Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2020-93-RC2, 2020

Biogeosciences Discussions

Interactive comment on "Uncertainties, sensitivities and robustness of simulated water erosion in an EPIC-based global-gridded crop model" *by* Tony W. Carr et al.

Anonymous Referee #2

Received and published: 17 June 2020

This appears to have serious methodological problems before one gets to the results.

The methods used have all been seriously criticised and in most cases the authors do not seem aware of these issues or chose to ignore them.

The EPIC model has been used to look at climate change impacts on crop yields and erosion rates e.g. Favis-Mortlock et al. (1991) and to model 7000 years of erosion under changing climates and land uses for a single field (Favis-Mortlock et al., 1997). It is stressed that EPIC needs calibration in order to give reasonable results. This is the very firm conclusion of the GCTE erosion model testing exercise (Favis-Mortlock, 1998; Boardman and Favis-Mortlock, 1998).

The authors claim that they are evaluating their results against field-scale measures (lines 84 and 95). This is not the case: they use 137Cs and erosion plot data (line 219). Erosion plot data cannot be up-scaled to field scale: it is useful for relative assessments e.g Cerdan et al. (2010). Extrapolation from12 plots in central Belgium to give an average rate of erosion for Europe is a well-known (?) example of misuse of experimental plot data (Boardman, 1998): the current paper is heading in that direction!

RUSLE is an unvalidated model and its problems and poor performance are reviewed in Evans and Boardman (2016a and b).

For a review of the general problems of using erosion models see Favis-Mortlock et al. (2001): in Harmon and Doe (ed) book.

137Cs has been seriously criticised recently (Parsons and Foster, 2011). The technique should not be used without dealing with these limitations. This problem is ignored in the paper.

It is simply not true to claim that there is a limited availability of field data and lack of long term measurements (lines 68-69). There are extensive data sets from Switzerland, north Germany and the UK. These could be used to validate the results of erosion models: see Boardman and Evans (2020: PPG) for a review of these methods of assessment of erosion at a field scale.

The method of deriving a common slope within an area of 9x56 km is not clear and seems rather dubious (line 122). Averaging slope from a large cell (eg. 1km2) is a common failing of erosion modelling exercises (e.g. Evans and Brazier, 2005).

One conclusion seems to be that wheat erodes are a greater average rate ((19t/ha) than maize (6t/ha) (line 244): this is contrary to all field evidence that I am aware of.

I strongly suggest that the methodological problems make this paper unfit for publication.