

Interactive comment on “Earthworm impact on the global warming potential of a no-tillage arable soil” by M. Nieminen et al.

Anonymous Referee #1

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This will be an outstanding contribution to the current discussion on the effect of earthworms on greenhouse gas emissions from agriculture. From an economic point of view such discussions are important given that there may be clear trade offs between the cost of climate change and the benefits of agricultural production. The recent meta-analyses on GHG emissions and earthworms and a similar meta-analysis on the benefits of earthworms for plant production hint at this dilemma. I like the fact that the authors challenged current conservation lore. There are too many conservation practices that were designed for a single purpose but may nonetheless have unintended consequences. More of these studies are needed.

I really liked the fact that the authors looked at small scale field measurements. They also combined a field with a mesocosm study which gives the study more explanatory

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power.

I realize that this paper is not about a nitrogen budget but nevertheless encourage the authors to add into the introduction a line or two about anecic earthworm burrows as hydrological short circuits of the biologically most active zone in the soil. I think this is important as it reduces the amount of nitrogen in the root zone by leaching of nitrate. It may open the discussion to the question of the origin of N₂O, i.e. nitrification versus denitrification. This maybe of interest for this paper since the authors suggest that field studies are needed to understand the mechanisms of GHG emissions. Clearly distinguishing among sources of N₂O is important in future studies.

Also I disagree with the overall conclusion page (6344, line 16- 24), maybe not in principle but in the strengths of the statements. The authors only worked with one field soil and so I would argue that they did not fill "the gap" but "contributed to filling a gap" and "the study further pointed out that more studies on the effect of conservation practices need to be carried out to fully understand their effect on the environment.". the same paragraph contains a statement about the effect of middens on GHG emissions. I don't think one can easily extrapolate from midden-scale to a larger scale as there may well be some competition for resources in densely populated fields so that the effect of middens are not additive. Maybe that statement could be modified maybe to "Midden soils are significant contributors of agricultural greenhouse gas production. *L. terrestris* and potentially other anecic earthworms should be carefully considered when designing conservation practices."

The work employs appropriate statistical and analytical methods. The manuscript is well-written.

I don't think Figure 2 adds anything to the paper and the results could be represented in the text because there really isn't much variation.

When the authors mention "model" in the figure captions do they mean the statistical model?

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