

SOIL Discuss., author comment AC2
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Reply on RC2

Patricia Merdy et al.

Author comment on "Soil organic carbon mobility in equatorial podzols: soil column experiments" by Patricia Merdy et al., SOIL Discuss.,
<https://doi.org/10.5194/soil-2021-3-AC2>, 2021

Response to the Referee 2 comments (hereafter in italics)

General comments

Abstract: please state the overall aim/objective of the study and perhaps a short sentence on the overall implications of the findings.

We reworked the introduction as follows: "Transfer of organic carbon from topsoil horizons to deeper horizons and to the water table is still little documented, in particular in equatorial environments despite the high primary productivity of the evergreen forest. Due to its complexing capacity, organic carbon also plays a key role in the transfer of metals in the soil profile and therefore in pedogenesis and for metal mobility. We were interested in As equatorial podzols, which are known to play a significant important role in carbon cycling, . Wwe carried out soil column experiments using soil material and percolating solution sampled in an Amazonian podzol area in order to better constrain the conditions of transfer of organic carbon at depth. The dissolved organic matter (DOM) produced in the topsoil was not able to percolate through the clayey, kaolinitic material from the deep horizons and was retained in it. When it previously percolated through the Bh material, there was production of fulvic-like, protein-like compounds and small carboxylic acids able to percolate through the clayey material and increasing the mobility of Al, Fe and Si. Podzolic processes in the Bh can therefore produce a DOM likely to be transferred to the deep water table, playing a role in the carbon balances at the profile scale, and owing to its complexing capacity, playing a role in deep horizon pedogenesis and weathering. The order of magnitude of carbon concentration in the solution percolating in depthat depth was around 1.5-2.5 mg L⁻¹. Our findings reveal a fundamental mechanism that favors the formation of very thick kaolinitic saprolites."

Throughout:

- *you refer to a number of hypotheses, but these are neither explicitly laid out nor rigorously tested. It would be better to replace the term hypothesis with the 'notion' or 'suggestion' or 'interpretation'*

We agree with the referee and we replaced "hypothesis" by "interpretation"

- *for clarity I would refrain from using 'significant' unless based on statistical testing*

We agree and we replaced significant by "important", "high" or "substantial"

Conclusion: would you be able to add a sentence or two on the wider implications of the findings?

We added the following: "More widely, our findings reveals a fundamental mechanism that favors the formation of very thick kaolinitic saprolite where pedogenesis could act for sufficient time."

Detailed comments

We have taken into account all the small detail corrections pointed out by the referee. Hereafter are our corrections to the comments which required a significant modification of the text.

Line 39: meaning? please rephrase or explain

We rephrased as follows: " The DOC fluxes exported and reaching the deep water table were generally approximated (1) by the analysis of groundwater taken from boreholes or springs situated at the outlet of an elementary watershed of known characteristics, or (2) by tracer-aided modelling at the scale of a larger catchment (Birkel et al., 2020). "

Line 175: these two sentences do not link well. please edit.

We substituted the phrase beginning with "Anyway..." by the following: "During the subsequent percolation through the kaolinitic material, the behavior of these two elements diverged completely: the kaolinitic material retained Al while it released Si, suggesting that Al was released by the Bh as OM-complexes.

Line 242: Incomplete sentence and two issues mixed up.

We rephrased as follows: "To what extent can the above findings be extrapolated to field conditions? The column experiments exhibited differences with typical field conditions. It lasted only 3 weeks, when at field under typical conditions a quasi-permanent water table is perched over the Bh which has a low hydraulic conductivity. ..."