Dear authors,
Thank you for preparing this revision. I gave your revised manuscript a last read and ask you to clarify the following minor issues. I regard this as a request for minor revision.
Numbers refer to line numbers in the track-changes revision:

Dear Dr. Singer,

We thank you for taking the time to re-read our manuscript and for the very good points raised. We believe this substantially improved the manuscript further. Below we reply to the individual comments:

19: I think this is written in a misleading and too simplified manner. The increased primary productivity will need a lot of CO2, thus limiting the CO2 outgassing. Please change and/or explain. Also see comment below.

Thank you for pointing this out. The complex interplay of DIC, PIC and outgassing is central to our manuscript and we want to make sure the reader fully captures it. We have edited the line in the abstract to read:

Especially in hardwater lakes, the close connection between primary production and calcite precipitation results in a poorly understood balance of carbon burial and release, with stronger coupling of organic and inorganic processes than in softwater lakes.

We then provide more details in the introduction (see reply below).

#45: guess this needs a comma after "millions of years ago" to make sense.

Thank you for pointing this out, we have added a comma to convey the intended message.

#49: I see no causality. Why would it be important? For what?

While the incorporation of atmospheric CO_2 into particles and its subsequent drawdown represents a direct drawdown of atmospheric CO_2, the dissolution and re-precipitation of carbonate rocks has no net effect on atmospheric CO_2 levels. Assuming 100% of DIC are atmospherically derived would lead to an overestimation of the atmospheric CO_2 sink of autochthonous particulate carbon. We have edited the sentence to make more clear that we are talking about the net atmospheric CO_2 drawdown:

Therefore, it is important to precisely constrain the origin of DIC, as only the atmospheric fraction contributes to net atmospheric CO2 drawdown of POC_{Auto} *and* PIC_{Auto}.

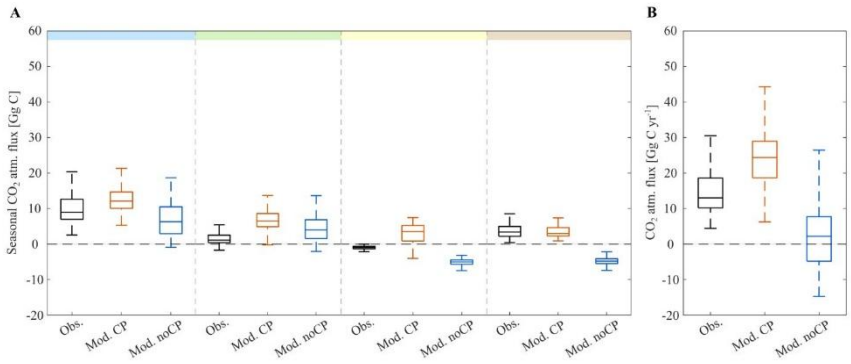
#59-64: While I agree that warming will drive CO2 from DIC into the atmosphere, I do think that such a simplified pathway from alkalinity to the atmosphere is not justified if calcite precipitation is driven by photosynthesis-induced increases in pH. When lake whiting is induced by blooming phytoplankton, the freed CO2 will be consumed in photosynthesis rather than lost in evasion, in my opinion. I ask the authors for a more nuanced phrasing of this text passage here and of the single sentence in the abstract. There may be alternative argumentation as well, but the current text seems a bit simple.

Thank you again for this important clarification. We agree that our original text oversimplified the relationship between calcite precipitation (CP) and CO2 outgassing. It is correct that in summer, when the lake is undersaturated or close to CO2 saturation, CO2 released by CP is not directly outgassed but rather taken up by photosynthesis. However, CP makes the lake

less of a carbon sink during summer and, through this buffering effect, ultimately shifts to net annual CO2 outgassing (Many et al., 2024).The text has been edited to read:

While the CO2 released during calcite precipitation can be taken up by photosynthesis, calcite precipitation ultimately contributes to net CO2 outgassing on an annual scale, by making the lake less of a CO2 sink in summer (Many et al., 2024).

We attach the figure below from Many et al. (2024), which shows seasonal (winter to fall) and annual CO2 fluxes in Lake Geneva. The model with CP (orange) better matches observations (black) showing net annual CO2 emissions, while without CP (blue) the lake would be a net carbon sink, particularly during summer.



#74-77: Is it correct to use the term "CO2 drawdown" in these lines? Aren´t you referring to the PIC and POC flux to the sediment and not to the decrease in CO2 concentration in the water?

We agree that the phrasing of this sentence, similar to L49, was ambiguous. We are again referring to the net burial of atmospherically derived carbon and have edited the sentence for clarity as following:

We show that combined ^{14}C measurements of both PIC and POC can be a valuable tool to precisely quantify net atmospheric CO_2 sequestration, and to highlight the potential importance of these processes with respect to the carbon balance in large, hardwater lakes.

#163: does detrital here mean rock-derived? Could also be read as derived from modern organic detritus.

Thank you for catching this ambiguity. We agree the readership of *Biogeosciences* might rather think of organic detritus. We have changed the phrasing to “rock-derived”.

#353: could you get a bit more into mechanisms of this do-deposition, perhaps with help of a reference?

Thank you for pointing out this opportunity to provide more detail. As riverine discharge is very low during these periods, we hypothesize that convective lake mixing is responsible for the redistribution of material. We have included the sentence:

This increase in PIC_{Allo} deposition could be linked to resuspension and lateral transport of (deltaic) sediment following enhanced bottom boundary layer turbulence during convective mixing in fall/winter (Fernández Castro et al., 2021).

We note that absolute PIC flux in these periods is vanishingly small at the distal location, and these redistribution processes, if of comparable magnitude for POC and PIC, have virtually no influence on POC deposition during this period.

References

Fernández Castro, B., Bouffard, D., Troy, C., Ulloa, H.N., Piccolroaz, S., Sepúlveda Steiner, O., Chmiel, H.E., Serra Moncadas, L., Lavanchy, S. and Wüest, A., 2021. Seasonality modulates wind-driven mixing pathways in a large lake. *Communications Earth & Environment*, *2*(1), p.215.

Many, G., Escoffier, N., Perolo, P., Bärenbold, F., Bouffard, D. and Perga, M.E., 2024. Calcite precipitation: The forgotten piece of lakes' carbon cycle. *Science Advances*, *10*(44), p.eado5924.