

Interactive comment on “Arable soil formation and erosion: a hillslope-based cosmogenic nuclide study in the United Kingdom” by Daniel L. Evans et al.

Anonymous Referee #2

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General comments

This is a neat paper that provides examples of soil formation rates from bedrock weathering derived from Be10 measurements. Two catenas are presented under different current land use for soil forming from sandstone parent material. Soil lifespans are calculated for topsoil and whole soil for the arable site and are based on first order calculations that use the soil formation rates presented in this study and soil erosion estimates from previous studies at the same field location. This is a very timely study given the use in the media of the unsubstantiated quote of “There are only 60 (or 100) harvests left if soil degradation continues”. A well written, concise paper that is suitable

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for publication after consideration of the minor clarifications detailed below.

Specific comments

P5 line 19 Include the correct reference to WRB (2015). Please see recommended citation in the preface of the manual.

P5 L23 CW soil has 94% sand. This would classify the soil at this site in WRB as an Arenosol not a Cambisol.

P5 L19-20 Please refer to the methods used for the determination of the particle size distribution and LOI.

P7 L 5 "...observation on the competency of the extracted material..." is a bit vague - how was the Saprolite or the soil/saprolite boundary determined exactly? A change in colour, consolidation, grain size? Please provide some further details.

P7 L6 You sample at the soil-saprolite interface and 50cm below it in RFF. Please indicate the rationale for these paired samples. These samples are not differentiated in the results – so are they both used to be representative of this boundary and what are the implications for this? In table 1 the lower samples in some locations are showing active weathering indicated by greater soil formation rates.

P8 L23 An additional statement needed here to indicate the exclusion of other potential soil forming inputs (e.g. organic matter and/or aeolian dust).

P8 line 25 depth to bedrock or depth to soil/saprolite boundary? Did you only use the samples labelled A from RFF to indicate depth to saprolite? Please confirm in the text.

P13 6 Did you undertake any geochemical analysis on the samples (XRF or spectroscopy?) I guess you would have reported it but it would have been really good to see some data (perhaps in another paper...)

P13 line 27, 31; P14 L5 and 14. Check the notation for p values for the Mann-Whitney tests. For significant difference $p < 0.05$; for no significant difference $p > 0.05$.

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P14 L3 Can you clarify if the sandstone dataset is from the temperate subset or from the whole global database? If the latter, then there is an interaction between climate and differences in sandstone lithology.

P16 L5. The toeslope also shows an Ap of 75 cm (p5 L20) which has also not been taken into account in the calculation due to the assumption that the top 30cm is representative of the current (active?) A horizon. If the top 30cm is removed then it could be argued there is still 'viable' topsoil at this location and thus the lifespan would be much greater than calculated (in addition to it also receiving colluvium).

P16 L6 Could the pebble bed offer some surface armoury that would reduce the rate of soil erosion once material above it has been eroded?

P16 line 15 This is the sampling depth, which is the soil-saprolite boundary, not depth to bedrock (be consistent with the descriptions you have used in other parts of the manuscript).

P18 L8. Is the last sentence incomplete?

Figure 2 Please indicate what the error bars show. Also include the sample numbers on the figure or in the caption.

Figure 3 If I have interpreted the sampling correctly then 4 of these samples are from 50cm below the soil-saprolite boundary. Does this figure therefore show sampling depth rather than depth to saprolite (for RFF there would be 4 pairs of samples with the same saprolite-soil boundary depth, one sample at the boundary and one 50 cm below).

Table 1 You state the average sample density. If you have measured the BD for each sample then what is the justification for using the average for all samples rather than the specific sample bulk density in the Be10 calculations?

Interactive comment on SOIL Discuss., <https://doi.org/10.5194/soil-2019-8>, 2019.