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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.

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Answers (in quotation marks) to the comments of Reviewer #3:

Silicon is one of the most important elements in terrestrial and marine ecosystems. Its flow and fate within these systems help to understand biogeochemistrial function and influences in between. Because of biological performance, the Si cycling is motivated via synthesized hydrated amorphous Silica. The authors selected an unique artificial catchment to observe the change of bio-Si driving by different biological functions,

especially phytogenic pathway. The research findings are rather interesting.

"First of all we would like to thank you for the very helpful comments on our manuscript. In general, we considered all your comments to improve the quality of our manuscript (please see our detailed answers/comments below)."

However, there are a few points needed to be addressed in the MS prior to the acceptance for publication. 1) Total Si analysis. If total Si also significantly changed during this 9 years because of other factors than biological, portion of total SI, i.e., BSi may also change. Unfortunately, I did not see the analysis of total Si changes in tables or figures.

"In our study we only measured total Si contents of plants but not of soils because the expected changes in total Si during such a small time period are too small - given the high background Si contents (quartz is the dominating mineral). Any changes during 10 years are lower than the precision of any lab analysis (either XRF or HF extractions), i.e., not detectable. However, we quantified the so-called 'amorphous' Si fraction in soils (by Tiron method) and discussed the corresponding results (please see ll. 398-415)."

2) are other sources of Si outside this catchment significant? this applied to wet and dry air deposition. I would like to see the data on this.

"This is an important comment. Actually, dust depositions (dry deposition) at Chicken Creek are very low (73-230 mg m-2 d-1 during storm events) and only slightly above the annual average (70-90 mg m-2 d-1) measured in the state of Brandenburg (Wanner, M., Elmer, M., Sommer, M., Funk, R. & Puppe, D., 2015. Testate amoebae colonizing a newly exposed land surface are of airborne origin. Ecological Indicators, 48, 55-62). As Si is a lithogenic element the total Si input by precipitation (wet deposition) is negligible as well (<1 kg Si ha-1 yr-1, Sommer et al. 2013). Nevertheless, we will add this information to the revised version of our manuscript to improve its quality."

3) are erosion/runoff significant for the temporary and spatial change of BSi? The data of land slope and erosion/runoff will help to address this issue.

"Good point. Erosion/deposition processes were clearly evident in the Chicken Creek catchment during the first years without plant cover. Substantial surface changes resulted from rill erosion as can be seen in aerial photographs (rill network) and from a comparison of DEMs over time (Schneider, A., Gerke, H. H., Maurer, T., Nenov, R., 2013. Initial hydro-geomorphic development and rill network evolution in an artificial catchment. Earth Surface Processes and Landforms 38, 1496-1512). Interrill erosion did not lead to surface changes larger than 20 cm during the first 5 years. Afterwards the establishment of an area-wide plant cover substantially reduces interrill erosion. Because all soil data of t0 refer to a depth increment of 30 cm we can reasonably assume the same soil conditions after the first years of more intense erosion. Furthermore, we carefully selected sampling points (2015) to be not influenced by erosion, i.e., at places with low surface roughness and outside rills, of course. We will add this information to the revised version of our manuscript to improve its quality."

4) Root, a substantial portion of plant biomass, actually are more important in the activating or demobilizing the Si from the soil or earth case, because of the interaction between root biomass and root exudate like acid, and mineral Si. Please add the analysis on this.

"You are right, the release of organic acids in the rhizosphere of plants can lead to increased weathering rates in general. However, we assumed this effect to be negligible at Chicken Creek due to the quartz dominance in combination with the large proportion of the sand fraction (western section 83 %, eastern section 82 %, southern section 83%). We will add a new table including information on sand, silt, and clay fractions at Chicken Creek to the revised version of our manuscript to corroborate our assumption."

Other specific points: - please report soil texture in table and MS, a important indicator of soil erosion/runoff.

"You are right. As we stated above we will add a new Table including information on sand, silt, and clay fractions at Chicken Creek to the revised version of our manuscript."

- line 141-143: From October 2007 to 2016 (I assume 2016 because the authors did not tell the sampling year), and plant sampling year is 2015, it is only 9 years instead of 10 years. This is 10% difference of duration!

"You are right; this sentence is some kind of misleading and we will delete it from the revised version of our manuscript as we do not present results of soil solution analyses in the current manuscript (we will do this in a forthcoming paper, which is currently in preparation). Soil samples were taken in 2005 (t0) as well as 2015 (t10) (please see ll. 141-142), while plant samples were only taken in 2015 (please see ll. 258-259), but contemporaneously with soil sampling. We will add the corresponding years of soil sampling to ll. 141-142 in the revised version of our manuscript to enhance transparency of our study."

- line 169-170: are $MgCO_3$ contents not significant in the soil? please provide the data and if not negligible, $MgCO_3$ should also be analyzed.

"At Chicken Creek the primary mineral component in all particle size fractions at t0 was quartz (only small amounts of K-feldspar, plagioclase). Calcite comprises 0.5-4.5 % of the initial sediment; dolomite was only detectable in 2 out of 11 samples showing 0.5 %. Magnesite ($MgCO_3$) was not detected in the mineralogical analysis (XRD). Consequently, we assumed $MgCO_3$ contents to be negligible at Chicken Creek. However, we will add the information above to the revised version of our manuscript to improve its quality."

- line 258: why not including root?

"In general, monomeric silicic acid (H_4SiO_4) enters the plant via its roots and is carried in the transpiration stream towards transpiration termini (e.g., leaves) in the aerial plant parts. When water evaporates, silicic acid becomes supersaturated and is precipitated as hydrated silica in the form of phytoliths. The vast majority of Si in plants is located at these transpiration termini, while considerably less Si can be found in other plant portions like stems, roots, and rhizomes. Sangster (1983) (Sangster, A. G., 1983. Anatomical features and silica depositional patterns in the rhizomes of the grasses Sorghastrum nutans and Phragmites australis. Canadian Journal of Botany 61, 752-761), for example, found no significant Si depositions in rhizomes of Phragmites australis. Consequently, we only analyzed the aboveground vegetation (including transpiration termini and stems). We will add this information to the material and methods-section in the revised version of our manuscript."

- line 389-391: for each year or 9 years?

"The reported values apply to samples taken at t10. We will add this information to the revised version of our manuscript."

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