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Biogeosciences Discussions

Interactive comment on "Nitrous oxide emissions at the landscape scale: spatial and temporal variability" *by* K. Schelde et al.

Anonymous Referee #1

Received and published: 31 January 2012

This is a timely and interesting paper utilises a mosaic of land use types within an agricultural landscape to study the spatial and temporal variations of nitrous oxide and major drivers for N2O emissions.

Specific comments

- Firstly, the English language throughout the whole manuscript needs revision, probably by a native English-speaking person for the grammar and the construction of the sentences. I have made some changes/suggestion for a few sentences throughout.

- Introduction, Pg 11944, the objectives of this study line 1-11 at the end of the introduction is not very clear.

- Section 2.1, Pg 11945, Line 25-26: please clarify what is meant by "On each sam-

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pling day, four 10mL gas samples were taken per chamber over the period of 50–70 min (CH1, CH3) or 80–90 min (CH2)." Do you mean, 10mL gas samples were taken at four intervals between 0 up to 70min (CH1, CH3) or 0 up to 90 min (CH2). Or did you take only four samples at the end of chamber closure period assuming linear gas concentration increase? This is important to assess the accuracy/precision of the measurements spatially when evaluating spatial variations.

- Section 3.1 Meteorology, pg 11947: you mention that the "Actual evapotranspiration, measured in the same field using the Bowen Ratio method, was 60–70% of reference evapotranspiration". You need to define what you mean by "reference evapotranspiration".

- Section 4.1, pg 11951, line 10: how can you make a comparisons between the different chamber types for N2O fluxes when no statistical analysis were made? e.g. you mention that "Only one of the chamber types (CH2) was vented, but fluxes measured with CH2 chambers did not appear to differ from other chambers (statistical test not relevant due to spatial variability effects)".

Also line 4: suggest delete "low technology methods" and replace by static chamber method.

- You mention "There was a trend that the small CH4 chambers did not resolve the temporal variability as well as the larger chambers: Their average flux did not indicate a response to slurry application (Fig. 3)……." But was the slurry applied after the chamber frames were inserted or before so that chambers can be positioned in a way that can resolve the temporal variations?

- Table 1. add another column for the measurement period e.g.:

Arable 1 and Arable 2 : full year in 2007-2008 Wheat 1 etc. . . : 5 days between 21-28 April 2009 Meadow: full year ni 2007

This is important for the reader to distinguish between those treatments used for tem-

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poral variations.

- Fig 7 b: I don't think this is necessary as they don't show extra information in the background flux level so can be deleted.

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Other technical corrections

- Fig 8: It will be better to delete the units (g N kg-1 DM) from the x scale and added to the text. "N2O fluxes (ng N m-2 s-1) versus NO3-N or total mineral N content (g N kg-1 DM). . .. . .

- Fig 8 c: the x axes should be "N_25-50 cm" and not "N_0-50 cm" ?

- Introduction, Pg 11944, line 2: Chamber measurements made over a range of time (20 months) and space (10 sites) at a Danish landscape focused on identifying variations in emissions due to topography, land use or crop type, and management.

Revise as something like:

Chamber measurements were made over a 20-month period from 10 sites at a Danish landscape to identify variations in emissions due to topography, land use or crop type, and management.

- Section 2.1, Pg 11945. Please define each treatment/site after first mentioned. I found it difficult to know what each site meant until the end of section 2.1 where Table1 is mentioned. You can mention Table 1 after the site names (Arable1, Arable 2 and Meadow, Table 1).

- Pg 11945, line 20: delete "at all times of the year"

- Line 24: delete semi "semi-permanently" as you already mentioned that the chamber where only removed for management.

- Pg 11946, line 8, "HMR analyses, when appropriate, non-linear concentration time se-

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ries based on the model by Hutchinson and Mosier (1981)." Do you mean, "HMR analyses, when appropriate, can be used for non-linear concentration time series based on the model by Hutchinson and Mosier (1981)."

- Pg 11946, line 25: "Measurement frequency was the same as that of the N2O flux measurements, however at times the portable TDR probes could only be inserted with difficulty, or could not be inserted at all, due to dry soil conditions".

Change to: "Measurement frequency was the same as that of the N2O flux measurements, except for some occasions when TDR probes could not be inserted because the soil was too dry.

- Pg 11947 lines 1-8: the paragraph is confusing, do you mean:

On each sampling date, five soil cores were randomly sampled from 0-25 cm and 25-50 cm soil layer at each site and pooled to enable a representative composite subsample. Samples were kept 5 cool (<10 C) during transport to the laboratory. Samples were frozen until analysis for NO3 and NH4 content, according to Mutegi (2010) for samples near chambers CH2, and according to Vilain et al. (2010) for samples near chambers CH1. ?

- Section 3.1 Meteorology, pg 11947: Consider revision for English to something like:

Meteorological conditions during the 20-month measurement period (2007–2009) were not unusual. The two winters were mild with occasional. Springs of 2008 and 2009 were both characterised by relatively dry conditions during mid to late April–May. In our rain-fed agricultural landscape this caused the soils to dry out. Accordingly, continuous measurements of soil water content at 5cm depth of field Wheat 2 showed a steady decrease in the volumetric water content from 15% to 10% during the intensive measurement period (19–29 April 2009).

- section 3.2, pg 11948, line 8: Figure 3 shows measured fluxes in field Wheat2, using three types of chambers. N2O fluxes were within the same low range, ...

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the same low range of what ??

- section 3.3 Spatial variability, pg 11948, line 19-21. Please revise the sentence:

“During the 2009 intensive campaign, campaign CVs per chamber type and site ranged between 60% and 140%. Practically all measured fluxes were positive.”

- also line 25-28: please change to:

“The first two transect points had a similar soil texture with a clay content of 7–8% and a soil organic matter content of 3% in 15–30 cm soil layer. The humus soil type in the valley meadow had a larger clay and organic matter content at the 15–30 cm depth (16% and 15% respectively).”

- pg 11949, line 24-26: you mention words like “trend” or “somewhat higher fluxes” etc.. can you do statistics to resolve these ?. - section 3.4, pg 11950, first paragraph “During the 2009 campaign, fluxes increased when wheat fields . . .. Please revise the English ?

- Also line 17, At Arable2 the highest flux was observed after the completion of two split mineral fertilizer and a slurry application, and . . .. . .

Consider revising to something like: At Arable2 the highest flux was observed after the application of two mineral fertilizer doses and a slurry application, and . . .. . .?

- Section 4.2.2 Arable land, pg 11954. needs revision for the English language?

- Page 11955, line 12, Please specify what kind of deep litter e.g. poultry ?”

“When fertilizing with farmyard manure or deep litter that is incorporated into the soil by ploughing, ...”

- section 4.3, pg 11956, in the paragraph Line 10-16: “autumn 2008 after the time of fertilization, were positively correlated with soil mineral N content when disregarding times of the year when conditions were unfavourable for N2O production.

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o Delete “the time of” o Suggest to delete the sentence “when disregarding times of the year when conditions were unfavourable for N2O production” as this does not add much? o You mention “The relations shown in Fig.8 for NO3 content in the topsoil, and for total N content in the topsoil and the 25–50cm intervals, are scattered, ... but Fig 8 shows 0-50 cm ? o You mention “highest mineral N contents” not really more like middle range 0.02-0.03 ? Need revising.

Interactive comment on Biogeosciences Discuss., 8, 11941, 2011.