SOIL Discuss., referee comment RC2
https://doi.org/10.5194/soil-2021-85-RC2, 2021

Comment on soil-2021-85

Anonymous Referee #2

Referee comment on "Can the models keep up with the data? Possibilities of soil and soil surface assessment techniques in the context of process-based soil erosion models – A Review" by Lea Epple et al., SOIL Discuss., https://doi.org/10.5194/soil-2021-85-RC2, 2021

Reviewer's report

Title: Can the model keep up with the data? Possibilities of soil and soil surface assessment techniques in the context of process based soil erosion models – A review

Journal: Soil

Manuscript ID: soil-2021-85

The authors attempt to draw links between the growing capacity of soil surface condition and nature assessment techniques and the capacity of "process based" soil erosion models to use these data. I really had difficulties to read this paper, as I was never able to see where the authors wanted to go or what they wanted to demonstrate. To start with, their main working hypothesis is never justified, and the article resembles a list of different, rather obvious, statements about the limitations of soil erosion modelling without any real evidence that these limitations would be lifted if the models were able to cope with improved measurement techniques. I therefore cannot recommend the publication in SOIL.

The hypothesis that model cannot keep up with the data is not justify in the introduction. Rather 15 lines of the introduction (out of 55) are about climate change, which is out-of-the-scope of the article, and there is no real demonstration that their hypothesis is plausible. On the contrary, the limiting factors for soil erosion modelling that are cited in the introduction (based on "many" reviews) point to problems linked to poor data availability. The hypothesis I would formulate reading the introduction is "can the data keep up with the models?"

The authors do not really describe what they consider to be an "expert based" soil erosion model. They give a list of soil erosion models that are supposed to be expert based. However, some of them are based on the USLE type soil erosion equation. Are these expert based? This list of 44 soil erosion models is very confusing. Why listing so many models and still not be exhaustive? What is the reasoning that led to the elaboration of this list? What is the use of this, almost three-page table, in the demonstration of the authors?

The different paragraphs that compose the article are also like a list of items that are pertinent to soil erosion modelling; however, they are only very superficially treated. For example there is a paragraph about tracing, that cite, sometimes very rapidly, some tracing techniques, again without being exhaustive, and I don't see how this paragraph contributes to an overall objective of the paper. The same for the paragraph on remote sensing that mostly deals with topography measurements, omitting many innovations in digital soil mapping.

The statements of the authors are often not rigorous. For example, one of the only reference to illustrate that model cannot cope with the data is Thomsen et al (2015). The authors say that Thomson et al. point out that the possibilities offered by SfM and TLS exceed the integration possibilities of the LISEM Model. First, this is not the objective of the article, and second, the experiments are carried out on 1m² plots. LISEM was never meant to run on 1 m² plots. What would TLS and SF would bring on a 100 ha catchment? The authors should have instead reported the discussion in the paper of Thomsen that go deeper in the issue of the parameterization of random roughness, which have implications in process representation of soil erosion models. The authors talk about data assessment on large scale for the reference Eltner et al. 2018, which is about experiments on plots from 600 to 2400 m². The authors also never cite the research on upscaling methods, which permit to integrate small-scale features for large scale modelling.

On the newly available data, the authors should distinguished, between the techniques that brings new information (that was not available before) and the ones that bring higher resolutions, as the implications are different, and should be treated separately. And then the questions that is interesting, is "what is the detail representation in my model that is optimum to achieve a good model performance. This question is valid both in terms of the nature of process representation (how many parameters should I integrate) and it's resolution.