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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Nitrous oxide emissions from a commercial cornfield (*Zea mays*) measured using the eddy-covariance technique" *by* H. Huang et al.

Anonymous Referee #3

Received and published: 14 September 2014

General comment

I think this paper presents a very interesting dataset of N2O fluxes, measured by new generation equipment which allows good performances when measuring fluxes by eddy covariance. While the authors take care in reporting the procedures followed to setup the instrumentation, and follow well established common practices for the calculation and correction of fluxes, I think that at points the paper looks hastily written, with some apparently contradictory - or at least confusing- sentences, and lack of accuracy. I also have the impression that the authors could improve the literature review. Therefore I recommend the article for publication, but only providing some modifica-

tions are made, see below.

Specific comments

I suggest you re-write the abstract: in its present form it is a dry list of some facts that are reported throughout the paper: it doesn't need to contain any references to other work, but it should synthesise the hypothesis and outcome of your work.

In the abstract, you mention the fertilisation rate of the field is 217 kg N ha-1. Then in the table, the total N is reported to be 118 kg N ha-1 (39+79). Which one is true?

Why do you think there is such an abrupt change in N2O concentrations in the period at the beginning of June? (Fig.6). The average shift from the plot seems to be of a bit less than 10 ppb in the level of N2O in the surface layer: this is quite a significant step in concentration, especially looking at the step from one day to the other (roughly on first days of June?): how do you explain it? How did you calibrate the instrument for concentrations? (how regularly, what was used in all instances of calibration). Before the first fertilisation, the levels of N2O seem to be quite consistent with the levels after the fertilisation events (both first and second).

I'm not sure of the value of the regression in Fig.10. While it is very useful to show a comparative and summarising plot of other studies combined with this, I am not sure the regression is adding any value. The relationship between the applied fertiliser and the flux is not a linear one, as asserted through the paper and through the literature, and so showing a linear regression may not suggest the right interpretation of the results; however, I see the authors' point of presenting an overall emission factor.

Generally, the authors report figures with too many digits, regardless of significant figures: albeit this comment may seem pedantic, there is no point in reporting figures that suggest a level of precision that is not actually achieved. Could you modify this throughout?

L440: do you think that the daytime fluxes were higher consistently through the whole

season? My impression is that the first two periods did have this behaviour, but afterwards it doesn't look like it from Fig.7. I think it is likely that the first two periods are pushing the overall averages in that direction.

Technical corrections: typing errors, etc.

Please revise all references (especially with regards to names), as there are a few spelling errors.

L61-62: remove nitrogen use; "consequently": I think it's wrong, as these are the reason why you get inefficient N use, not the other way round. Correct the sentence.

L63: these are some of the forms through which N is lost, not the only ones, so add "e.g."

L77: oxygen supply within the soil strata.

L93: before the references in brackets, put "e.g." , as the articles are all referring to the original source of the Reynolds theory.

L97: remove "fluctuations". The covariance is between the variables themselves, not their fluctuations.

L99: the vertical wind speed seems an omega; it should be "w" (also in L183).

L102: "previous" to when? The laser spectrometers have been available since the early 90s.

L106: The reference needs correction, the author is Di Marco. Correct also in the reference section.

L137: it's a wave number.

L151: Do you mean NH4+ here?

L152: can you specify here the working principle of such equipment? Just briefly, but it is useful for the reader who does not normally deal with such system, to identify what

detector type is used.

L155: same as line 97.

L189: add "applied to trace gas measurements".

L192: insert "e.g." before Ferrara.

L198-199: cospectrum

L208: the star in ustar is a subscript, not superscript. correct throughout.

L238:it's not clear here on what you made the regression/correlation. Does this refer to a figure? If so, include it. If not, then explain more in words what you've done, or where you explain it.

L270-1: swap "units" with "points".

L278-280: this sentence is unclear. Add "that" after "continuous corn canopy", delete "with".

L280-281: With "these" do you mean the differences? Spell it out, as the sentence is unclear.

L287: using different units of measure through the paper does not help: can you be consistent throughout? You used ng N2O-N m-2 s-1; ug m-2 hr-1; ug ha-1 hr-1. Just settle on one and change throughout.

L315: availability of N

L334: what do you mean with N+?

L363-364: this is a repetition of an earlier sentence.

L368: Delete "a" before vapour cospectra.

L375: I don't understand here: how do you apply the correction? Do you just use the average percentage value over all? If so, why? You have calculated all factors, so can

you not use those directly and more reliably?

L389: delete the comma after Figure 10.

L409-410: you are comparing figures with different units of measure, change that, and as before keep it as much as possible in the same unit.

L421: amount is singular in this case

L424: change in N2O flux.

L426-429: I don't understand these sentences "monitoring these events.." onwards. Perhaps you can synthetise them in one simpler sentence. How do you mean "apparently caused"? Justify this.

L430: is it not better to say "is not correlated"?

L433: table 4 does not contemplate N application rates, so it is difficult to conclude what you say, perhaps add the information on N application so it is easier to see.

L435:delete the double comma. replace "during the diurnal cycles" with "when looking at the diurnal cycles".

L442: delete the double dot.

L471: N2O-N, not just N.

L479-81: i don't fully agree with this, if you specify during the first and second periods it's more correct. The soilT has a diurnal cycle (more or less pronounced) through the year, and this is not driving N2O emissions at all times (see my comment before).

Fig4. Caption. "a" and "b" are not visible in the charts, perhaps add them to the plots inside the chart area, otherwise specify in the text what's right/left. Correct "Obukov". Replace "outputted" with "output".

Fig 5-6: replace the fertilization asterisk symbols with vertical lines for example, to make it easier to read. These symbols are not easily seen together with the rest of the

charts content.

Fig 7: the legends, axis, text in the plot areas are too small to be readable. I understand the advantage of having all charts nearby, but I think it would be better to change the format of the written words within the plot areas. I take the regression coefficients are referring to daily values

Fig8: again, change the marker for fertilizer events to vertical lines or something that is easier to see. The caption is unclear, you mention data from March were shown, but the graph shows from april onwards?

Fig.9: need to change the size of the text within the plots, they're difficult to read. Also, in the caption, specify the values time resolution (hourly?). Add in all plots when the fertilisation events occurred (maybe a vertical line).

Fig.10: I suggest to replace the red square with a filled square (red or not) as it will be more visible in the final format.

TABLES:

Tab4: In the headers of the table, repeat the units and what does r(p) meaN? Also, SxN, it's an index of some nature, but what information does it add to the paper? If you want to keep it, you need to explain it.

Tab6: double parenthesis in the caption, delete it. Replace "swiss" with Switzerland.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 20417, 2014.