Geochronology Discuss., author comment AC1
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Reply on RC1

Alexander Simpson et al.

Author comment on "In situ Lu–Hf geochronology of calcite" by Alexander Simpson et al., Geochronology Discuss., https://doi.org/10.5194/gchron-2021-46-AC1, 2022

I find this to be a strikingly innovative work that shows the power of reaction cell technology for separating isobars and documents the application of Lu/Hf dating of Precambrian calcite from a variety of igneous, metamorphic and hydrothermal settings using LA-ICPMS. The results are of high quality and should be of broad interest.

Dear Don Davis. Thank you very much for your helpful comments and interest in our research.

The presentation has a few problems, particularly regarding the use of Supplementary Data files, that are outlined below. Aside from this, my comments are mostly minor and are given below as well as annotations to the manuscript file.

Lines 9 & 166

Strictly speaking, the Agilent 7900 is a tandem mass spectrometer but historically this term referred to sector magnetic instruments, which caused me some confusion when I first read the abstract. Why not refer to it the same way the company does: a triple quadrupole?

Our understanding is that the term 'triple quadrupole' is brand specific (to Agilent) and the geoscience community is moving toward a more generic term: MS/MS.

We have carefully looked further into this comment and it appears that the correct term is tandem quadrupole mass spectrometry, rather than tandem mass spectrometry. We will correct this in the revised manuscript. We will also add the term 'triple quadrupole' when MS/MS it is first mentioned, to make it clear that this is another name for the type of mass spectrometer we have used.

References to Supplementary files and figures in Lines 161, 169, 227, 239, 494.

These appear to be incomplete and confusing. I could not find any supplementary text files. There are no captions for the supplementary figures. Supplementary File 1 in lines 239 and 494 presumably refers to Supplementary Table 1.

Thanks for pointing this out. We will thoroughly go over these lines and update the figure captions in supplementary file 1.

Line 204

The main problem that I have noticed with ablating large amounts of calcite is the prevalence of signal spikes due to dislodging chunks of incompletely ablated sample from the walls of the He tubing, the mixing chamber and the plasma torch. Forcing compressed N2 (not compressed air from the lab outlet as it tends to contain oil) back through the ablation chamber tube at its outlet with the sample chamber removed, replacing the external tygon tubing and ultrasonicating the mixing chamber and plasma torch in alcohol reduces this problem. We haven't found a big problem with the cones, although a thick coating might become charged, reducing transmission, so they should be periodically cleaned.

Thanks for the comment. We used a similar procedure for cleaning our tubing and will further clarify that this is important to do after ablating large quantities of carbonate.

The large laser beam diameters we have used tends to deposit coatings on the cones and to mitigate this, it`s important to keep calcite Lu-Hf runs rather short (and carefully clean the cones afterwards).

We plan to expand this section (including reference to cleaning procedures, such as the one you mentioned) in the revised manuscript.

Figure 3

Instead of presenting ordered age error bars as now shown, more information would be given by plotting the analyses using inverse (177Hf/176Hf vs 176Lu/176Hf) diagrams with 2 sigma error ellipses along with the best fit line forced through the assumed initial (176Hf/177Hf)c value. Although it is a bit more work, the isochron could be marked off with % values of radiogenic 176Hf. It is better to celebrate the data by letting them speak for themselves, rather than reiterating how good they are after every paragraph of the discussion.

Yes, thank you for this comment, this would be a good alternative way of presenting the data (and produces effectively the same result as the Hf corrected data.)

It may be somewhat redundant to include both a common-Hf corrected weighted average plot and (inverse) isochron plot, given both are effectively 'anchored' to the same value.

However, we will give this some thoughts and either add the inverse isochrons in the supplementary materials or as part of the results figure in the manuscript.

Alex Simpson and co-authors