This manuscript proposes a new method to study/reconstruct paleo-temperature using TL of feldspar from rock surface. Reconstructing paleo-temperature is an important topic in climatic change study, so the attempt of this study is important and worth for publication. However, there are some technical issues that are not settled well, which prevents convincing me that this is achievable. Here I summarise my major concerns.

1) Kinetic model: the authors considered three processes in their model, including dosing (growth), thermal decay and athermal decay (fading), which are represented by different terms in their equation 1. They then estimated the parameters based on TL measurements in different ways. For both the growth curve parameters (D0 and a) and fading parameters (rho'), my understanding is that they were based on the signals from different integrals of the TL glow curve (e.g., 200 – 250 C in 10C interval). However, for the thermal decay parameters (E, s and b), they used a T_m-T_{stop} method, in which the signal from each temperature interval is obtained from subtracting consecutive fractional glow curve. That means, the signals they used to estimate present-day charge population ($\bar{n}$), growth curve and fading are based on simple integral of TL signals at different intervals, which obviously are a mix of signals from a range of trapping energy levels, but the thermal kinetic parameters are based on single (or narrow-range) trapping energy levels. That says, the authors did not separate the TL signals for constructing their model using a similar way (Tm-Tstop method) that they did for estimating the thermal decay parameters. This is problematic, as the combination of different trapping levels are not linear, so their model (equation 1) simply becomes invalid when the signals being analysed are associated with a range of trapping levels are analysed. One need to makes sure that the different parameters in Equation 1 are all obtained from the same signal associated to a single or narrow-range energy level. I am not use if this can be achieved as the combination of MAR protocol (and fading test) and Tm-Tstop would be very difficult to achieve.

2) The authors simply assuming feldspar consist a continuous trapping energy level. However, it has been commonly accepted that band-tail states play important role in the luminescence process (including TL and IRSL) in feldspar (Poolton et al., 2002). I do not see any reason to discard the band-tail states from their model.

3) How sensitive is the model to dose rate ($\dot{D}$)? The dose rate would play an important role in filling the traps during natural process, so I would expect that it will somehow influence the model results. Unfortunately, the dosimetry of the samples is poorly described. How did the author estimate the dose rate of K-feldspar? The author appears to simply crush the rock and select 150 – 250 um grain size range. What are the original grain sizes of the K-feldspar minerals in the rock? Did the authors make any rock slide to investigate this? This is critical as there are a large contribution of internal dose rates for K-feldspar.

4) The authors applied the NCF method to overcome sensitivity change issue for TL measurements. They do realise the limitation of this method as it is based on extrapolation of the NCF values from low temperature to high temperature

region, which is unreliable. Although the authors tested the effect of initial sensitivity changes on the modelling results and found very little changes for their sample, it does not guarantee that this applies to other samples and situations. The reason that the sensitivity changes did not affect the results is simply because that their samples are young and the growth of signal still lies on the linear part of growth curve, so any systematic changes in the sensitivity result in a proportional changes of different signal integrals. For older samples or high-De samples, however, this may result in non-proportional changes among different signal integrals (because the different D0 values for different integrals), and, hence, different model results in paleo-temperature. This potential problems should be appropriately acknowledged as at present it gives false impression that the initial sensitivity change does not matter.

Minor comments:

5) Line 21: Credits should be given to Li and Li (Li and Li, 2012) who firstly proposed the idea of multiple-thermometers using TL (although not implemented in their study), and they also first introduced the rate equation to investigate the effect of single growth and saturation on OSL-thermochronology.

6) Figure 1: The authors should at least provide some typical TL glow curves for their samples before showing the kinetic results.

7) Figure 1c: The fading parameter (rho') shows systematic change as a function of temperature up to 280C, but it suddenly become 'no fading'. This is surprising. The different integral signals represent a continuous mixture of signals of different athermal features, why one can obtain a sudden change in the fading? Is it because that the fading rate has large uncertainty range consistent with zero fading? In this case, it would be problematic to say 'no fading', as statistically it is also like to be 'fading'.

8) Figure 8b: Why not plot the results for other temperature range (e.g., 120 – 150 C)?

9) Figure 8c: what are the errors for the NCF at high temperature range (200 – 250C)? Have you incorporated the NFC errors into the final results?

10) Table 1: Why there are no errors for E, s and b? Why an arbitrary error of 5% is assumed, rather than their actual analytical errors?

11) Figure S3: why there is only one natural point but 3 regenerative points for each thermometer? Did the author just measure one aliquot for natural?

References

Li, B., Li, S.-H., 2012. Determining the cooling age using luminescence-thermochronology. Tectonophysics 580, 242-248.

Poolton, N.R.J., Ozanyan, K.B., Wallinga, J., Murray, A.S., Bøtter-Jensen, L., 2002. Electrons in feldspar II: a consideration of the influence of conduction band-tail states on luminescence processes. Physics and Chemistry of Minerals 29, 217-225.