

# ***Interactive comment on “How big is the influence of biogenic silicon pools on short-term changes of water soluble silicon in soils? Implications from a study of a ten-year-old plant-soil-system” by Daniel Puppe et al.***

**Daniel Puppe et al.**

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General comments to the reviewer and editor:

First of all we would like to thank the reviewer for the very helpful comments on our manuscript. In general, we tried to consider all comments of the reviewer to improve the quality of our manuscript (please see our answers/comments below).

Answers (in quotation marks) to the comments of Reviewer #2:

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The authors present an interesting and detailed examination of the various constituents of the biogenic silicon pools within a constructed watershed in Germany. There is a detailed methodology outlined in this paper with some interesting results-both through time and through space. My biggest concern is that this paper starts with a claim to uncover truths about biogenic Si pools other than phytogenic pools with in systems, but the work is mainly focused on a highly-disturbed, constructed watershed. Which is incredibly important to study, but I am not sure much of the introduction fits into what the study actually is. There is question of the broad, applicability of these findings which I only point out given the sweeping nature of much of the introduction. A recasting of this could solve this issue. There needs to be more focus on the disturbance aspect-that is one way to take this work. In Lines 66-70 you bring up the idea of disturbance and disequilibrium and how that affects Si cycling, but don't really explore that. Further in the work, results are presented in a manner that there is explicit testing of various regions of the watershed and it is a bit confusing as to what is being tested as there are "initial values" that seem to be for the whole watershed that are considered to homogenous (which the authors allude to) and then each section is independently tested against these initial values. Part of my confusion here stems I think from my misunderstanding of the closing section of the introduction as there is some obfuscation about what is being hypothesized.

"Thanks a lot for your critical comments and helpful suggestions. In general, we are still convinced of our study design and the corresponding presentation of results. At t0 there are some slightly differences in abiotic soil conditions (which is also stated in the manuscript), but we assume no differences in the distribution of biogenic siliceous structures (phytoliths, testate amoeba shells etc.) shortly after construction of the study site (a fact that has already been shown in Puppe et al. 2016). Thus, a differentiation between different sections already at t0 would produce redundant results for biogenic Si, i.e., BSi for t0 (east)  $\approx$  BSi t0 (west)  $\approx$  BSi t0 (south). This is why we only show one value for BSi at t0 (which holds true for all sections). However, to accurately describe changes of abiotic soil conditions in every section we differentiated between

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the different sections already at t0 (as these slight differences have been known since the end of construction work of Chicken Creek). However, we reworked especially the introduction and the material & methods section of our manuscript to make these points clearer for the reader.”

At it's core, this manuscript is a good survey of the biogenic Si pools in the Chicken Creek watershed. But currently, I feel the introduction and discussion read as if they are from two separate papers. I believe the introduction needs to be reshaped to fit the paper that is here. The methods section is excellent and there is a thorough write-up of the procedures presented with adequate documentation. This should be lauded as many papers are often lacking in such detail for those who would like to replicate experiments. Some of the background for this paper that is necessary is in the Puppe et al. 2016 paper in Geoderma-but this manuscript submitted here reads as a good companion piece to the Geoderma one. There is an appeal here to many readers of Biogeosciences mainly in that Si cycling is not well understood broadly in the biogeochemical community and this work has the potential to make inroads towards expanding the understanding of Si cycling and its relevance. There is a lot of potential here with a need to make the paper more uniform and clear. Presently, there it is too disjointed.

“Thanks a lot for your detailed critical comments and encouraging words. We tried to follow your very helpful suggestions (please see our answers and comments below).”

INTRODUCTION 50 – I would consider changing the line “pro- and eukaryotic organisms. . .” to “prokaryotes and eukaryotes.” “Done.”

59 – The phrase “big scale” reads to colloquially and I would suggest changing that. “Done.”

60-61 – I would clarify this sentence a bit and tone it done the claim. Though this is a substantial amount, this one facet will not regulate all of the climate. “You are right. We rephrased this sentence.”

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62 – Change “since” to “for” for clarity. “Done.”

70-72 – I am interested here in how these are unbalance. Could you expand more here? In what direction and magnitude, please. “We added some information on this topic here.”

73 – “. . .allow to analyze. . .” is not grammatically correct. “We corrected this sentence.”

75-84 – I really like this summary of pervious work and major findings here. “Thank you for your encouraging words.”

83-84 – Shorten “. . .as well as uptake into 83 biological systems” to just “biological uptake” “Done.”

85-92 – There is to much effort need to suss out what the hypotheses motivating the work are. They are in there, but need to be clarified. “You are right. We reworked this paragraph and hope it is clearer now.”

METHODS 107 – What do you mean by “serving as aquifer” here? This is worded strangely and could be interpreted in different ways. “We added some more information here and hope it is reasonable now.”

112-115 – I think this area could be improved by considering the area of each portion of the watershed, and maybe even something like an upslope accumulated area calculation. There is some work here that depends heavily on hydrology, but there is not so much hydrology in here. Some GIS work could help.

“You are right; we added some information on the area of the different parts of Chicken Creek. However, we did not include GIS work in our manuscript as we generally focus on biogenic Si pools and not on hydrology, but we will consider this aspect (and corresponding GIS work) in a forthcoming paper (Sommer et al., in preparation).”

116 – Wait, what is skeleton content? “We added a definition of skeleton content.”

\*Also, it is not necessary to put Chicken Creek in quotations each time. “Okay, we

changed this throughout the manuscript.”

157 – “weighted” should be “weighed” “Done.”

160 – Change “was not used” to “avoided” “Done.”

183-184 – This sentence is awkwardly constructed and could be clarified. “You are right. We rephrased this sentence.”

195-203 – The verb tense vacillates a bit and should be standardized throughout. “Done.”

254 – Why were there two replicates before, and now three? “Different laboratory analyses were done in different replicates (two or three replicates), which is why we give the information on replicates for every subsection independently. However, we added the corresponding method in each sentence to make it clearer.”

Overall, good methods section. “Thank you for your kind words.”

RESULTS 290-295 – I generally like this section, but you could present some percent change too as a normalized difference. This is usually a good way to focus what you want the reader to notice. “We followed your recommendation.”

295-297 – This decrease in pH, this is interesting here. “You are right.”

301 – Usually you see it written  $7.4 \times 10^{-3} \text{ g kg}^{-1}$  “You are right, we changed it.”

323 -328 – This part gets really confusing when you say “increase to” and you present a range. I am not really sure where to follow with this. Could mean with a standard deviation or error or some measure of uncertainty be more clear? “We followed your recommendation and added means here.”

\* In general there is the presentation of results by different sections of the watershed, though this is not something presented as a hypothesis. If this is the manner you want to present, maybe consider making this a research question and present a mechanism that could potentially describe the patterns. “You are right. We reworked the introduc-

tion and our hypotheses/aims.”

365-367 – I am of the opinion that you cannot refer to a figure as self-evident of your results. The results section is the to describe the overview of these different pools. Our you could just cut this line. “We followed your recommendation and changed the heading of this subsection and deleted its first sentence.”

372 – Do you have a sense for the total above-ground storage of Si in raw numbers? “This is an interesting question. Unfortunately, until now we only have the data presented in our manuscript. However, we will consider this aspect in a forthcoming paper (Wehrhan et al., in preparation).”

DISCUSSION 378 – This reads more like a topic sentence than a sub-heading “You are right. We reworked it.”

\* The discussion leads of with the origin of where the Si in the system is coming from. Obviously there is an importance imparted to this point, perhaps make this something you are testing then rather than just throwing out initially in the discussion. “We reworked our manuscript, especially the introduction and material & methods sections and hope it is more consistent now.”

393-397 – Great, here is the stuff about the sections being different. Maybe bring some of this up in the methods section where you describe the site. “This information already can be found in the material & methods section.”

\* Also, what is skeleton content? “We added a definition of the skeleton content in the material & methods section.”

428 – Larger, instead of bigger. “Corrected.”

FIGURES Fig 3- What are the error bars here? Without knowing it is difficult to believe that the South plot is statistically significantly different unless these are SD as much of the other paper, but with ANOVA wouldn’t confidence intervals or standard error be a good alternative? “We added information on error bars in the figure caption.”

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Fig 4 – You highlight the different axes, but the differences are between A +B and C+D. Again, error bars. This really highlights the internal variance at the south site. What is going on there? You could really dig in there more in the future maybe. “We corrected the hint on different axes and added information on boxes as well as whiskers.”

Fig 5 – A couple of notes here, technically this graph is pretty good. But given the large differences in total Si pool size, I don't think normalizing the scales is the best way to present this as it obscures relationships among the sites. It makes the t0 sites look much larger when we know they aren't. Also, thatching is often distracting when you could go full color for this journal. Again though, interesting stuff going on in the south section. “You are right. We added a hint on different BSi pool sizes in the figure caption and reworked the layout of the diagram.”

Fig 6 – This is a really interesting way to present this as you have combined a table with a conceptual diagram similar to that of a textbook. I really like this. The font color differences are a bit distracting, but well done. “Thanks a lot for your kind words. We reworked the figure and adjusted font colors.”

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