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Biogeosciences Discussions

Interactive comment on "Si cycling in a forest biogeosystem – the importance of anthropogenic perturbation and induced transient state of biogenic Si pools" *by* M. Sommer et al.

Anonymous Referee #1

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I thoroughly enjoyed reading this paper. It succeeds in advancing our current understanding of the Si cycle in forested ecosystems. Particularly the inclusion of both zoogenic and phytogenic pools and their turnover rates and the combination of microscopic research on both biogenic and mineral phase are intriguing and novel. This study shows the complexity of the Si cycle, and the clear need to incorporate ecosystem soil amorphous Si pools in studies aimed at modeling terrestrial Si processing and fluxes. This study also clearly shows that these soil biogenic Si pools are not in steady state. While lots of recent research has given clear indications for this, this study provides evidence. Good suggestions on how to further unravel the complex puzzle opened up by this study are provided. I think this paper should therefore be

published in biogeosciences, although I think some issues still need clarification.

- The introduction puts a lot of emphasis on Ge/Si and isotopes, but they are not actually used in this study. This part of the intro could be reduced, and the applicability of both techniques can be pointed to in discussion (where it is already touched upon). On the other hand, the 4 scenarios concerning weathering and climate limitation of Si cycling in Cornelis et al. 2011 should be better clarified.

- It is difficult to assess where cores were taken. A map of the system could be very useful. Also the focus on only one core for sediment and soil is potentially limiting the applicability to the whole study site. It should be at least discussed what the lack of spatial distribution of sampling could imply for the results.

- Why was soil bulk density estimated and not determined? (18870, last line)

- Was a correction applied for mineral Si release during Tiron extraction? Both NaOH and NA2CO3 can extract significant amounts of mineral Si, and different correction methods have been suggested (e.g. Saccone et al. 2007). Why was no correction applied?

- The nomination "pedogenic silica" is what is supposed to be extracted with Tiron. But what does it stand for? Biogenic and amorphous phases? What was the coherence between phytolith Si pool (biogenic amorphous Si) and (corrected for minerals) Tiron Si pool?

- It is unclear how many times litterfall was sampled (one date – four months?)

- The quantifications for the zoogenic pool contains quite some assumptions... Why was Si content from another study used? What are implications?

- Can borosilicate probes influence the dissolved Si concentration?

- The study of Struyf et al. (2010) on Si fluxes after soil disturbance and cultivation should be included in the intro and discussion... How do results fit in the conceptual

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model put forward in this study?

- Line 22, page 18868: this is not a sentence as it contains no verb. Quite some of these “verb-less” sentences are found through the manuscript, please carefully check.

- Page 18875, avoid stem near areas, please consider revising wording.

- Page 18882, line 15-17. This is a strong conclusion, as mainly taken from concentrations. However, fluxes and hydrology should be accounted for.

Cornelis, J.-T., Delvaux, B., Georg, R. B., Lucas, Y., Ranger, J., and Opfergelt, S.: Tracing the 25 origin of dissolved silicon transferred from various soil-plant systems towards rivers: a review, Biogeosciences, 8, 89–112, doi:10.5194/bg-8-89-2011, 2011

Saccone, L., Conley, D. J., Koning, E., Sauer, D., Sommer, M., Kaczorek, D., Blecker, S. W., 15 and Kelly, E. F.: Assessing the extraction and quantification of amorphous silica in soils of forest and grassland ecosystems, Eur. J. Soil Sci., 58, 1446–1459, 2007.

Struyf E., Smis A., Van Damme S., Garnier J, Govers G.,Van Wesemael B., Conley D.J., Batelaan O., Frot E., Clymans W., Vandevenne F., Lancelot C., Goos P. & Meire P (2010). Historical land use change has lowered terrestrial silica mobilization. Nature communications, 1,129. doi:10.1038/ncomms1128

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