

Geochronology Discuss., author comment AC1
<https://doi.org/10.5194/gchron-2021-42-AC1>, 2022
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Reply on RC1

Stephen E. Cox et al.

Author comment on "Short communication: Mechanism and prevention of irreversible trapping of atmospheric He during mineral crushing" by Stephen E. Cox et al., Geochronology Discuss., <https://doi.org/10.5194/gchron-2021-42-AC1>, 2022

We thank the reviewer for thoughtful and encouraging comments. We agree with the substance of the review, although logistical concerns limit our ability to expand the analytical work. We describe our plans to address the reviewer's comments in detail below.

Regarding the additional experiments, it is not logistically feasible for us to perform these quickly at this time due to other obligations and the fact that most of us have changed institutions. We intended the "vacuum then He soaked" experiments as a test of how much He was adsorbed during crushing rather than by less time-sensitive, probably reversible processes after crushing, and we will add additional discussion to the text in light of both this reviewer's comments and the extensive comments provided by reviewer 2 on the same subject. We believe that we can adequately address these questions in discussion and by reference to previously published data (as pointed out by reviewer 2) without the need for additional measurements.

The modifications suggested to figures 1 and 2 make sense. See the new versions attached. We will also clarify in the text that the plotted "background level" is better described as the detection limit of the method and is conservatively high as a result.

While it is true that in figure 3 the degree of helium contamination is a simple function of grain radius, the same is true of uranium concentration and age as well, and those two properties are interchangeable. We presented the results according to grain size because this is the variable most easily controlled by the person selecting samples for analysis, so we want to preserve this view. In acknowledgement of the reviewer's concerns and the original intention to present a way to quickly identify the minimum acceptable grain size, we suggest a two panel plot showing uranium concentration vs. grain size for a constant age and uranium concentration vs. age for a 63 micrometer grain size, with fractional [He] contamination as a heat mapped primary variable in each. We have attached examples. See also the response to reviewer 2 for more discussion about potentially expanding this figure.

We will modify the offending sentence in the conclusion to more closely follow the previous discussion.

Please also note the supplement to this comment:

<https://gchron.copernicus.org/preprints/gchron-2021-42/gchron-2021-42-AC1-supplement.zip>