

Response to reviews for Manuscript No. egusphere-2024-1691

Speleothem evidence for late Miocene extreme Arctic amplification - an analogue for near future anthropogenic climate change?

by Umbo et al, submitted for publication in Climate of the Past.

Dear reviewer

Thank you for taking the time to review our manuscript and for your kind words and excellent suggestions.

First, I consider line 371. You are correct that dilution can impact Sr-Mg concentrations and we'll amend the manuscript to clarify this. As you point out, this dilution effect would have the same impact on trace element concentrations as PCP when driven by precipitation. Thus, this reinforces our conclusion that Sr, Mg, Ba, and P are driven by (and reflect) precipitation dynamics.

Your second suggestion to adopt the D47 crunch algorithm, in addition to using the Easotope software, to process our clumped isotope data is sensible and we will look to implement this. This will provide an interesting comparison between the two methodologies which will be of interest to the wider clumped community in general. There are some hurdles to overcome, notably the marrying of our "sliding window" normalisation approach with the D47 crunch approach which normalises over analytical sessions. This difficulty has been widely discussed in the clumped isotope community and a solution has yet to be found.

However, I believe it should be possible to find a solution given the unique way in which we normalise our data. We apply a sliding window over single analytical runs (i.e. we apply multiple overlapping windows across a single analytical session and the window never overlaps multiple analytical sessions). This should allow us to apply the D47 crunch algorithm to our data. We would note that it is unlikely that applying the D47 crunch standardization and error propagation approach will change our interpretations and conclusions.

This recalculation exercise will produce additional temperatures which will be added to Table 3 in the manuscript. This means Table 3 will now provide a comparison of the different D47 temperature reconstructions, thus providing some distinction from Table 1, addressing your concerns.

Many thanks once again for your efforts reviewing the manuscript

Yours sincerely

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