

Biogeosciences Discuss., referee comment RC1
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Comment on bg-2022-1

Jakob Wallinga (Referee)

Referee comment on "Reconciling the paradox of soil organic carbon erosion by water" by
Kristof Van Oost and Johan Six, Biogeosciences Discuss.,
<https://doi.org/10.5194/bg-2022-1-RC1>, 2022

Review of 'The Soil carbon erosion paradox reconciled', by Kristof van Oost & Johan Six

Submitted to BIOGEOSCIENCES, reviewed by Jakob Wallinga, Jakob

The authors assess the effect of soil erosion on soil Carbon fluxes at different spatial and time scales, based on a literature review and relatively simple modelling. The work is highly relevant, original, and of interest to the readers of Biogeosciences. Moreover, the work has large societal relevance in light of sustainable development goals with regard to land degradation neutrality and climate change.

My main reservation with regard to the work is that the literature reveals large uncertainties in the parameters that govern the C fluxes in (parts of) the total system at different timescales. Yet, in the Table 2 (summarizing parameters) and in the modelling that is reported in Fig. 4 the authors only report and use the estimates derived from a non-linear regression, without uncertainties. Hence the uncertainty is not shown in the final modelling result, which is a pity and a shortcoming of the work. I would encourage the authors to include uncertainties in the table and model, and represent these uncertainties in shading in the resulting figure 4. Such a representation would provide a much better image of the state of knowledge on this subject, including which parts of the system are least well understood.

In addition, I suggest that some additional effort is needed to improve layout and clarity of the figures, including legends and captions. Specific recommendations with regard to figures and text are added to the annotated PDF of the manuscript.

Finally, I would encourage the authors to relate their findings to the present challenges with regard to land degradation neutrality and climate change. Their figure 4 shows that soil erosion is a net Carbon source at decadal timescales. This is exactly the timescale at which reducing atmospheric CO₂ is most needed to reach Paris climate agreement targets. Thus, while (pre-)historic soil erosion may be a C sink in coming decades, present-day erosion will provide a C source in that same time period. This implies that preventing soil erosion contributes not only to food security, but also to climate change mitigation in coming decades.

Please also note the supplement to this comment:

<https://bg.copernicus.org/preprints/bg-2022-1/bg-2022-1-RC1-supplement.pdf>