Response to RC2 on 'Double dating in the Middle Pleistocene: assessing the consistency and performance of the carbonate U–Th and U–Pb dating methods'

We thank the reviewer for their careful reading of the manuscript and helpful suggestions. We respond to the reviewer's comments below.

1. Specific comments

Line 6: thousand of years (ka)

We have changed this in the revised manuscript.

Line 28: applications

This seems correct without the 's'?

Line 48: worth mentioning briefly why U–Pb chronometer is currently less widely applied than U-Th for this time interval.

We have added a sentence to this paragraph explaining that the U–Pb method is less widely applied to Pleistocene carbonates than the U–Th method mostly because it is more labour intensive and only yields precise ages for samples with low inherited Pb.

What does UoM stands for, I assume University of Melbourne?

Does this comment relate to the caption of Figure 1? UoM does stand for University of Melbourne. We have now specified this in the caption of Figure 1.

Line 245: The U–Pb age of sample CCB-6-1 seems to be reliable based on good spread in U/Pb ratios along the isochron and data point scatter. However, the discussion on the synchronicity of the stable isotope profiles among the 3 stalagmites lacks sufficient context. The authors should elaborate on the basis of this agreement, and provide some more context about the good agreement between isotopic variations amongst coeval speleothems from Galleria delle Stalattiti.

We have largely addressed this in our response to reviewer 1.

We have modified this sentence to add more context. The good agreement between isotopic profiles of coeval GdS speleothems is demonstrated in Tzedaksi et al. (2018) and Bajo et al. (2020). We have added the Tzedakis et al. (2018) citation to the revised text.

Line 260-263: the MSWD and p values listed here for the best-fit regression line and for goodness-of-fit of the paired ages to a 1:1 line are different than the values listed in Figure 3. Please revisit either the text of the figure to reflect the correct values.

In the text we provide two different MSWD/p-values. The first (line 260) is for an unconstrained regression fit to the data. We then check if the slope is consistent with one within uncertainties, and the y-intercept is consistent with zero. The second (line 262) pertains to a fit of the data to a fixed 1:1 line passing through the origin. Since we plot the data in Figure 3 against a 1:1 line, this is the MSWD value provided in the text box.

Line 274: I think the text here refers to figure 4, not 5. Please correct.

We have corrected this.

Line 313: specify for the reader that this Figure S4 in the Supplemental Material

Done.

Line 381: include here the references of Woodhead et al (2006) and Stirling et al (2007) for the speleothem MO-1/3 and KOZ.

We have added these in.

Line 387: see Supplemental figure S5

Done.

Line 388: worth mentioning what is the value for this correlation in Stirling et al (2007).

We have added in this value.

2. Figures and tables

Table 1: note in the table legend that CI stands for confidence interval

Done.

Figure 1: it is difficult to see the grey shading indicating the 95% confidence interval of the black line; consider using a darker shade.

We have adjusted this accordingly.

Figure 2: in the legend, specify what MSWD stands for and that n is for number of samples.

We have added this information.

Table 2: this table is not referenced in the manuscript.

We have added a reference to this table in the text.

In the table legend, what does “3 Assuming Gaussian distributed analytical uncertainties” refers to? Number 3 is not listed in the table.

The superscript of the heading of the second column should have read ‘2, 3’. This was accidentally omitted.

Figure 6: For consistency in the figure legend and enhance readability, I suggest including the following information:

” consensus value in geochronology”(Steiger & Jager (1977)

average terrestrial zircon (Hiess et al (2012)

average crustal rock (Tissot and Dauphas) 2015

average oven water (Tissot and Dauphas) 2015

While we agree that it would be convenient to have this information available in the legend, doing so makes the plot overly cluttered. We have provided this information in the caption and hope that this will suffice for most readers.

In the figure caption replace “Li et al” with “Li and Tissot”

We have corrected this.

References

Bajo, P., Drysdale, R. N., Woodhead, J. D., Hellstrom, J. C., Hodell, D., Ferretti, P., Voelker, A. H. L., Zanchetta, G., Rodrigues, T., Wolff, E., Tyler, J., Frisia, S., Spötl, C., & Fallick, A. E. (2020). Persistent influence of obliquity on ice age terminations since the Middle Pleistocene transition. *Science*, *367*(6483), 1235–1239. https://doi.org/10.1126/science.aaw1114

Tzedakis, P. C., Drysdale, R. N., Margari, V., Skinner, L. C., Menviel, L., Rhodes, R. H., Taschetto, A. S., Hodell, D. A., Crowhurst, S. J., Hellstrom, J. C., Fallick, A. E., Grimalt, J. O., McManus, J. F., Martrat, B., Mokeddem, Z., Parrenin, F., Regattieri, E., Roe, K., & Zanchetta, G. (2018). Enhanced climate instability in the North Atlantic and southern Europe during the Last Interglacial. *Nature Communications*, *9*(1), 1383–14. https://doi.org/10.1038/s41467-018-06683-3