Comment on gchron-2022-3
Melanie Bartz et al.

We thank Paulramasamy Morthekai for reviewing our manuscript and the constructive comments, which will improve the manuscript. In the following we will reply to the comments in detail:

"However, I feel the sample selection is not proper because essentially 2 feldspar specimens were considered (albite and microcline) which under-represent the feldspar types. They could have considered 1) geochemical end members (orthoclase and anorthoclase in addition to albite), and 2) order-disorder representing feldspar (like sanidine in addition to microcline)."

We appreciate the comment on the sample selection. Our samples were carefully chosen for our purposes, because most of the luminescence dating studies focus on K-rich and Na-rich feldspars. This is why we have decided to work on a microcline and albites. Regarding one of the plagioclase samples, we have chosen a Na-feldspar with a higher Ca-content in order to cover the more weatherable feldspar end-members and to discover whether this sample would show more changes with weathering time in its luminescence properties. As presented in the manuscript, this is not the case. We agree that an anorthite would likely reflect more changes due to its higher Ca content in comparison to K- and Na-feldspar end-members, but we think that an anorthite is not representative for most of the luminescence dating approaches. Likewise, sanidine, which forms in felsic volcanic rocks, is very rare in soils and was therefore not chosen in our experiments.

About the specific comments, we agree on both points and I expand below:

"1. It is said that XRD measurements were done but the results are not shown. As XRD measurements have already been done, the order-disorder parameter could have been calculated and considered as another luminescence parameter. This parameter becomes relevant as the blue emission is hypothesized to be associated with an oxygen ion trapped in between 2 Al ions (Al-O1 - Al). Hence monitoring this order-disorder parameter using XRD measurements with the time points will give better understanding."

We agree that order-disorder structure of feldspars is an important characteristic of luminescence emissions, which becomes especially true for the Al-O~Al (i.e., blue emission). However, we think that a detailed discussion about the XRD data
will not give much new value to the manuscript. Additional XRD experiments on the treated albite samples after 240 h did not show any differences except for intensity.

"2. In line with the earlier suggestion, change in the TL intensity and IRSL intensity before and after the artificial weathering i.e., the effect of weathering in controlling the residence time of trapped electron/hole is a direct and important luminescence dating characteristic. In simple terms whether weathering make a sediment younger than actual. This measurement demand that all the experiments should happen in dark environment. So, the reduction (or no change) in laboratory induced luminescence intensity before and after weathering will suffice (only 2 time points). For measurements shown in Figures 4 and 5, as I understood, laboratory irradiation was given after each time point."

We agree that the experimental approach the reviewer recommend (i.e. irradiation before chemical treatments) would be very interesting. We considered using this approach but decided that the experiment would be too complicated. Starting the experiments by irradiating the samples prior to chemical treatments would add additional uncertainty in terms of natural dose distribution and the effect of irradiation without preheating on the distribution of anomalous fading, especially as we chose to carry out the chemical treatments at higher temperatures (40 °C for aqua regia), which could further modify the dose distribution of highly unstable charge. It would be interesting to try this experiment in future work.

We are happy to follow up a further discussion,

Melanie Bartz (on behalf of the co-authors)