

***Interactive comment on* “The SISAL database: a global resource to document oxygen and carbon isotope records from speleothems” by Kamolphat Atsawawaranunt et al.**

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Author’s final response

Reviewers comments in italics; response in normal font.

All line numbers specified here are with respect to the first version of the manuscript.

Author’s response to Referee 1

1) *I would suggest that the authors briefly introduce the others proxies used to re-*

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construct past changes. There are many sources of palaeoclimate information, and we do not think that this is the place to provide a summary of all of the sources and methods used. However, we agree with the reviewer that this might be of interest to non-specialists, as so we propose to provide a reference to a standard book that does provide such an overview (Bradley, 2015) and to modify this sentence to read: "Speleothem records are one of the types of record widely used to reconstruct past changes in climate (see Bradley, 2015 for an overview of other methods).".

Bradley, R. S.: Paleoclimatology: Reconstructing Climates of the Quaternary. Third Edition, Academic Press., doi:10.1016/C2009-0-18310-1, 2015.

2) *Table 1: I would suggest to add countries list to the table*. The database itself does not contain information about the country of origin of the records. We have added this information into Table 1, and modified the caption to make it clear that this information is added here but is not available in the database. Specifically:

Table 1: Information on speleothem records (entities) in the SISAL_v1 database. Elevation (Elv) is given in metres and latitude (Lat) and longitude (Long) in decimal degrees. For convenience, we have given the country in which each record is located although this information is not available in the database itself.

Author's response to Referee 2

1) *I have only one concern, and that is the accessibility of the database. It might be that C1 I misunderstood something, but I have tried the link to the SISAL database provided in the abstract (<http://dx.doi.org/10.17864/1947.139>) and came to the website of the University of Reading. I saw that access to the database is only provided to those who are a member of the University, and that scientists can fill in a data request. To facilitate*

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researchers with fast access, the database should be accessible to all scientists. Is it necessary, and possible, to become a member of the University of Reading?

In response to requests from the editor, we created a new version of the database and CSV files of the individual tables to allow users to regenerate the database with their own software. This deposit also includes a collection of example codes (in R and Python) to provide users with model queries which can be used with the database. It was necessary to create a new DOI for this, which superseded the old DOI. This is the reason that the old DOI now gives only restricted access. We sent a new version of the paper to the editor, with the new DOI, and we apologise that this was not made clear to the reviewer. We have updated the DOI in the revised manuscript.

2) Lines 103-106: Lapse rate is visible in $\delta^{18}\text{O}$ in meteoric rainfall. The rain falls on the land surface above the cave, and then (ideally) is not subjected to further changes while flowing through the host rock towards the cave. So I do not understand why the elevation of the cave is preferred above the elevation of the land surface. Unless the authors refer to altitude dependent temperature changes and the related isotope fractionation between water and CaCO_3 , but then this needs to be specified.

We agree that there is a lapse rate effect in the $\delta^{18}\text{O}$ signal. The elevation of the land surface is not necessarily recorded by people sampling speleothems. It can however be obtained from a digital elevation model (DEM) provided the location is known. We give the elevation of the cave in the database because this is the information that cannot be obtained from other sources, and it can be used to estimate both the additional impact on the $\delta^{18}\text{O}$ signal and the thickness of bedrock above the cave (by subtraction from the DEM-obtained elevation) and therefore to, for example, estimate the water transit time into the cave. Cave elevation, or at least the elevation of the cave mouth, is a commonly recorded variable. We agree that the sentence in the text only emphasizes the lapse rate effect and we will expand this to read: “The elevation is that of the cave itself, not the elevation of the land surface above the cave. Since the elevation of the

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land surface can be obtained from other sources, we include the cave elevation to facilitate making additional lapse rate corrections for oxygen isotopes for high elevation sites (Bowen and Wilkinson, 2002). This also allows an estimation of the depth of the overburden above the speleothem site, and hence an estimate of the time taken for water to reach the cave.”

3) *Line 120: “has been carried out for at least multiple measurements that cover one or multiple entire seasons.”* We have rephrased this to; "has been carried out periodically for at least one entire season (as opposed to one-off measurements of in-cave conditions when the speleothem was collected)"

4) *Lines 152-155: Please rewrite this sentence. providing a range of data that is available facilitates researchers with what exactly? I believe the authors mean: will facilitate researchers to undertake analyses..... "wishing to undertake" implies a description of the "type" of researchers but not what it facilitates.* We have rephrased this sentence to: "However, listing the range of data available from any speleothem will facilitate future updates of the database to include other types of measurements apart from stable isotopes (i.e. trace elements) and will help researchers in locating speleothems where multiple types of measurements have been done."

5) *Lines 181-182 “larger samples can also increase detrital material” : I don’t agree with this statement. Smaller samples taken from dirty layers can also increase detrital material. Please specify. It all depends on the skills of the person who drills the samples and on how clean the sample is.* We agree that smaller samples taken from dirty layers can also increase detrital material and be problematic. We have removed this sentence entirely.

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6) *Line 207: Is >300 with respect to an atomic ratio or activity ratio? Please indicate to prevent confusion. We have clarified that this is the $^{230}\text{Th}/^{232}\text{Th}$ activity ratio in the revised MS to prevent confusion.*

7) *Typos pointed out by referee 2: We have corrected all the typos as pointed out in the revised MS.*

Author's changes in manuscript:

Changes in response to the referees which have been described above have been repeated here to keep all the changes within this section

Changes in response to referees and additional rephrasing

1. Line 30: Rephrased sentence starting of the paragraph to read: “Speleothem records are one of the types of record widely used to reconstruct past changes in climate (see Bradley, 2015 for an overview of other methods).” .
2. Lines 103-106: Rephrased to read: “The elevation is that of the cave itself, not the elevation of the land surface above the cave. Since the elevation of the land surface can be obtained from other sources, we include the cave elevation to facilitate making additional lapse rate corrections for oxygen isotopes for high elevation sites (Bowen and Wilkinson, 2002). This also allows an estimation of the depth of the overburden above the speleothem site, and hence an estimate of the time taken for water to reach the cave.”
3. Line 120: Rephrased to read: “has been carried out periodically for at least one entire season (as opposed to one-off measurements of in-cave conditions when

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- the speleothem was collected)” .
4. Lines 152-155: Rephrased to read: “However, listing the range of data available from any speleothem will facilitate future updates of the database to include other types of measurements apart from stable isotopes (i.e. trace elements) and will help researchers in locating speleothems where multiple types of measurements have been done.” .
 5. Lines 181-182: Sentence removed entirely: “However, larger samples can also increase detrital material (if present and/or abundant), thus increasing age uncertainties when correcting for it” .
 6. Line 207: “ $^{230}\text{Th}/^{232}\text{Th}$ activity ratio >300” specified.
 7. Line 310: Rephrased to read: “The database contains information” instead of “The database contains a large amount of information”
 8. Line 415: Added “by funding to LCB from” before “the Geological Survey Ireland Short Call 2017”

Typos and grammatical corrections

9. Line 57-58: “a useful addition” instead of “a useful additional”
10. Line 83: “, the quality of the data” instead of “, of the quality of the data”
11. Line 88: “from publications.” instead of “from publications as necessary.”
12. Line 109: “fracture flow increases as rocks age” instead of “fracture flow increases, as rocks age”
13. Line 187: “loss of ^{234}U ” instead of “loss of U”

14. Line 288: “provided” instead of “provide”

15. Line 305: “special” instead of “especial”

Changes with respect to author names and affiliation

16. We have changed the order of the author: “Yassin Ait Brahim” to after “Syed Masood Ahmed” so that the names are in the correct alphabetical ordering. The affiliations have been renumbered accordingly.

17. We have corrected the affiliation for Yuval Burstyn and the affiliations have been renumbered accordingly

Changes in response to the editors

18. Figure 1 (Schema) moved to SI

19. Tables 2 to 16 have been moved to SI.

20. Figures and tables numbering in MS have been corrected to reflect the movement of tables and figures into the SI.

Changes due to addition of data

21. Figure 1 (Schema, now Figure S1) updated

(a) Corrected typo: “clumped isotopes” in entity table to “clumped_isotopes”

(b) Added columns: “entity_status” and “corresponding_current” were added to entity table

22. Table 3 (now Table S2) updated

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- (a) Two fields: “entity_status” and “corresponding_current” were added
23. Table 2 (now Table S1) updated
- (a) One field: “entity_status” added
24. Line 156-158 (section 2.2.2): Rephrased to include additional information regarding entity_status and corresponding_current to read: “The entity metadata table contains four fields to facilitate data traceability. The first two fields give the name of the person who was responsible for collating the data, and a DOI or URL for the original data. Some records have been partially or entirely updated since first publication. Although these records are included for data traceability, the entity_status field indicates whether they have been partially updated (e.g. with additional samples and/or improved age models) or completely superseded by a new record. The field corresponding_current indicates which entity (or entities) provides updated information.” instead of “The entity metadata table contains two fields to facilitate data traceability: the name of the person who was responsible for collating the data and a DOI or URL for the original data.” .
25. Overview of contents (section 2.4) have been partially edited to account for superseded entities (derived from the new field entity_status and corresponding_current) and provide more information regarding the number of entities with no age models and/or no isotopic records.
26. We have also added three new entities from two new sites (Perdida cave and Zhuliuping cave), and two new entities from two existing sites (Kanaan_MIS6 from Kanaan cave and RL4_2018 from Buca della Renella) into the database and in this table.
27. We have updated the figures and numbers in the text to reflect these changes (Overview of contents (section 2.4) and Conclusion (section 4)).

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28. Section 3. Data availability were edited to include new DOIs with CSV format. Both DOIs from researchdata.reading.ac.uk and NOAA (only CSV files) were included in this section.
29. We have edited the abstract to include the new DOI from researchdata.reading.ac.uk

Changes due to correction of mistakes

30. We have corrected a number of site coordinates in Table 1. However, two sites were still found to have wrong coordinates and therefore additional comments were added to the caption of Table 1. The caption of Table reads as follows:
 - (a) Table 1: Information on speleothem records (entities) in the SISAL_v1 database. Elevation (Elv) is given in metres and latitude (Lat) and longitude (Long) in decimal degrees. For convenience, we have given the country in which each record is located although this information is not available in the database itself. Latitudes and longitudes are given correctly here but are not given correctly in the database for Brown's cave and Uamh an Tartair.
31. Ezgi Ünal-Ärmer added to author contributions after Pauline Treble (Line 399).

Changes to references

32. One reference was removed from the reference list. This reference is a PAN-GAEA reference to the data (and provided in the database in the entity table under (data_Doi_URL) and was originally cited in Table 1 alongside the original

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paper. We have decided to remove this from the citation in Table 1 and only kept the original paper citation. This citation is:

- (a) Veiga-Pires, C., Ghaleb, B., Héllie, J.-F. and Hillaire-Marcel, C.: U-Th ages and stable isotopes from SPA speleothem from Algarve doi:10.1594/PANGAEA.884250, 2017.

33. This reference was added in response to referee 1 comments:

- (a) Bradley, R. S.: *Paleoclimatology: Reconstructing Climates of the Quaternary*. Third Edition, Academic Press., doi:10.1016/C2009-0-18310-1, 2015.

34. These references were added in response to the additional entities that had been uploaded to the database:

- (a) Nehme, C., Verheyden, S., Breitenbach, S. F. M., Gillikin, D. P., Verheyden, A., Cheng, H., Edwards, R. L., Hellstrom, J., Noble, S. R., Farrant, A. R., Sahy, D., Goovaerts, T., Salem, G. and Claeys, P.: Climate dynamics during the penultimate glacial period recorded in a speleothem from Kanaan Cave, Lebanon (central Levant), *Quat. Res.*, 1–16, 2018.
- (b) Winter, A., Miller, T., Kushnir, Y., Sinha, A., Timmermann, A., Jury, M. R., Gallup, C., Cheng, H. and Edwards, R. L.: Evidence for 800years of North Atlantic multi-decadal variability from a Puerto Rican speleothem, *Earth Planet. Sci. Lett.*, 308(1–2), 23–28, 2011.
- (c) Huang, W., Wang, Y., Cheng, H., Edwards, R. L., Shen, C.-C., Liu, D., Shao, Q., Deng, C., Zhang, Z. and Wang, Q.: Multi-scale Holocene Asian monsoon variability deduced from a twin-stalagmite record in southwestern China, *Quat. Res.*, 86(1), 34–44, 2016.

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