GENERAL COMMENTS

The study by J. Zhu and coauthors reports soil N_2O emissions in a subtropical forest in China, which receive high atmospheric N-deposition since many years. N_2O fluxes along elevational gradients in two typical landscape elements were assessed and compared. Atmospheric N deposition rates are severely increasing in tropical regions, but the consequences for soil N_2O emissions have only been addressed in a few studies so far. Hence, the topic of the study is of high relevance to the biogeochemical community.

In general, the manuscript is well-written. However, I advise that it requires major revision before it can be considered for publication in Biogeosciences. A couple of important details are missing in the methods description, which I pointed out in my specific comments below. While the experimental methodology is clear in general it is, for example, not clear how long the gas samples were stored before gas-chromatographic analysis in Norway and if this may have influenced the data, and how long the soil samples were stored before extractions for analysis of nitrate and ammonium contents. The statistical analysis of the data is not adequate. Unfortunately, the authors lumped all their time-series data into mean values which they compared between plots and landscape elements with paired t-tests. These analyses need to be repeated with a test appropriate for longitudinal data, for example linear mixed-effects models. I expect that this may change the test results and consequently parts of the interpretation/discussion. More in general I think that the manuscript contains too many abbreviations, which makes it unnecessarily difficult to read. Please constrain the use of abbreviations to the ones that are frequently used and/or really needed.

Given that the authors revise the manuscript accordingly it may then be suitable for publication in Biogeosciences.

SPECIFIC COMMENTS

- P14949/L16: Please define ‘TSP’.
- P14950/L8-11: Since there is no data underlying this statement please rephrase (e.g. the turnover rate … is ‘likely’ high), or turn the sentence around (i.e. starting with the result that little OM is accumulated, and continue from there (e.g. ‘which might indicate that…’).
- P14951/L13-15: This sounds as if the chamber bases were always inserted into the ground just before measurement, is that the case? This may introduce bias in the measured gas fluxes due to soil disturbance. Please expand on this possibility in the methods.
- P14951/L21-23: The gas samples were shipped to Norway for gas chromatographic analysis. How long was the time delay between sampling and analysis? Were the butyl septa tight for this time of storage, such that the possibility of biased results can be excluded? Did you test for this? Please expand on this.
- P14951/L28-31: The choice of the mathematical model used to calculate the gas fluxes is crucial. How did you decide for each flux whether to use a linear or a second order polynomial fit? Has an objective criterion been applied to make this choice? Please be more specific in this important aspect!
- P14952/L19-22: I strongly suggest to also include the instantaneous denitrification rates of the deeper soil layers, and not to exclude them just because they were low. This is an important piece of information.
- P14953/L4-5: How long and under which conditions were the soil samples stored before the KCl extractions? Please expand on this.

- P14953/L29: Please insert a reference for the assumed soil particle densitiy, e.g. (Linn & Doran, 1984).
- P14954/L16-18 and Fig. 8: The minus reciprocal is a rather uncommon transformation, and a sinusoidal transformation very uncommon. Why did you choose such uncommon transformations? What was the reason to transform the data? Unless there is a really argument promoting this choice I would strongly advise to stick to the common transformations used to transform right- or left-skewed datasets.
- Sect. 2.3: Please check throughout that you give the units for all used variables and parameters, e.g. missing for VM and VPD.
- P14958/L14ff: Are these the results of the multiple linear regression analyses, or are these linear regression results? Please specify. If these are linear regression results please add this method in your statistical methods description.
- P14958/L24-25: Here and for all other regression equations, please include a measure of variance of the parameter estimates, e.g. confidence intervals. It is not explained what 'R-S(adj)' means, please add.
- P14960/L1-7: It seems that you compare your maximally observed flux rate with mean values over longer time periods from the literature? If so I don't think that this is adequate, please reconsider. Mean flux rates of less than 11 μg N_2O-N m^{-2} h^{-1} were also reported in the literature, see e.g. the compilation of soil N_2O fluxes for montane forests in (Koehler *et al.*, 2009).
- P14960/L22-23: Storage of tropical soil samples before extraction of the extractable nitrogen can severely bias the results, and may e.g. artificially inflate the nitrate concentrations compared to in-situ extracted soil samples (Arnold *et al.*, 2008; Turner & Tania, 2009). From the current methods description it is not clear how long the soil samples were stored before extraction, and if this may have biased the results. Please expand on this in the methods section!
- P14960/L25-28: Please check this with an appropriate statistical analysis, i.e. an analysis for repeated measurements. Do the results remain the same? The same question arises e.g. on P14961/L10-12.
- P14961/L20: Please include a reference for the statement that decreasing diffusion promotes N_2O-N_2 reduction.
- P14963/L8: Please give the exact P-value, not just '$P<0.05$'.
- P14964/L4-6: The fluxes are even comparable to a tropical lowland forest in Panama which was experimentally N-enriched for 9-10 years (Koehler *et al.*, 2009).
- Table 1: Please include a measure of variability, e.g. standard errors.
- Fig. 3: How comes that WFPS does not clearly drop during the 'dry-col season'? Why did WFPS in T3 drop so much during July-September 2010?
- Fig. 5: This is not a nice representation of the data. I suggest to revise the figure, and present the data similar as for soil-extractable nitrate in Fig. 7.
- Fig. 6: How is 'summer' defined? How comes summer was just ~1 month long in 2009, but more than 3 months long in 2010?
- P14963/L26: I don't find this argument very logical. If you know how much of the area is covered by GDZ and you determined typical emissions, why not upscale accordingly?

TECHNICAL CORRECTIONS

- P14952/L12: There are two references for Zhu et al. 2012, please distinguish between them.
- P14953/L6: Please don't use acronyms that are not so common and may not be known to all readers, in this case please spell out what 'FIA' means.
- P14954/L14: I suspect here is a typo 'for O and O', please correct.
- P14955/L4: MLR is an unnecessary abbreviation, please spell out.

- P14960/L16: Suggest to replace the ‘as’ with ‘because’.
- P14960/23: Please correct to ‘non-limiting’

REFERENCES

Arnold J, Corre MD, Veldkamp E (2008) Cold storage and laboratory incubation of intact soil cores do not reflect in-situ nitrogen cycling rates of tropical forest soils. *Soil Biology and Biochemistry,* 40, 2480-2483.

Koehler B, Corre MD, Veldkamp E, Wullaert H, Wright SJ (2009) Immediate and long-term nitrogen oxide emissions from tropical forest soils exposed to elevated nitrogen input. *Global Change Biology,* 15, 2049-2066.

Linn DM, Doran JW (1984) Effect of water-filled pore space on carbon dioxide and nitrous oxide production in tilled and nontilled soils. *Soil Science Society of America Journal,* 48, 1267-1272.

Turner BLR, Tania E (2009) Short-term changes in extractable inorganic nutrients during storage of tropical rain forest soils. *Soil Science Society of America Journal,* 73, 1972.