SOIL Discuss., referee comment RC1
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Comment on soil-2021-3

Anonymous Referee #1

Referee comment on "Soil organic carbon mobility in equatorial podzols: soil column experiments" by Patricia Merdy et al., SOIL Discuss.,
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This paper aims to precise the behaviour and the role of input water on podzols horizons system assessed by an experimental procedure. The question addressed is fundamental in relation to the knowledge of those regions and in particular on the soil carbon, silica, iron and aluminium cycles in intertropical terrestrial systems. For this reason I consider that this kind of experiences have a high scientific significance. The scientific quality and the presentation are excellent. So lets go to the fundamentals.

The methodological procedure is well documented and pertinent. Could you add the work's reference where those Bh horizons were sampled, we don't need the coordinates, by the way it's important to express the extension of tropical podzols. Do we have to understand that the soils materials correspond to the Lucas et al 2012 reference?

My first reflexions are related to experimental conditions.

The input water came from a field sampling, how OM and Fe were maintained in solution, was the natural pH 4.1 and the cool temperature sufficient?

We know that the Bh horizon porosity is quite limited; in general the granular porosity of the E horizon was filled up by the OM deposited by successive coating on sand grains, finally in an "old Bh", the only porosity that remains is like fissury structure revealed by micromorphology, and expressed during the possible dry period, when the water table remains only in the kaolinitic mantle, and the uppers horizons can ± dry. So please: comment in your point of view the choice you made for the sieved materials (here you

enhance a macro-granular porosity) and also the value of the water flow in the columns. Did you air-dry the soil samples before sieving?

Additionally, you had a rapid comment on the possible microbial activity; can you describe the temperature conditions of the experience?

I understand that we consider that the Q-K column is a reference; I would have made a column only with the Q to express a control, and in particular to have a control with the Si, but also for the DOC. I think that you made here also a choice?

The results. They are very interesting. In my first reflexion, I was expecting that the procedure used for the samples promote a "liberation" of OM, and an elevated values of DOC.

Please, in the figure 4 indicate the significance of the DOC relation with Al. I'm not sure that you have to stress a global linear relation Fe=f(DOC), your figure showed three facts: there is a positive relation in the columns Q-Bh1-K, the Q-Bh2 had another comportment, and the QzBh1 and Bh2 another one, so it seems that the behaviour of iron is complicated and regulated by the fine nature of the two Bh samples? If the iron migrated as mineral colloids, I'm not sure that it is explicated here (those colloids been stopped in the 0.45 µm filters). Do you have some explanation for the differential comportments of the Bh1 and Bh2?

I understand the interest for the fig 5. Do you mean, sentence 195-196, that it is the "promotion" of the podzol volume? So, where was going the Si? In all columns the concentrations showed a Si-"exportation". This fact needs a return of discussion in the section 3.4 /

Concerning the carbon-water concentration and the kaolinitic mantle, are those concentrations compatibles with specific surface of the mineral phase (retention with no-Bh columns)? we understand that a considerable part was retained. Can we suppose that the upper part of the kaolinitic mantle have to be saturated by the small molecules of OM (low molecular mass) to after observe the process of weathering of the kaolinite? Do you can link better this part of the discussion in the 3.4 section with others results. Papers on experimental pedology are scarce, and it is interesting to enhance the results.

With regard to the carbon concentrations in water, [DOC], can you extend the discussion to the basin, or perhaps a part off (in the introduction or in the discussion), some papers where achieved on the water-carbon in the Amazonian basin.

About the last sentence in the conclusion, others works in others part of the Amazonian shields showed the development of podzols on kaolinitic soil as a result of modification of vertical drainage and then clay weathering.

Editorial

Line 79, its not mineralization, but with H2O2 a total OM oxidation.

Please review the sentence lines 139-140, which remains unclear.

There is a problem in the edition of the sentences from line 241 to the Ishida ref.