

***Interactive comment on* “Exploring the advantages and limitations of *in situ* U-Pb carbonate geochronology using speleothems” by Jon Woodhead and Joseph Petrus**

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We thank Matt Horswood for his positive review and address his specific comments below.

Comment: ‘The authors conclusions favour ID approaches where material and spatial resolution allows and broadly this is the case. However, with improved precision comes resolution of complexity and ID results can often be more scattered than LA results due to the low resolution of scatter of imprecise LA data but also because ID methods require 10,000 times (as cited by the authors) more material than LA methods and so are more likely to intersect open system material and/or mix different age or common-

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Pb zones. The inclusion of these variables may be reflected in high MSWD's for ID work (e.g. Fig.3 top left plot) or their homogenisation by the large amount of material required for ID work may mask this variability in the same way that low-precision LA data can. Perhaps some commentary along these lines to provide a balance of assessment might be warranted'

Response: We agree entirely and have included additional text to this effect in the revised manuscript.

Comment: 'The authors also normalise their LA data to WC-1 for both Pb/U and Pb/Pb. This constrains the LA data to be no more precise than the reference value uncertainty. Using a better quantified reference material for Pb/Pb normalisation would reduce the uncertainty on the intercept somewhat and likely better constrain the uncertainty on the Pb/U intercept. The instrumentation and acquisition strategy (Attom, Escan) the authors use may have fortuitously reduced or eliminated any bias in the measured 207Pb/206Pb but other instruments and acquisition strategies may not respond in the same way. The need for a more precisely known 207Pb/206Pb reference material should therefore be noted for other use cases'

Response: We actually used the Deflector jump mode on the Attom but have included some additional discussion around the issue of mass bias and the use of reference materials in this regard.

Comment: The 'rotation' of the 207Pb/206Pb intercept for LA data noted by the authors and the consistent bias to higher intercepts than for ID data is curious and something that needs more complete understanding. Until this can be realised the LA 207Pb/206Pb intercepts can only be considered to be inaccurate.

Response: We agree and have added additional text to this effect in the revised manuscript

Comment: It would be good to see a change to the terminology used to represent

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uncertainty and measurement precision. On page 4 particularly but also throughout the manuscript, the term 'error' is used where this should be uncertainty, and the term 'internal error (or uncertainty)' is used where the authors mean measurement precision. This change in terminology would reflect more up to date VIM recommendations on nomenclature.

Response: Apologies for the lax terminology. This has been remediated throughout the manuscript.

Comment: I therefore recommend publication after consideration for the minor comments I have made here and in the attached edited pdf.

Response: All minor comments in the attachment have been addressed in the revised text

Interactive comment on Geochronology Discuss., <https://doi.org/10.5194/gchron-2019-8>, 2019.

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