Biogeosciences Discussions

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Comment on bg-2022-56

Anonymous Referee #2

Referee comment on "Modeling nitrous oxide emissions from agricultural soil incubation experiments using CoupModel" by Jie Zhang et al., Biogeosciences Discuss., https://doi.org/10.5194/bg-2022-56-RC2, 2022

Zhang et al. present a study where results from a short term incubation study was used to assess the ability of a process oriented model to simulate N2O emissions from soil with the addition of different crop residues and nitrate levels. The paper is generally well written and the topic within the scope of Biogeosciences and presents an interesting discussion and review about challenges of accurately simulating soil N2O fluxes. Therefore, I think, that the manuscript should be valuable for other researchers trying to model N2O emissions from soils and could be potentially published in Biogeosciences. However, I agree with the comment by Lorenzo Brilli, that the approach is not really novel and that there is the need to focus more on solutions rather than discussing the limitations.

In addition, I am not really sure to what extent results from a short term incubation, with sieved and repacked soil cores and limited measurements can be used to calibrate and quantify the uncertainty of a process based model used for simulating N cycling and N2O emissions under field conditions. The conditions used in the incubation (sieved, repacked cores, constant temperature and soil moisture) are not typically found in the field and highest N2O emissions are often associated with wetting and drying cycles. Moreover, sieving the soil will result in the destruction of soil aggregates and lead to increased SOM mineralization. I think that theses points need to be better highlighted in the paper and their implications for modelling N2O emissions under field conditions discussed.

LN 25 ff: “For the development of process-based models, we suggest there is a need to address soil heterogeneity, and to revisit current subroutines of moisture response functions.”

Soil heterogeneity was very much reduced in this experimental set up by sieving and re-packing the soil. Can you comment what this implies for field measurements?

Ln 108, to what size was the soil sieved?