Geochronology Discuss., author comment AC1
https://doi.org/10.5194/gchron-2021-17-AC1, 2021

Reply on RC1

Alastair C. Cunningham et al.

Author comment on "Attenuation of beta radiation in granular matrices: implications for trapped-charge dating" by Alastair C. Cunningham et al., Geochronology Discuss., https://doi.org/10.5194/gchron-2021-17-AC1, 2021

Many thanks for the detailed review. You raise a number of points which need addressing, and should lead to an improved submission. Regarding the main issues:

- The modelled dose rate to dosimeters when sources are placed on grain surfaces, which differs from Guérin et al., (2012).

This difference largely comes from an omission on my part. The MC simulations in section 3 address the external dose rate only, i.e. they do not include a self-dose from the dosimeter grains. It was modelled this way for two reasons;

- There are code limitations on the total number of sources in the MCNP6, that prevent every grain from being a source. So if there are 5000 grains in total a simulation, and the number of sources is <1000. Dosimeter grains are selected from the remaining non-sources, hence do not have a self-dose;
- The self-dose is easy to calculate from the simpler MC simulations in section 2; for the complex simulations, it makes no difference whether the doses are modelled at the same time or added later.

Obviously this was not clear in the manuscript. In addition, the self-dose values should have been included when making the summary statements in the results/discussion/abstract. When they are added, the difference with Guérin et al. 2012 numbers is reduced. For the sand-sized sediments with surface sources, the U and Th dose rates are 19 % and 28 % greater than for whole-grain sources. The remainder might be explained by small differences in the input parameters (grains size distributions, etc)

2 On the effects of water content:

I think you are on the right lines with the water content. The analysis in section 4 was done by comparing the effects of water to quartz in the same geometry. However, this is not what is assumed in the standard equation. To do this subject justice would require a much larger set of simulations, which is certainly no room for in the present manuscript. So this section will be removed in the revision.