

Geochronology Discuss., referee comment RC1
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Comment on gchron-2021-46

Donald Davis (Referee)

Referee comment on "In situ Lu–Hf geochronology of calcite" by Alexander Simpson et al.,
Geochronology Discuss., <https://doi.org/10.5194/gchron-2021-46-RC1>, 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. 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?

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.

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 ultrasonicing 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.

Figure 3

Instead of presenting ordered age error bars as now shown, more information would be given by plotting the analyses using inverse ($^{177}\text{Hf}/^{176}\text{Hf}$ vs $^{176}\text{Lu}/^{176}\text{Hf}$) diagrams with 2 sigma error ellipses along with the best fit line forced through the assumed initial ($^{176}\text{Hf}/^{177}\text{Hf}$)_c value. Although it is a bit more work, the isochron could be marked off with % values of radiogenic ^{176}Hf . 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.

Don Davis

Please also note the supplement to this comment:

<https://gchron.copernicus.org/preprints/gchron-2021-46/gchron-2021-46-RC1-supplement.pdf>