

Interactive comment on “New analytical and data evaluation protocols to improve the reliability of U-Pb LA-ICP-MS carbonate dating” by Marcel Guillong et al.

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I really enjoyed reading this manuscript – it is clearly written and laid out and with some very clear figures, and will be a very valuable addition to the U-Pb LA-ICP-MS carbonate spot dating literature. In particular, some of the results on i) the effects of pit aspect ratio on U-Pb age offsets, ii) varying ablation rates for different carbonate matrices and iii) age heterogeneity of WC-1 (which are excellently illustrated in Figure 3, 5 and 7 respectively) are ver significant. I only have some minor comments, as outlined below.

Substantive comments

C1

L72-73 As pointed out by reviewer #1, the adjustment of integrations to optimise spread along an isochron is potentially problematic (depending on how it is done). The down-hole fractionation is applied by Lolite to the RM, and then to all unknowns. This could result in age offsets if the downhole fractionation curve for carbonate samples is different to that of the NIST glass primary RM. You could use VizualAge_UcomPbine to see if this is the case, by doing an appropriate ^{207}Pb correction to carbonate samples and seeing if the final ^{207}Pb age channel is consistently ‘flat’ (i.e. not systematically rising or decreasing)

L81 The drift correction in Lolite is separate and occurs after the downhole correction (see Appendix B1 in Paton et al. 2010, G3)

The slopes in Figure 4 make little sense as presented – use relative (%) age differences on the y-axis

L142-143 This definitely requires a reference or should be deleted. I do not know of any study that uses different spots sizes for unknowns versus RMs which sounds like a pretty bad idea (even if this study subsequently shows that workarounds might be possible as suggested in L189-194). Which bring me on to a question about lines 189-194 – have you tried this?

I would like to see more discussion on what the cause of the excess variance in the two secondary RMs might be. The TIMS data for JT do have quite a high MSWD (incidentally the ASH-15D TIMS data and its MSWD should be briefly mentioned in the text) – is it sampling of a slightly age-heterogeneous material and is this the cause of the LA-ICP-MS excess variance? Also the ASH-15D LA-ICP-MS vs TIMS age offset needs more discussion – the end of the abstract (L19-20) and the end of the conclusions (L241-244) seem somewhat contradictory in this respect.

Typos / minor edits to text

L30 ‘typically a standard glass’ L36 ‘isochron’ L75 do not follow use of the word ‘repli-

C2

cate' here L111 define ϵ' on first usage L119 space between sessions and respectively
L124 'inter session' L126 VRM = validation reference material? L149 (and any other
occurrences) 'mismatch' L178 'aragonite samples' L216 reword 'usual results'

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