Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2019-282-RC2, 2019

Biogeosciences Discussions

Interactive comment on "Effects of sterilization techniques on chemodenitrification and N_2O production in tropical peat soil microcosms" *by* Steffen Buessecker et al.

Anonymous Referee #2

Received and published: 6 September 2019

Review of "Effects of sterilization techniques on chemodenitrification and N2O production in tropical peat soil microcosms" by Buessecker et al.

Summary

Understanding the relative contribution of chemodenitrification is severely hampered by artifacts that may arise as an unintended result of such sterilization methods. The authors present a very thorough assessment of the impact of commonly used sterilization techniques on determination of abiotic nitrogen reaction mechanisms in soils. Specifically, they have evaluated addition of mercuric chloride, zinc chloride, sodium azide and chloroform as biocide agents – as well as treatment by autoclaving and gamma irradi-

ation. Abiotic reactions involving nitrogen intermediates (NO2-, NO, etc.) are known to commonly involve redox active metals (Fe, Mn) and organic matter complexes. As presented in the manuscript, the authors' approach focused on a comprehensive evaluation of the impact of sterilization methods on, bulk soil properties (pH), availability and speciation of metals (Fe), resultant impact on microbial cell status (live/dead), the composition of dissolved organic matter, the consumption rate of amended NO2- and the production rates of CO2 (as a proxy for heterotrophy) and N2O. This study is an exceptionally comprehensive assessment of the suitability of these sterilization techniques in the context of soil environments – with clear implications for aquatic systems as well. The authors find that gamma-irradiation results in the least severe generation of artifacts – and therefore offers the clearest path towards realistically constraining abiotic reaction mechanisms (such as chemodenitrification) in environmental studies.

The manuscript is very well written and organized, the results are presented in clear and concise figures and the discussion provides succinct and compelling arguments for explaining the observations. While there are a million different permutations of reaction conditions that could/should be evaluated – in my opinion – this study represents a very nice benchmark for the study of abiotic nitrogen reactions for future studies and warrants publication in Biogeosciences.

Minor Comments

L 60: explain that Cu is required for nitrous oxide reductase. L 73: Equation 4 is really more of a Figure, no? L155: Explain what a methanizer is. It may be pertinent to mention that decomposition of nitrous acid (HNO2) could be occurring at the especially low pH conditions of the HgCl2 addition. Might be useful to consider whether you think this could be contributing to any of the dynamics observed in this treatment, where pH was 3.6. See Park and Lee, 1988 (J. Phys. Chem. v92. p6294). L380: . . . since no enzymes. . . L392: . . . accompanied by ICP-OES. . .

Interactive comment on Biogeosciences Discuss., https://doi.org/10.5194/bg-2019-282, 2019.