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Interactive comment on "Spatial variability and hotspots of soil N_2O fluxes from intensively grazed grassland" *by* N. J. Cowan et al.

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Thank you for reviewing our manuscript. We have found your comments to be constructive and useful in amending sections of the original manuscript submission. Please find the reviewer's comments and the corresponding changes made to the manuscript below.

Anonymous Referee #1 ["(1) The context of section 3.3 about N2O fluxes from drainage stream should be rewritten concisely because of its less importance."] Section 3.3 will be shortened to address this.

["(2) The authors have discussed more about the correlations between soil properties and N2O fluxes, and also indicated that the soil conditions is more conducive for the oc-

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currence of nitrification and thus higher concentrations of NO3-. However, the authors suggested that denitrification may be the primary process for N2O emissions solely according to the lack of correlation between NH4+ and N2O fluxes, this conclusion assumed seems to be speculative and misleading. The process of nitrifier denitrification as a significant source of N2O production under certain soil environmental conditions is increasingly highlighted in various soils, and should be incorporated into the discussion of the current manuscript."] The potential pathway of nitrifier denitrification has been added to the discussion section with two relevant references. "Another possibility is that conditions are favourable for the conversion of NH4+ to N2O via microbial nitrifier denitrification. In certain conditions the nitrifier denitrification process can be responsible for the majority of N2O released from soils (Kool et al., 2010; Zhu et al., 2013)".

["P15330 L14-16, what is the exact time for gas measurement?"] Not entirely sure what is meant by "time" in the question. Measurements were made during the day between 10:00 am and 4:00 pm. Hopefully this is what is asked for. Changed text to include sentence "Measurements were made continuously between 10:00 to 16:00 on these days".

["P15333 L18, the unit for KCl should be 1 mol L-1."] The reviewers statement is correct, text unit has been changed to "mol L-1"

["P15334 L11, "Fifty measurements were. . .", this should be checked again throughout the manuscript."] Numbers were converted to text throughout the document where necessary.

["P15334 L10-13, this section is in contrast to the first paragraph in the later 3.5 section, and should be rewritten."] I am unsure where the contrast is. The first section which the reviewer refers to is about the location of flux measurements. Section 3.5 refers to which locations the soil measurements were made from. Although the soils were made from flux measurement locations the locations differ as is explained in the text.

BGD
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No changes have been made to the text to address this.

[“P15334 L17, “, respectively”, as well as in other places in this manuscript.”] Various changes made throughout text to include commas.

[P15337 L5, “between the height. . .”.] Typo corrected.

[P15338 L21-22, this sentence is unclear. P15338 L22-23, the range of soil bulk density needs to be clear.] Both sentences re-written as: “WFPS % values across all measurement locations in the field ranged between 9 to 50 % with a mean value of 26.5 %. The bulk density of the soil in the field with the exception of the manure heap perimeter ranged between 0.6 to 1.1 g cm-3 with a mean value of 0.8 g cm-3. Due to the heterogeneous nature of soils there were several outliers for each of the soil properties measured across the field (Table 1)”.

[P15339 L13-14, concentrations of NO3- should also be correlated strongly with both total nitrogen and WFPS%.] Correlation between NO3- with NH4+ and TOC was a lot stronger than that of total nitrogen and WFPS, but we include them both for completeness.

Interactive comment on Biogeosciences Discuss., 11, 15327, 2014.