

Interactive comment on “Land use change affects biogenic silica pool distribution in a subtropical soil toposequence” by Dácil Unzué-Belmonte et al.

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In this article, the authors question the impact of land use change in tropical environment, from forested to cultivated land, on the biogenic silica content of soil. They find that in addition to the known impact of harvest (which prevent plants Si to be returned to the soil), erosion also plays a role by moving the superficial, biogenic silica-rich, soil layer downslope where it can be buried. The authors find that increased erosion leads to higher biogenic silica mobilization, eventually leading to stronger biogenic silica depletion in soil. Deforestation and steeper slopes are found to be aggravating factors for this biogenic silica depletion.

The study is globally sound and of good quality and is worth publishing. I do however have some minor concerns detailed below.

C1

1° Erosion vs land-use: The land use change aspect could be discussed more thoroughly. The authors says several times (e.g., L281 and 296) that the impact of deforestation is clear and that the “study clearly shows how sensitive subtropical soil silica cycling is to deforestation”. I don’t think the impact of land use change is that clear though, and the authors somehow acknowledge it later in the text: “The absence of a larger decrease in the gently sloped cropland may indicate that deforestation occurred too recently to see such a decrease, [...]”. The authors should be more moderated and discuss more in detail the limited difference of average biogenic AlkExSi content between forest and cultivated sites (gentle slope). They should also discuss more the change of the biogenic AlkExSi distribution within the profiles between the two land uses.

Regarding the erosion aspect, it would be useful to give somewhere in the introduction some data on the erosion fluxes after deforestation. If such data are available in the literature, that would help the reader to get an idea of the importance of the phenomenon at a global or regional scale. Is it just an epiphenomenon or potentially a major Si sink?

2° The authors used an innovative technique to estimate the biogenic silica content in soils. This technique allows differentiating between Si originating from biogenic silica dissolution and from soil minerals during a leaching. The authors discuss the biogenic alkaline extractible Si (AlkExSi) content in the soil profiles, but also spend a lot of time presenting and discussing the non-biogenic AlkExSi content in soil profiles. Non-biogenic AlkExSi can somehow be seen as a proxy for geochemical and mineralogical change in the soil under anthropic pressure, which is interesting, but here the authors spend nearly as much time presenting and discussing the non-biogenic AlkExSi content in soil profiles as they do for biogenic AlkExSi, the object of the study, ... to in fine say that there is no clear trend to observe. I do understand that a negative result can also be interesting, but in this case the part dedicated to non-biogenic AlkExSi could, to my opinion, be shortened. The potential interest of looking at non-biogenic AlkExSi data should also be clearly explained earlier in the text.

C2

3° Regarding the writing, although the structure is globally good, the phrasing is some-time confusing and the manuscript would greatly benefit from some additional careful readings and reworking to improve the clarity. The Results section for example could be expurgated from long data descriptions that just repeat the content of the tables. Other examples are given in the specific comments below.

Specific comments:

L 22: “that deforestation will rapidly deplete” should be “that deforestation rapidly depleted” as one cannot generalize that easily the observations made here.

L 22 and 283: 10-53 % -> What do these percents correspond to? Is this the remaining fraction of the initial biogenic AlkExSi pool? It's not clear. This problem is recurrent in the text.

L48: change “most relevant” into “most”

L55: “. . .can represent up to 40%. . .”

L 99-100: This list of pits is indigestible. Please just mark the pits on figure 2.

L 129: To check the quality of what analysis?

L 184 - 188: Again, this list is painful to read and the data are already in table 2 anyway. Please remove. Also, the number of digits after the comma varies for a same average in the text and in table 2 (E.g., 14 ± 5.0 ; 14 ± 5 ; 14.2 ± 5). Please homogenize throughout the manuscript at the correct precision level.

L 189: I don't think these recalculated Si pools are “more accurate”; it's not a question of accuracy but rather a question of making it comparable to the cropland dataset.

L 195 - 206: Here again, the data are not easy to read and to understand. Instead of repeating again the average data, maybe refer to the table 2 for the average values and just give the difference between the sites with different slopes.

C3

L 233: “adsorbed onto oxides” and “adsorption” not “absorbed onto oxides “ and “absorption”

L 240-246: I don't understand the point of this paragraph.

L 277: What does this “37%” mean?

L 282: ILS > ILG > ARG > ARS, what are these acronyms? I could not find where in the text they were explained. S and G stand for steep and gentle, but the other letters?

L 290-294: I don't get the point here. Do the authors mean that the slope is a more important parameter than the land-use regarding the erosion intensity? Also, what are these 67% mentioned? Is it the increase of biogenic AlkExSi resulting from landslides? The phrasing is not clear.

L 339-340: the higher abundance of clay mineral and oxides in more weathered soils is not really a specific feature of Cameroonian basalts, it is nearly a definition of soil weathering. The point the authors are trying to make here is not clear.

L 355: It is worth mentioning that some authors also vividly contest this hypothesis.

Figure 3 and 4: unless I missed something, these two figures tell exactly the same thing. The layout is slightly different and one is in mg.g⁻¹ while the other is in kg.m². . . and that's it. Is there any reason to keep both? I would also suggest to indicate the acronyms of the pits directly on the figure, to make the comparison with the table easier.

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