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Biogeosciences Discussions

Interactive comment on "Modern silicon dynamics of a small high-latitude subarctic lake" *by* Petra Zahajská et al.

Anonymous Referee #2

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The manuscript by Zahajská et al. presents a interesting point describing the silicon dynamics in a high-latitude lake. The authors quantified the groundwater and river inputs by using Si isotope and 222Rn mass balances through the years. Groundwater contributed 3 times higher than the rivers. The methods could be used for other water bodies. In general, It is a nice piece of work to be published in Biogeosciences. However, the current manuscript version does not reach the level of Biogeosciences. Especially the interpretation of the raw data and the discussion focus too much on the mass balance for the whole lake.

Considering 79% of DSi input is consumed by diatoms. I would like to see more interpretation about the changes of DSi and BSi concentration, for example the DSi concentration decrease in the beginning of the growing season, however the DSi consumed

by diatoms and BSi flux to sediment increased. To my knowledge, the temperature involved the process.

There are a number of other changes and theoretical issues that should be considered. 1. The authors claimed the mechanisms responsible for the diatom-rich sediment formation in the Lake, I only see the results and discussion based on water/silicon isotope/ Radon mass balances. I would like to see more discussion about the water-sediment interaction. How the temperature involved the primary production of diatom and dissolution of detritus, especially during the growing season. 2. Considering the residence time of the lake is around 2 months during the growing seasons and most of the biogeochemical processes happened during the same period, water samples from streams and lakes were collected from June to September 2019, while the Si isotope mass balance based on an age depth model. To me there is a huge uncertainty. 3. I am confused by the DSi consumed by diatoms in Figure 6 B, is it constant? Can you also add the monthly temperature in the figure? 4. Considering the high accumulation of BSi, any idea to include the legacy assessment based on your data set? I did'n see this in the discussion. 5. I am interested in the BSi flux in Figure 4. Can you explain the change for the period 1803-2019? Maybe you can get some clue from DOI: 10.1038/ncomms1128 or mainly because of the sedimentation rate?

Specific comments L 10-11 Switch section 3 And 4. Maybe considering combining to one section. L 58 the temperature in 2018-2019 should be 10.1 L 70 Compress this section by move more details to SI. L244-245 The text read like out of place. L248 Can you add the rough flow velocity of the Lake during the growing season? I am curious the net sedimentation rate of BSi in the lake. More interpretation about how the residence time impact the BSi accumulation. L 254-257 Based on this part, discuss how does BSi and temperature involved in the seasonal change of DSi in the below discussion part. L 478 fine-grain should be fine-grained.

Some references maybe the authors would benefit how to explore the mechanisms especially the water-sediment dynamics. 1. A simplified algorithm for calculating ben-

thic nutrient fluxes in river systems 2. Exploring Long-Term Changes in Silicon Biogeochemistry Along the River Continuum of the Rhine and Yangtze (Changjiang) 3. Historical land use change has lowered terrestrial silica mobilization

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