it is linear regression, did you apply linearity checks for the N2O concentration development within chamber headspace? All of the above issues can lead to large errors in the flux estimates, making the comparison of N2O emission rates measured with different chambers unreliable, unless the methods are harmonized. For instance, the choice of a wrong flux calculation method (linear vs. non-linear) may lead to severe underestimations (e.g. Kroon et al., 2008; Pedersen et al., 2010; Christiansen et al., 2011), and that the rate of underestimation can be different between the chambers used. However, this does not ruin the comparison of the treatment effects on N2O emissions (e.g. fertilization, tillage, cropping, warming, drought etc.).

Page 9264, lines 17-19: Please, give more details of the statistical tests.

Page 9266, line 12: I suggest focusing only on treatment effects and not on the differences between the sites.

Page 9268, lines 6-8: The differences between the sites have a high uncertainty due to the method of choice (as mentioned above).

Page 9268, lines 20-22: If the chamber fluxes are generally underestimated due to the use of e.g. linear regression as the flux calculation method, the percentage of added N lost as N2O emissions may be even much higher than that reported here.

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Page 9276, Table 1: There is some confusion in the abbreviations of the treatments. Please, harmonize all with the same logic. For instance, Beano, Cropland tilled is marked with CNT, and cropland no till with CT. What does MSW stand for? What is DMPP inhibitor? Sometimes O refers to organic and sometimes Oat. Sometimes C refers to Control, sometimes to Conventional.

Page 9278, Table 3: I would like to see here extra columns for "number of measurements per year", and "number of chambers".

Page 9284, Fig. 2. Explanation of c) is missing.

References

Christiansen, J.R., Juszczak, R., Giebels, M., Korhonen, J., Pihlatie, M. 2011. Assessing the effect of chamber placement, manual sampling and headspace mixing on CH4 fluxes using a laboratory experiment. Plant Soil, 343, 171-185. DOI 10.1007/s11104-010-0701-y

Kroon, P.S., Hensen, A., Van den Bulk, W.C.M., Jongejan, P.A.C., Vermeulen, A.T., 2008. The importance of reducing the systematic error duet o non-linearity in N2O flux measurements by static chambers, Nutr. Cycl. Agroecosyst. 82, 175-186.

Pedersen, A.R., Petersen, S.O., Schelde, K., 2010. A comprehensive approach to soil-atmosphere trace-gas flux estimation with static chambers. Eur. J. Soil Sci. 61, 888-902.

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