

Biogeosciences Discuss., referee comment RC2
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Comment on bg-2022-149

Anonymous Referee #2

Referee comment on "Biogeochemical processes captured by carbon isotopes in redox-stratified water columns: a comparative study of four modern stratified lakes along an alkalinity gradient" by Robin Havas et al., Biogeosciences Discuss.,
<https://doi.org/10.5194/bg-2022-149-RC2>, 2022

In this study, the authors analysed the carbon in lakes that acts as analogue of Precambrian Oceans. The manuscript is well written, the methods are state-of-the art, the figures are clear, and the conclusions are well supported by the results. Overall, the study greatly improves our understanding of how biological reactions are recorded and should be of great interest for the readers of Biogeosciences. However, I do have two major concerns.

First, the introduction suggests that biogeochemical processes are facing natural selection. However, there are no references backing up such a statement. To the best of my knowledge, there are no empirical evidences indicating that biogeochemical processes are facing selection. Either the authors need to provide evidence that biogeochemical processes are selected and develop that point a bit more or change the terminology. I think everyone would agree that the diversity of biological enzymes is higher now than it was in the early earth. However, I conceptually fail to see why geological (e.g., erosion) or chemical (e.g., redox reaction) processes must have evolved. The authors need to provide further evidence that those processes evolve or focus the manuscript on what can be demonstrated empirically.

Second, the structure and length of the manuscript, especially the discussion, is not helping the reader to understand the message of this manuscript. The discussion is about 550 lines long (more lines than all other sections of the manuscript combined) and contains additional figures. I do want to apologize to the authors that it took me so long for giving my review back but part of this is because the discussion is pretty much an additional manuscript. I guess only half of the data in this manuscript are in fact needed to make a good story. I would suggest splitting the current manuscript into two manuscripts, one focussing on the data presented in Figure 2, 3, 5 and another one with the isotope data. The introduction claim that the manuscript will describe "the C cycle of four modern redox-stratified alkaline crater lakes". Well in that case, I only need two subsections in the results/discussion: (1) source and fate of inorganic carbon and two (2) source and fate of organic carbon. In addition, describing all processes in all lakes, one by

one, is not helping the reader to extract useful information, on the contrary. I would rather suggest using the results from all lakes and provide a general conclusion.

Minor comments:

The setting/context section is really appreciated. However, I think there is a need to point to Figure 2 (which is currently poorly located) already in the setting/context section. For instance, after reading that lakes were stratified, I was wondering why the authors talk about pH without mentioning the water depth and without presenting the pH profile.

Line 67: delete data

Line 161: What semi-calibrated means?

Line 165: Why different volumes?

Line 166: Does pre-ashed mean pre-combusted? Add temperature and time if this is the case.

Line 171: Please provide details on the transport from the lake to the laboratory.

Line 175: Was the water filtered, stored in a container and then, put in the Exetainer? Or the filter went directly into the exetainer?

Line 196: Was the acid added in the field? Also, we need to know the type, concentration and volume of acid added. This is important because we need to know by how much the samples were diluted after the addition of acid.

Line 197: The name of the laboratory should be written in either French or English throughout the manuscript, and the city in which the laboratory is located should be mentioned. Currently we have a mix of French and English.

Line 206: So, the autosampler was loaded with one lake sample, then six samples of DI water, then another lake sample. The first DI water sample (after the lake sample) was not considered, correct? Not sure I get how the samples were processed and which sample was discarded.

Line 265: Place into brackets and move "between 34.5 and 35 mM" after "throughout the water column".