

Biogeosciences Discuss., referee comment RC2
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Comment on bg-2021-265

Ben Bond-Lamberty (Referee)

Referee comment on "To what extent can soil moisture and soil Cu contamination stresses affect nitrous species emissions? Estimation through calibration of a nitrification–denitrification model" by Laura Sereni et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2021-265-RC2>, 2022

General comments

This paper describes a dual lab experiment and modeling study looking at how increasing copper in the soil interacts with soil moisture to nitrate production and related fluxes. This is an interesting topic and the "modex" (model-experiment) approach is promising. I applaud the authors for making their analytical code and data available for review—thanks. The text is generally well written although there are many minor English issues that occasionally make things unclear.

Unfortunately, there are many unclear and/or weak spots in the current manuscript. Some of the experimental conditions and assumptions are unclear; the introduction makes some questionable assertions; the Cu experiment is very short, while environmental contamination tends to be much longer, making it unclear how relevant the results are (this point is also noted by the other reviewer); many of the figures and model assessment should be re-thought or clarified. I agree with the other reviewer that the discussion is unfocused and difficult to follow, and the authors' final conclusions are unclear.

In summary, there are many points of interest here, but the current manuscript needs extensive revisions and should then be re-reviewed.

Specific comments

- Line 19: "assess" the effect? Also should be "extent" in the title
- 32: in general R² is not sufficient for assessing model performance, as it doesn't say anything about bias (but I see lines 288-289, which are better, thanks)
- 53: "biogeochemical models"?
- 68: Lado 2008 is about European soils — a very different thing than global soils, which is the scale of ESMs
- 120-: is there a control (no Cu addition)? Unclear
- 235: Please specify versions of all R packages used, in addition to the R version. Also, maybe time to update the latter!
- 280: what is the timestep of the DNDC version used?
- 285: were data randomly separated into parameterization and validation datasets? This is a crucial and unclear point
- 288-289: would be good to test and report whether these slope values are significantly different from 1.0, and whether the intercept is different from zero
- 449-465: most of this is simply restating the results and should be removed
- Figure 2: is the x axis logarithmic? It makes reading and interpreting the graphs difficult
- Figure 3: please show 1:1 lines