

Interactive comment on “Base cations in the soil bank. Non-exchangeable pools may sustain centuries of net loss to forestry and leaching” by Nicholas P. Rosenstock et al.

Anonymous Referee #1

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Title: Base cations in the soil bank. Non-exchangeable pools may sustain centuries of net loss to forestry and leaching Author(s): Nicholas P. Rosenstock et al. MS Type: Short communication Special Issue: Quantifying weathering rates for sustainable forestry (BG/SOIL inter-journal SI)

General Comments

The paper examines different methods for quantifying extractable base cations in a forest soil. The different methods give different pool sizes of extractable elements, which is not surprising, but the careful comparison to other data from the forest makes

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for a nice read. Comparative studies are always helpful to readers.

My biggest question is whether you did a so-called total element extraction, which I believe is some combination of hydrofluoric acid (HF), perchloric acid (HClO₄), and nitric acid (HNO₃)? It seems necessary to define the upper bound of elements, the total elemental pool, to put the extractable pool size into perspective.

Overall, the paper is well written.

Specific Comments

1) The Abstract reads well.

2) The Introduction section reads well. My only comment is what about Mehlich-3 extraction. This is common in many soil fertility studies. How does it compare? I am not suggesting that you provide a complete literature review in the Introduction. However, keep in mind that the literature is filled with ways to assess extractable nutrients.

1) The Methods are okay, to me. I do have a few questions, however. Does the length of time for the HCl-extraction matter? It seems that the extractable amount would depend upon time for different pools to equilibrate with the acid. Also, did the Aqua Regia include several additions of hydrogen peroxide? Was the Aqua Regia done with hotplate or microwave? As I understand, there are several variations of Aqua Regia, which tend to give different extractable amounts.

3) Using a 65-year rotation is fine. However, this value seemed to be lost in text. Indeed, I did not realize that you had specified age until the Results. Perhaps, the paragraph including page 5, line 6 could be reorganized a bit to emphasize the assumption.

4) Table 2 is a bit odd, to me, because the differences among sites depends only on leaching. I find it surprising the same values apply for weathering among the three sites. Is this real, or a best guess?

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5) I suppose that I should read the supplemental methods, but your calculation of microbial biomass pool is confusing to me. Why not do the typical fumigation-extraction? I believe Anderson and Domsch (Anderson, J. P. E., & Domsch, K. H. (1980). Quantities of plant nutrients in the microbial biomass of selected soils. *Soil Science*, 130(4), 211-216) did so.

6) The same sort of logic applies to base cations bound to organic matter. Why not do the typical before and after hydrogen peroxide treatment? Or, did you try a chelating agent, such as citric acid and ethylenediaminetetraacetic acid (EDTA)?

7) While I agree that the calcium in the calcium oxalate pool is not large, are you sure that you got all of the calcium bound to humic compounds?

8) With all do apologizes, I think that the section on Primary Minerals (3.4.6) is a bit confusing. The literature is filled with studies that assess base cations in primary minerals and, as mentioned above, most use some combination of HF, HClO₄, HNO₃. Without this measure, I simply do not understand how you can claim 0.2 M HCl is good enough. I seem to be missing the point here.

9) The Discussion section is okay.

Technical Comments

2) Page 1, Line 15: change 'pools' to 'pool size'.

3) Page 2, line 5: consider saying, 'because biomass extraction also removes nutrient elements in biomass.'

4) Page 2, line 37: 'barium and ammonium salts' or 'barium salts or ammonium salts'?

5) Page 3, line 1: perhaps delete 'insoluble': 'complexes' does not need a modifier.

6) Page 8, line 7: change 'e.g.' to 'for example.'

7) Page 8, line 8: cations also form complexes with humic compounds.

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8) Page 8, line 16: does 0.2 M HCl dissolve organic compounds?

9) References: check the list carefully. There are duplicates in a few places.

Interactive comment on SOIL Discuss., <https://doi.org/10.5194/soil-2019-5>, 2019.

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