

Interactive comment on “Potassium isotopic variability and implications for ^{40}K -based geochronology” by Leah E. Morgan et al.

Leah Morgan

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Thanks to this anonymous reviewer for their positive and constructive comments, which are responded to here.

Comment: I strongly recommend a comparison and discussion of the other major systematic uncertainties. When does the community need to consider this issue? What are examples where this systematic uncertainty has implications for open geoscience questions? How does this compare to other minor but consequential sources of systematic uncertainty, such as “cold storage”, radial and circumferential flux ratio, mass spectrometer biases such as mass discrimination and detector intercalibration?

Response: These are important questions that are difficult to answer. Ultimately, the

C1

other sources listed will vary considerably with sample and time, and so will K isotopic variability. A statement will be added to the conclusions indicating that this is a smaller issue than many uncertainty sources but may become more important as our constraints on those uncertainties improve.

Comment: Is the author suggesting a revised age for GA1550 and FCs? What additional work is required to reinforce this result?

Response: Given the relatively small effect on these ages, and ongoing work on this issue, we are not currently suggesting revised ages for neutron fluence monitors. Rather, we are publishing these results to make this issue known and providing the equations so that it can be accounted for when necessary. Ultimately, renewed work measuring ^{40}K concentrations in mineral standards will likely result in revised ages, but that work is yet to be completed.

Comment: . . . other monitors are routinely used and could be mentioned, namely ACs. The community is also in the process of identifying new potential neutron flux monitors and more discussion and examples of how this systematic uncertainty can affect interlaboratory and inter-system calibration is important.

Response: This is a good point. The effect on the age of ACs will be modeled and shown in the revised manuscript.

Technical Comments:

Comment: I recommend improving the nomenclature and symbols used in the equations. I was able to follow the calculations but at times found it difficult. I recommend changing atwtK, to AK or similar.

Response: In the revised manuscript, ‘atwtK’ will be changed to ‘W’, for consistency with Min et al. (2000).

Comment: I recommend improving figure 2. The effect on age is a continuous function and should be represented as such. Where the major neutron flux monitors plot should

C2

be included, not simply “currently assumed values”. A vertical shaded region indicated the typical and extreme ranges of delta 41K for silicates is recommended.

Response: Figure 2 will be improved as suggested.

I also recommend adding another figure showing the effect on sample age at different age ranges, perhaps at 1,10,100 Ma.

Response: We agree this would be useful and will work to develop such a figure for the revised manuscript.

Line 112 “Measuring the 40K decay constants explicitly includes d41K measurements of the relevant materials” This statement needs more context or somehow incorporated into the paragraph better. Its not clear the purpose of this statement in the context of the preceding paragraph.

Response: This sentence will be reworded for clarity: “Future measurements of 40K decay constants should include $\delta^{41}\text{K}$ measurements of the relevant materials.”

Interactive comment on Geochronology Discuss., <https://doi.org/10.5194/gchron-2020-18>, 2020.