Biogeosciences Discuss., 12, C5013–C5015, 2015
www.biogeosciences-discuss.net/12/C5013/2015/

Biogeosciences
Discussions
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Interactive comment on "Soil N_2O and NO emissions from land use and land-use change in the tropics and subtropics: a meta-analysis" *by* J. van Lent et al.

Anonymous Referee #3

Received and published: 7 September 2015

GENERAL COMMENTS

I provided a quick access report on the first version of this manuscript submitted to Biogeosciences. I am happy to see from the authors' response to the access reviews, and from reading the current version of the manuscript, how thoroughly the authors have responded to the referees' concerns. As discussed in my earlier report, I believe this meta-analysis is important and timely, given the growth in the number of empirical studies on this topic post-2005, the recent release of the IPCC AR5, and the rising interest in REDD+ schemes for mitigating climate change in developing & newly industrialised tropical countries. This study is especially useful in drawing our attention to major sources of uncertainty in global N-oxide budgets and highlighting major knowl-

edge gaps; namely: pointing-out the scarcity of data on N-oxide fluxes from oil palm and soybean agro-ecosystems; and the under-representation of Africa and Oceania in empirical datasets. In this sense, this meta-analysis/literature review is potentially agenda-setting, and clearly articulates the case for expanding research on N-oxides into these understudied environments or regions. The meta-analysis also confirmed the validity of important under-pinning conceptual models, such as the Hole-In-the-Pipe (HIP) Model (first proposed by Firestone & Davidson in 1989), which has been in use by the modelling and empirical community for the last 3 decades. Further confirmation of the hierarchy of environmental drivers (e.g. N availability>WFPS; no significant role of temperature in modulating fluxes) which N-oxide fluxes provides a means for us to understand and predict how land-use change is likely to impact NO and N2O emissions in various LU & LUC scenarios.

Specific comments are provided in the section below.

SPECIFIC COMMENTS

1. Pages 12797-12804: There are several spelling or grammatical errors in the discussion and conclusion sections that require correction; please re-read these sections and revise the text accordingly.

2. Page 12799, lines 16-22: Consider revising these sentences as the authors' meaning here is not expressed very elegantly or clearly. What the authors appear to be saying is that there is no statistically significant increase in N-oxide emissions following LUC (although there appears to be a non-significant numerical increase); and that increased N-oxide emissions are only to be reliably expected in systems that receive N-fertiliser inputs (e.g. crops, fertilised plantations, etc.).

3. Page 12800, lines 12-21; page 12820 Figure 4: Do the authors have any thoughts as to what may lead to the trend identified in the meta-analysis, i.e. enhancement of N-oxide emissions in the first 5-10 years following disturbance? It may be interesting/thought-provoking for the authors to speculate here; for example, is the ini-

tial increase in N-oxides linked to a soil disturbance effect (e.g. mineralisation of N from SOM following land-clearing/site preparation?), or is this driven by external inputs (e.g. re-equilibration of the plant-soil system after it a switch-over to higher N inputs)?

4. Page 12802, lines 1-3: To what extent is this high variability caused by temporal variance in N-oxide fluxes? Even with adequate coverage of within or among-plot spatial heterogeneity, one of the underlying problems with field N-oxide flux measurements is the high temporal variability.

5. Page 12802, lines 15-17: Lack of temperature sensitivity is finding that is common to many tropical empirical studies, even with relatively large temperature ranges. Do the authors have any thoughts as to what may explain this lack of temperature response? Is it because N-oxide fluxes are more fundamentally constrained by other variables (e.g. N-availability, anaerobiosis/porosity), or is there some other fundamental reason?

6. Page 12802, lines 17-19: Consider revising this sentence; input of N fertiliser does change N availability. Perhaps a better way of phrasing this is, e.g. “However, increased emissions after LUC were not exclusively due to fertilization; changes in endogenous levels of soil nitrogen availability, or WFPS were also key factors impacting the changes in N2O fluxes.”

Interactive comment on Biogeosciences Discuss., 12, 12783, 2015.