Geochronology Discuss.,
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Interactive comment on "Potassium isotopic variability and implications for ^{40}K-based geochronology" *by* Leah E. Morgan et al.

Anonymous Referee #2

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General Comments This manuscript is a welcome contribution to the literature. With technical and scientific advancements in the Ar/Ar community, interest in sources of uncertainty once thought to be second order has expanded greatly. Potassium isotope variability has long been neglected and it's important to investigate its effect on the Ar/Ar system, however, even the author admits the effects appear to be minor.

Overall I admire the concise technical manuscript focused on pushing forward our understanding of the systematic uncertainties in Ar/Ar geochronology. With minor revisions, as detailed below, I hope to see this manuscript published in Geochronology.

Specific Comments Comparison of the systematic uncertainties. The manuscript does a nice job of demonstrating the effect of Potassium isotope variability. However the magnitude of this systematic error is not put into any context. I strongly recommend

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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?

Should age of FC be revised? “Based on the above assumptions, the most likely scenario is that the K-Ar age of GA1550 is older than previously believed by 95 ca. 35 ka, and the 40Ar/39Ar age of FCs (based on the age of GA1550) is older than previously believed by ca. 7 ka.” Is the author suggesting a revised age for GA1550 and FCs? What additional work is required to reinforce this result?

Comparison to more neutron flux standards The manuscript compares the effect of k isotope variability to only GA1550 and FC. Although these are widely used neutron flux monitors 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.

Technical Comments 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.

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

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

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.

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