EGUsphere, referee comment RC1
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Comment on egusphere-2022-386

Anonymous Referee #1

Referee comment on "The 8.2□ka event in northern Spain: timing, structure and climatic impact from a multi-proxy speleothem record" by Hege Kilhavn et al., EGUsphere, https://doi.org/10.5194/egusphere-2022-386-RC1, 2022

General comments

- Multiple records suggest that the 8.2 ky event is the most significant climate anomaly of the Holocene. It is likely to have been triggered by melt waters in the North Atlantic region allowing us to examine a climate mechanism that may well operate in the near future. Thus, the authors certainly address a relevant subject.
- The authors select a cave from the North Atlantic region, close to the source of the perturbation.
- They provide a reconstruction of the hydroclimate of the regions using multiple proxies and with decent age control. They make a careful examination of the proxy interpretation within the record they produce, pointing out strengths and limitations.
- They further compare this record to others in the region providing regional context to the event.
- I think the goals of the project are highly relevant. My major comments address one technical calculation aspect and consideration of a recently published paper that is relevant to the conclusions in this paper.

Specific comments

- Growth rate calculations:
  - One of the strengths of using speleothems as a proxy archive is the strong age control. This is provided by absolute uranium-thorium dating with well-constrained uncertainties. Conversion of these absolute ages to an age-depth model has to incorporate uncertainties resulting from sampling resolution, averaging of time during sampling and other statistical considerations that the age-depth model may make.
  - I think a more robust way to go about growth rate calculations is to measure the growth rate between uranium-thorium dates, rather than stable isotope and trace element sample depths.
  - This study has made sufficient age measurements to make this approach feasible.
  - To examine the relationship between growth rate and stable isotopes and trace elements, I would then average these proxy measurements between uranium-thorium depth samples.
  - I would highly recommend that the authors carry out this exercise, if not as the main analysis, then at least for verification purposes.
- Timing and structure:
  - The recently published paper by Parker and Harrison on 'examination of the timing, duration and magnitude of the 8.2 ka event in global speleothem records' would be a useful reference to contextualize the region examined in this study to global records in the Parker and Harrison study.
- More nuanced characterization of the trigger region:
  - It is often the case that the driver of a climate events, such as the 8.2 ky event, is 'found' in distal locations such as the monsoon regions. This is not surprising, but nevertheless, it would be nice if the event could be better characterized at the source location.
  - The authors have a sample and experience with the climate of such a trigger source location. Where possible, it would be nice to see if the authors could discuss their results against modeled data and data from other archives and proxies in the region to give a better picture of the event. This would help understand the climate dynamics in other locations as well and would make the study more useful and impactful.

Specific comments

Line 45: Does the ice layer counting effect the start and end age or also the duration of the event?

Line 55: Please can you add references for 'event, duration, shape and impacts' as well as the attribution to 'low resolution time series'.

Stay consistent with units of trace element measurements through the paper.

Figure 1: Show Cantabrian region and the Santander GNIP locations on the map.

Is it monthly averaged d18O or rainfall-weighted monthly averaged d18O?

Figure 2: Thanks for the photos! It would be great if you could provide some additional information. E.g. what is the height of the drip water from the stalagmite? Do you know if the water is dripping through the stalactite, or if it is blocked, and flowing outside the stalactite.

Line 110: Rainfall 'amount effect' is a rather technical term used to describe an isotopic process more relevant to tropical convective systems. Perhaps this is rather upstream rainout?

Paragraph starting at 130: It's great that so much cave exploration and monitoring has been done. At the moment, it is not clear how much of the information in this paragraph is from the Rossi and Lozano paper and how much is your interpretation.

Section 3.1 – Material: Was the mineralogy of the sample measured? Which method was used? Based on the measurement, what is the mineralogy of the sample?

Sections 3.3 and 3.4: Were stable isotopes and trace elements measured at the same resolution. Figure 4 suggests somewhat lower resolution trace element measurements.

Table 1: Please can you show this data as cross plots in the supplementary information section. It is a better way to understand the data. It would be helpful if this could be done wherever you refer to correlation coefficients.

Line 260: Perhaps the 30-point running correlation won't be necessary if the data is examined between U-Th dates.

Figure 4: This is a tricky one. The anomaly in magnitude and duration is ever so small in all the proxies apart from the growth rate. The growth rate is the one that is expected to show an anomaly. I would be curious to see how the results would be after measuring growth rate between uranium-thorium dates. I also find it more intuitive to see warmer

and wetter directed up. Perhaps the proxy plotting direction is this way to accommodate for the interpretation of the d18O isotopes. Maybe you could add 'interpretative keys' to the sides of the records e.g. d18O = meltwater i.e. source water change / longer travel / upstream rainout etc. or something of the kind.

Figure 5 description: I am wary of language like 'well-defined excursion'. The plot only covers the short duration from 9.2 to 7.8 ky. Even within the plot, neither the magnitude nor the duration of the d18O excursion stand out very clearly against the rest of the record.

Line 445: Reference Fig. S5 here. What are the pale lines in Figure S5?

Line 505: 'prominent multi-pronged decrease' again I would be wary of using such strong language.

Line 510: It could be change at moisture source and/or an increase in the distance of the moisture source from the cave location given circulations changes that maybe expected with such an event.

Line 515: Perhaps the Stoll et al paper (https://doi.org/10.1038/s41467-022-31619-3) is useful for thinking through how the location of meltwater release may impact the oxygen isotopic composition of the source region.

Line 520: Is the mechanism of …more effective recharge = low d13C = low Mg/Ca = low growth rate… does it not apply for slow growth phases of the speleothem? What is the 'exception' here?

Line 545: Add acronym for LAO here if you are going to use it later in the section.

Data availability: Maybe best to submit data to NOAA – more findable. And Zenodo or a University repository in SISAL format with the additional metadata since SISAL database updates are not frequent.