Authors' Response

We thank the Editor and Reviewer for their comments on the revised manuscript. The authors' response and explanations of changes in the manuscript are written in blue after each comment.

Comments to the author:
Dear authors,
Thank you for revising your manuscript.
I sent it to one of the reviewers for further evaluation, and the feedback is good. Please see below their minor revision requests.

I also went through your revisions, and have few points to raise that I hope you could address prior to accepting your paper for publications.

Overall, I would suggest few words/compounds replacement for conciseness and for consistencies:
1. Replace "atmospheric precipitation: with "rainfall", this way the use of the earlier confusing "precipitation" is solved

It is true that the term "atmospheric precipitation" is long, but since both "atmospheric precipitation" and "carbonate precipitation" are often repeated in the text, it is important to specify in each context which precipitation is meant (see earlier comment by Reviewer 1). "Rainfall" could be a shorter alternative, but a significant part of the atmospheric precipitation falls as snow in our study area, which is why we prefer to keep "atmospheric precipitation".

2. The word "account for" is a phrasal verb and makes the manuscript wordy. It is used several times in the manuscript. I encourage the authors to replace as much of it with "consider"

We replaced "taken into account" by "considered".

Few detailed comments are below.

Best wishes,
Dr. Ny Riavo Voarintsoa
BG Associate Editor

Figure 1
It is confusing to read increase in precipitation in that figure "an increase in air temperature leads to an increase in precipitation d18O" --> what precipitation, I believe one the reviewer has pointed this out already, but it was not addressed carefully. Also, I

wanted to know is this air temperature–precipitation relationship always straightforward, any relevant reference that support that statement?

“Precipitation” has been changed to “atmospheric precipitation” for consistency with the rest of the text. The relationship between temperature and precipitation d18O is dependent on the climatological context, but they are clearly correlated in mid- and high latitudes. This information was included in the figure caption with an appropriate reference.

I think the linkage between isotopic composition of the water and air temperature is a bit blurry, and I highly recommend the author to consider the degree of evaporation and the relative humidity, rather than simply temperature.

It is already mentioned in the figure under point (1) that higher temperatures are associated with stronger evaporation from the lake. We added relative humidity as an influencing factor in the figure caption.

The author caution readers to note that there is an opposite influence of temperature on carbonate d18O in (1) and (2); but this is not what I understand from looking at that figure. In (1) it only shows lake water (there is no carbonates), and in (2) it indicates O isotope fractionation between the two phases. I believe the authors should be clearer, or rewrite the figure caption to avoid such misinterpretation from the readers?

It is true that (1) and (2) point to lake water and water-carbonate fractionation, respectively, and not to carbonates directly. The effect on the carbonates is a consequence of the effects on (1) lake water and on (2) fractionation. To be clearer, we rephrased the figure caption.

L: 68: when you mention "isotopic equilibrium", I’d like to caution you in using that expression (see Daëron, M., Drysdale, R.N., Peral, M. et al. Most Earth-surface calcites precipitate out of isotopic equilibrium. Nat Commun 10, 429 (2019). https://doi.org/10.1038/s41467-019-08336-5)

We added the suggested reference and a sentence to explain that isotopic equilibrium rarely occurs in Earth surface carbonates.

L. 165: Rephrase: a diving team collected some water samples, surface sediments, and living Chara from the lake.

The sentence was re-written accordingly.

Reviewer comments:

Dear authors,

Thank you for revising your manuscript and addressing my and other reviewer's comments with care and detail. You have delivered an elegant work and important scientific contribution.
My last and very minor comment: two sentences in conclusions are correct but read awkwardly, below I suggest how to rephrase them:

Both sentences were rephrased according to the reviewer's suggestion.

Line 522 – 524: Based on the understanding of these environmental controls, it is possible to estimate seasonal water temperature changes from the d18O of lake water and of specific biogenic carbonates, provided that components formed during different seasons but sampled from the same sediment layer are analysed individually

Line 535 – 537: The intra-specific variability in d18O and d13C of biogenic carbonates highlights that care must be taken to obtain representative subsamples of a species for each time interval, especially if working with shallow water environments where water temperature can change rapidly over short time.