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Interactive comment on "Direct dating of overprinting fluid systems in the Martabe epithermal gold deposit using highly retentive alunite" *by* Jack Muston et al.

Anonymous Referee #2

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Overview :

Muston et al. present an interesting data set and pose an important question about the recurrent nature of fluid flow events in an economic deposit. Insufficient petrologic information is given about the analysed materials, hampering interpretation of the data. The argon data treatment is difficult to justify as it is both incomplete (no inverse isochrons given, etc.) and ignores more straightforward explanations, e.g., simple, robust plateau definitions. Indeed, the selection of steps appears arbitrary in many cases. Overall, the manuscript is under-developed and the given interpretations are unconvincing, and for this reason I would reject this paper for publication in GChron.

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General Comments :

Line 80 : No detailed chemical, mineralogic or imaging data are given for the samples, so the presence of silicate minerals cannot be evaluated at a scale relevant to the material prepared for analysis. Do we know that this material is exclusively alunite or even dominantly alunite?

Line 81 : How do furnace spectra discriminate contaminants whereas lasers do not? This statement is incorrect and unsupported. Lasers can step-heat and some laser systems are equipped with pyrometers. Given then that blanks can be measured throughout a laser step-heating sequence and that furnaces have comparatively long heat-up and cool-down times, many would argue that laser step heating is superior to furnace step heating. If you're implying that lasers are only used for 'spot analysis', i.e., total fusion, then the same can be done with a furnace.

Line 83 : Clarify what is meant by 'contaminants'. Do you mean silicate contaminants? Excess argon? Atmospheric argon? This statement seems contradictory – why would you employ a method that maximises the effect of contaminants?

Line 84 : How long is the pre-degas step at 400°C? Is age information lost here? Recoil effects? If gas is lost from low-retentivity sites, how does this affect the 'asymptotes & limits' (AL) data interpretation?

Line 120 : Again – contaminants of what? Wouldn't you expect silicate contaminants (micas or relict feldspar) to degas at higher temperatures than alunite?

Line 121 : Why is this not a recoil effect? What about fluid inclusions with excess argon?

Line 126 : what is the nature of contamination that produces younger ages? Is it a mineral? Clays?

Line 134 : What does 'each data point' refer to? Inferred ages for the selected plateaux or the calculated ages of each gas aliquot from all experiments?

Line 190 : This argument would be better supported if inverse isochrons of the included steps for the AL treatment were shown, i.e., demonstrating that excess Ar, etc., is not an issue.

Figure 3.

Need inverse isochrons to examine presence or absence or excess argon, etc.

Need to list step selection criteria for plateau determination – many cases where steps are left out with no obvious reason for their exclusion.

Plots would benefit from showing %radiogenic gas and Cl/K, Ca/K per step.

A: Are the green steps subject to recoil or excess 40Ar? Why is the ca. 90% step left out of the blue plateau? B: What is the justification for subdividing this into two 2-step plateaux rather than one 7 step plateau? C: Seems an arbitrary choice of 3 steps – five other 'sets of three' could be chosen, or a large set of five steps (the final five). Etc..

Technical Points :

Figure 1 : Sample map shows only 9 sample labels (not 10) and 8 locations. PURNAMA appears to be missing. For the location with two samples, what is the spatial relationship of these two?

Line 191 : superscript 39Ar

Line 111 : can 'be' degassed. . .

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