**Comments on Exploring the relationships between Electron Spin Resonance (ESR)/Optically Stimulated Luminescence (OSL) properties and trace element composition in various quartz-bearing bedrocks (Strengbach catchment, Vosges)**

**General comment:**

Present work tries to address an important issue related to variation in quartz OSL and ESR sensitivities by comparing their respective intensities with each other and estimated trace elemental concentration in the samples. In this work author restrict the study to source rocks in order to see the variabilities in intensity at source of sediments. Although, the work tries to address important question, but I am disappointed that no major conclusion is deduced. Majority of conclusion are in line with existing ones. Besides this, I find there are some serious scientific and measurement flaws which need to be addressed. I am giving majority of major comments below. In addition to this, minor and major comments are also given as comment in the attached pdf file.

**Comments**

**Page 8, Line 245-255:** Why authors measured sample weight after measurements? any specific reason.

Generally, silicon oil tends to evaporate during heating which can reduce the weight, thus mass normalization will be improper. In addition, it’s also shown that quartz crystal contain molecular water and it evaporates during heat treatment. This will also result in improper weight estimation.

**“The aliquots were first bleached for 300 s at 90 mW/cm² and 125°C before any given dose.”**

Does this step introduces any sensitivity variation? Have you checked?

**“*a given dose* of 50 Gy was given to all aliquots to allow,”**

It will be better to refer it as a test dose or regeneration dose whichever is appropriate than to say it a given dose. It creates confusion.

**“is investigated to evaluate its natural sensitivity and possible correlation with the OSL sensitivity”**

Authors mentioned above that they have already bleached this peak and performed a natural measurement, then how are you referring it as natural sensitivity?

Some works (Chauhan et. al. 2015) have suggested that the 110 C TL signal and OSL signal are correlated only upto certain small dose, not for larger dose. 50Gy is quite large dose. Did authors check the correlation explicitly?

we evaluate the quartz OSL sensitivity after a

**“255 second similar irradiation dose but measured at room temperature (BOSLf25°C), which”**

How does it help? does it not get effected by retrapping by 110C peak?

**Page 9, Line 262-277:**

**“was exposed to light (SOL2 solar simulator - HONLE) for 2000 hours (“**

How does it compares with bleaching using blue led for 300s in previous experiments?

**“We reasonably assume that both Al and Ti centres have reached saturation before sample processing and measurements because source bedrocks are older than 250 Ma.”**

what is typically saturation dose of Al/Ti centres and what is the dose rate of source rocks?

**Page 9, Line 282-299:**

**“ To prevent quartz from breaking under the laser beam, analyses were carried out on thick sections made from whole rock samples from bedrocks. A total of fifteen samples were analysed for trace elements in quartz (including Al, Li, and Ti) with between 28 and 60 spots on the various quartz grains present on the thick section.”**

Normally for ESR and OSL analysis, quartz is separated from the rock or sediment by rigorous chemical and physical processes. In this case whole rock is being used, so how reliable this data set will be for comparison with ESR or OSL data?

How accurate would these be for comparing against OSL/ESR data?

How the spot positions were chosen?

**“ The median concentration for each considered element was calculated for each sample to allow comparisons with ESR and OSL data”**

It would be much better to use quartz grains in pellets form or use other method for elemental analysis. I am not sure, how reliably we should compare whole rock data with separated quartz grains data.

**Page 10, Line 304-315:**

**“On the one hand, low sensitivities ……………. 100 and 250 cts/Gy/mg. The”**

It will be better to give typical sensitivities in table format and shine down curves comparison. How the shape/decay constant of the two types of quartz varied. It can be a useful information.

**“TL110°C peak sensitivities present…………. higher values than other bedrock samples.”**

Are there any peak shift and peak width changes observed for the different sensitivity quartz?

**“sensitivity values related to BOSL25°C measurements follow the same pattern with two groups of low and high BOSL25°C intensities”**

I really don't understand the purpose of BOSL 25, why is it required? How it can help in understanding the posed objective?

**“Comparison between BOSL25°C and BOSL125°C ………..plot along this linear fitting trend (Fig.2A)”**

Although positive correlation is expected, but the nature of regression may not be defined. Why authors say it’s a linear correlation? The R2 is low.

**Page 10, Line 325-335:**

**“measurements: low Ti-Li and………remaining granites and sandstones.”**

Is there a reason why such a specific trend is observed?

**“Ti-H. Third, intensity …………. granites/sandstones group”**

Why is there no correlation between these quantities as they are expected to be correlated to luminescence properties of crystal?

Does that mean that there is no point of using correlation between BOSL and Ti-Li together?

Several earlier works have suggested the correlation of Al centre with OSL of quartz, but present work suggests opposite. Which one to believe?

**Page 11,12, Line 345-355:**

Why there is no trend of different centers? As there is expected correlation of these centers with OSL, there should be a trend. Is it because the measurements were done on thick slice of samples rather than on the quartz grains?

**Page 12, Line 363-371 section 5.3:**

**“First, comparison between Al contents and BOSLf125°C sensitivities show a good correlation (Fig. 4B, R2=0.719).”**

Is it not the self inconsistent statements. In previous sections authors show that BOSL can be linked to rock types but Al and other centres can are not representing any trend with rock type, but here again authors are claiming that they are having good correlation. please check for consistency in the text.

**section 5.3**

In general, the correlation drawn in this section appear uneven. As discussed above, the centres intensities are not showing correlation with BOSL or systematic trend. Sandstone has high OSL but low Al content although others seem to have a good correlation. No linear relation between Al and ESR Al is observed. Is it not because the measurement is incorrect. LA-ICPMS is measuring whole rock, which implies aluminum in the matrix can also be estimated and obviously it will be significantly different from Al content of the quartz grain. Possibly same is the reason for other uneven behavior. I encourage authors to do measurements on the separated quartz grains rather than bulk matrix to obtain consistent results.

**Page 13, Line 385-396:**

**“and (ii) the received natural dose is high enough to be considered identical for all samples.”**

How can you considered natural dose same for all samples? Even if it is old, the variable doserates and the variable ambient temperature conditions will result in equilibrium doses to be different.

**“that the measured ESR intensities obtained on quartz of bedrocks are comparable to their sensitivities.”**

This is wrong statement

**“(ii) two main groups can be obviously distinguished based on the analysis of different measured signals.”**

Will it be true for present samples or for any other sample?

**“but no correlation was observed between ESR-Al and BOSLf125°C sensitivities”**

This is clearly inconsistent statement w.r.t. previous statements.

**Page 13, Line 404-407:**

**“positions. First, we report a significant linear correlation (R2=0.891) 405 between quartz’s Al and Li contents so that two groups of quartz-bearing bedrocks can be distinguished in the Strengbach catchment (Fig. 4A).”**

Isn't this true for other silicate minerals also, why specifically quartz here?

**Page 14, Line 410-417:**

**“A good correlation is observed between Al contents and BOSLf125°C (Fig. 4B R2=0.719), as already reported in Alonso et al. (1983) and Preusser et al. (2009), whereas it is much weaker between Al contents and TL110°C (Fig. 4F R2=0.137) signals.”**

This is inconsistent, OSL and TL are correlated, Al and OSL are correlated but TL and Al are not. why is it so?

**“Li+Na+K). On the other hand, …..quartz lattice itself.”**

How much was feldspar contamination in separated quartz grains?

**Page 14, Line 423-430:**

**“assumed to be caused by the fact that not all substitutional Al atoms are present in the form of paramagnetic centres.”**

How the two groups are giving two different hypothesis? In present case I strongly suspect that it could be due to measurement on rock slice instead of quartz grains. Is there any way to prove or differentiate between substitutional Al showing non paramagnetic behaviour?

In present case the dose given is sufficiently high as authors claim.

**“The increasing amount of Ti content may cause a general increase of the Ti-Li ESR signal, and an increase of substitution of Si by Ti.”**

How this is happening? This is hypothetical. Why should this happen?

**Page 15, Line 455-459:**

why only quartz vein results are explained, why not other samples?

**Page 15, Line 460-483:**

**“Importantly, not only are these observations somehow inconsistent with each other (e.g. contrasting behaviour, different threshold temperatures…), but they also only partly fit our data. On”**

why you want to fit inconsistent observations with your data?

**“If one would have expected the highest ……..gneissic samples (Fig. 2E). On”**

This indicates that something other than temperature is playing a role. Constant high temperature helps the ions to defuse uniformly in the crystal. But cooling rate decides the trapping of defects in crystal. A faster quenching enable trapping of impurities, while a slow cooling lead to more pure crystal structure. Thus, it will be good if analogy can be extended for explanation.

**“Also, low OSL sensitivities are not only observed for the gneisses but also in granitic bedrock which undergone deformation (Bilstein Fault zone for samples #9A, 9B, 10). This”**

This is contrary to laboratory observations. It is often observed that annealing upto 500C in laboratory result in several order change in OSL/TL intensity.

**Page 15, Line 495:**

**“ This suggests that pressure can be one of the prevailing factors driving changes in OSL/ESR sensitivities”**

what will be the mechanism for this?

**Page 15, Line 515:**

**“the two other sandstone samples (#30 and 44) present similar OSL sensitivities than those of the granites.”**

What is distance of transport from source for these sediments?