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Biogeosciences Discussions

Interactive comment on "The acetylene inhibition technique to determine total denitrification ($N_2 + N_2O$) losses from soil samples: potentials and limitations" *by* R. Felber et al.

Anonymous Referee #3

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In the present manuscript the acetylene inhibition technique was used to determine total denitrification losses from a grassland site in Switzerland. The results were compared to N2O fluxes measured in the field using static chambers. The limitations of the acetylene inhibition technique are discussed. The determination of N losses from soils due to denitrification is in the scope of BG. The manuscript is carefully prepared and mostly well-written. In contrast to many other publications dealing with results obtained by the acetylene inhibition technique the method is critically discussed. However, the comparison of the results of the acetylene inhibition technique with N2O fluxes determined in the field using static chambers is not valid, since the latter one also includes N2O released via the nitrification pathway. Due to limitations addressed in

the manuscript the results do not increase the current knowledge about denitrification losses in grasslands. Minor flaws are the following: Parts of the abstract and the introduction have to be revised. The Material and methods section could be a bit more informative. In my opinion, the manuscript can not be published in BG in the present form. Therefore I recommend major revisions.

Specific comments

Titel: The title is not appropriate, since the approach used is not really suited to evaluate the potential and limitations of the acetylene inhibition technique.

Abstract: The abstract has to be a bit more concise. More information about the experimental set up (field measurements) and the limitations of the acetylene inhibition technique should be provided. p. 2852, l. 8: The objectives of the study should be formulated concisely. After reading the abstract I am not sure why the study was conducted – to determine denitrification losses from a grassland site, to develop a laboratory system for the measurement of denitrification losses or to try to quantify the uncertainties of the acetylene inhibition technique? p. 2852, l. 12: The field measurements including some important soil properties should be shortly described. p. 2852, l. 17/18: The drawbacks of the acetylene inhibition technique have to outlined in some detail.

Introduction: The structure of some parts of the introduction could be improved. p. 2852, l. 25/26: There are also indications that organic N forms contribute to the N nutrition of plants. This was recently reviewed by Näsholm et al. (2009), New Phytologist 182. p. 2852, l. 26 to p. 2853, l. 3: Some figures should be provided to illustrate the N fluxes mentioned in the text (fertiliser uptake by plants, NH3 and NO emissions, etc.) p. 2853, l. 20 to p. 2854, l. 10: This passage has to be revised. The paragraph dealing with published data on dentirification losses should be moved to p. 2853, l. 20 (without stating the method used in the respective study). After the enumeration of the various approaches that are used to determine N2 losses from soils, a short rationale

should be given, why the acetylene inhibition technique is addressed in more detail in the following paragraphs. p. 2854, l. 17-23: Not all limitations of the acetylene inhibition technique are listed, e.g. the potential inhibition of NO3- production via nitrification is missing (Seitzinger et al. 1993, Biogeochemistry 23).

Material and methods: p. 2862, l. 11-13: The determination of the isotopic composition of N2O has to be described in some more detail.

Results: p. 2862/2863, Section 3.1: As mentioned above the comparison of the results of the acetylene inhibition technique with N2O fluxes measured in the field is not valid, since nitrification also contributes to the N2O fluxes in the field. p. 2863, l. 13: The concentrations of available NO3- should also be shown.

Figures: Fig. 2: There are two points marked by S'2,2, but none marked by S2,2. Fig. 3: The number of samples used to calculate the mean N2O fluxes should be provided.

References: Naesholm, T., Kielland, K. and Ganeteg, U., 2009. Uptake of organic nitrogen by plants. New Phytologist, 182: 31-48. Seitziger, S.P., Nielsen, L.P., Caffrey, J. and Christensen, P.B., 1993. Denitrification measurements in aquatic sediments: a comparision of three methods. Biogeochemistry 23: 147-167.

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