

Response to the review of Jakob Wallinga of the manuscript 'A progressively elevated temperature (PET) IRSL SAR procedure – first experiments and results' by Kadereit et al.

1 **Review of the manuscript 'A progressively elevated temperature (PET) IRSL SAR**
2 **procedure – first experiments and results' by Kadereit et al.**

3 **Submitted to GChron, reviewed by Jakob Wallinga.**

4

5 I would like to compliment the authors with their original, complete and well
6 documented manuscript, which details the development and a number of tests of a
7 new approach to obtain equivalent doses on single aliquots of feldspar. Their
8 progressively elevated temperature (PET) approach builds on the established single-
9 aliquot regenerative dose (SAR) method using the post-IR IRSL signal. However it
10 deviates in that IR and post-IR signals are obtained during a combined Continuous
11 Wave stimulation while the sample temperature is raised. The approach has not
12 been attempted for feldspar before, and has several potential advantages over
13 widely used two-step (IR-pIRIR) and multiple step (MET) approaches for identifying
14 anomalous fading and bleaching trends as a function of measurement temperature.
15 Thereby the PET approach has the potential to develop into the method of choice for
16 feldspar IR/pIRIR measurements. I warmly recommend publishing of this highly
17 interesting manuscript, which I expect to become widely used and cited by the
18 luminescence community.

19 Dear Jakob Wallinga,

20 we would like to thank you very much for your constructive and supportive review.

21 We will answer to your comments in blue below.

22

23 In my mind the manuscript could be further improved by considering a few issues in
24 more detail:

- 25 • The clarity of the introduction may be improved by adding a clear aim and
26 research questions in the final paragraph. The authors do much more than
27 'introduce aprocedure'.

28 We will rework our introduction and carve out our aim and research question. Still,
29 we are aware, that at present we have not done much more than introduced a new
30 procedure. There is much more work to be done: collect more data; investigate the
31 physics in more detail; develop automated procedures for the definition of the PET-
32 peak and the deconvolution and description of the De-value curves; develop smart
33 graphs to present the results of the gained De value curves of a sample in a clear
34 and concise way, as they exist for classic luminescence dating, e.g., with Abanico
35 plots (Dietze et al., 2015); etc.

- 36 • For developing and testing a new approach, it is always helpful to work on a
37 set of very well-defined samples with high-quality independent age control.
38 Unfortunately, the samples used lack such age control. Why did the authors
39 perform the research with these samples?

40 It is true that we did not have samples at hand, which were taken, e.g., from a volcanic
41 layer that was independently numerically dated, e.g., by $^{40}\text{Ar}/^{39}\text{Ar}$, which might be
42 regarded as high-quality independent age control. But it is not like these samples do
43 not have any age constraints depending on what is considered as independent. OSL
44 SAR and pIRIR SAR are established methods generally considered as reliable. There is
45 a quartz coarse-grain OSL age for HDS-1849; a feldspar coarse-grain pIR₆₀IR₂₂₅ age for
46 HDS-1776; the gravelly-sandy deposits (Oberes Kieslager; Mannheim-Formation)
47 underlying HDS-1827 were deposited until the transition from the Late Pleniglacial
48 (LGM) to the Lateglacial period (14 +/- 1.5 ka according to Lauer et al. 2010, Lauer et
49 al. 2011) giving a maximum age for the “quick and dirty” separate from that sample,
50 while the overlying ^{14}C -dated deposits (ca 11.2 ka cal. BP; Engel et al., 2022) give a
51 minimum age for HDS-1827. Thus, HDS-1827 is sandwiched between ca 18 ka or
52 14 +/- 1.5 ka below and ca 11.2 ka above.

53 The three samples span a considerable, for geomorphic settings relevant time period,
54 they are “from all over the world” and from diverse palaeo-environments.
55 Nevertheless, they behave similarly under PET IRSL SAR, giving confidence in the here
56 suggested approach. Therefore, the triplet of samples appeared appropriate. In
57 addition, the diversity of the palaeo-environments they represent is reflected
58 beautifully in the results of the PET-IRSL De measurements, with least bleaching at the
59 bottom of the riverbed (HDS-1827), best bleaching for the aeolian sample HDS-1849
60 and somewhat intermittent bleaching for the loess sample HDS-1776 that had been
61 slightly reworked in the downslope direction.

- 62 • For background subtraction, the authors propose to use the dark counts
63 measured at 60oC after the PET stimulation. They show that the instrument
64 background is identical with and without IR stimulation for an empty aliquot
65 and independent of temperature (Fig. S6.5). However, this approach for
66 background calculation is very different from the widely-used late
67 background subtraction. Moreover, the signal obtained during the
68 recuperation measurement seems to be much higher than this background,
69 especially for the higher temperatures (e.g. Fig. 3). Could the background-
70 subtraction approach be the reason for elevated De estimates in the higher
71 temperature range as observed in Fig. 7 (and discussed elsewhere)? I would
72 like to encourage the authors to consider and discuss the validity of the
73 background subtraction in more detail.

74 We, indeed, use the signal measured at 60 °C TL for background subtraction, which is
75 different from the late-light subtraction concept introduced by Aitken & Xie (1992). As
76 dose-recovery tests work well, we do not subtract different/larger backgrounds, such

77 as, e.g., the signal of the zero-dose SAR cycle (recuperated signal), which seems to
78 virtually lend itself for background subtraction. As this signal increases with increasing
79 stimulation time up to PET_{max} , this is at first sight irritating when you think of a "classic"
80 background of a "classic" shine-down which declines asymptotically.

81 PET-IRSL does not offer anything that would qualify as a background signal
82 comparable to the standard approach. Each data point of the PET-IRSL signal curve
83 represents only an instantaneous readout. Therefore, the individual data channels of
84 a PET-signal curve might be regarded as a chain of short shine signals (cf. also the SA
85 additive protocol by Duller 1991), each next one at a readout temperature slightly
86 higher than the previous one. When thinking in terms of shine-downs, the short-shine
87 signal represents the very early signal for which background subtraction might not be
88 highly relevant. In PET-IRSL SAR terms, the De-signal curve might be regarded as a
89 chain of short-shine signals, each representing the very beginning of a latent, not
90 performed shine-down.

91 We assume that the course of the zero-dose SAR cycle (recuperation-measurement
92 signal) is adequately considered in the SAR data analysis procedure used to calculate
93 the De values.

94 If we understand you correctly, you wonder whether an improved background
95 subtraction could lead to a correct recovery of the given dose. In **Figures R-JW 1** and
96 **R-JW 2** we oppose the signal curves and De-value results with and without such a
97 background subtraction, using the PET-IRSL SAR dose-recovery test on sample HDS-
98 1827 shown in Figure 6a of the manuscript. The given dose is ca 120 Gy (red line, with
99 10 % error margin denoted by the dashed red lines). **Figures R-JW 1a** and **R-JW 1b**
100 represent the procedure as given in the manuscript, i.e., only with the machine-
101 background subtracted. In **Figures R-JW 1c** and **R-JW 1d** the "recuperated" signal was
102 subtracted. Both signal curves, i.e., those of the regeneration doses and those of the
103 normalization dose, show some change in shape, but that of the normalization dose
104 is stronger. The not background-corrected normalization dose curves seem to reflect
105 the signal increase with increasing IRSL readout temperature. Therefore, they can
106 correct each regenerated signal curve adequately. The background-corrected
107 normalization-dose signal curves do not show the final signal increase any more, and
108 therefore do not correct for it (or less) for the calculation of the Lx/Tx-normalized
109 curves relevant for De calculation. As a result, both De-value curves in **Figures R-JW 2**
110 show only marginal differences. The centre values are the same within error margins
111 and the De-value errors are generally somewhat larger after subtraction of the zero-
112 dose signal curve. Both "recuperated" dose-points, i.e., from the "wavy" and the flat
113 zero-dose signal curve, are adequately considered in the SAR data processing
114 procedure used for De value calculation.

115 Although it seems possible to first subtract the "recuperated" background signal, we
116 did not choose that option in the original manuscript, nor would we like to apply it in

117 the revised manuscript. We prefer to keep the data as “original” as possible, unless
118 future findings should teach us otherwise.

119 Anyway, neither way of data processing provides flat end-to-end De-value curves for
120 the dose recovery test with the too “hot” SAR parameter values. The actual game
121 changers are the thermal SAR parameter values preheat temperature, PET_{max} and
122 hotbleach temperature, as shown in Fig. 6c for HDS-1827 and Fig. 6d for HDS-1849 (cf.
123 also Supplement 2 for HDS-1827 and Supplement 3 for HDS-1849).

124 • For some samples, dose-recovery tests yielded doses well below the expected
125 dose for low-temperature IR in combination with a high preheat (e.g. Fig. 6ab,
126 supplement 6). Similar behaviour has previously been reported by Kars et al.
127 (2014 - <https://doi.org/10.1016/j.quageo.2014.04.001>) who attributed this to
128 trapping sensitivity change. I encourage the authors to discuss their findings
129 (also for De estimation and possibly bleaching experiments) in this
130 perspective.

131 Thank you very much for that hint. We will incorporate the findings of Kars et al.
132 2014 in our discussion on the De-underestimation of low-temperature IRSL after
133 “too hot” preheat procedures in our dose-recovery tests. Possibly uncorrected
134 sensitivity changes in the first SAR cycle are always the white elephant in the
135 luminescence lab. As we always adjusted/down-regulated the preheat procedures
136 appropriately (as based on the results of our dose-recovery and zero-dose tests), we
137 think that we do not have to worry about undetected trapping-sensitivity changes in
138 our partial-bleaching tests and De-estimations. We consider it as fundamental to
139 produce flat end-to-end De-value curves in the dose recovery tests, as otherwise we
140 would lose a tool for detecting partial bleaching in the natural sample. Or did we
141 miss anything here?

142

143 Minor (technical) suggestions:

144 • Fig. 2: The step ‘give regenerative dose’ is shown at the end of each cycle (step
145 8). I suggest the dose (either natural or regenerative) should appear at the top
146 of the cycle rather than at the end of the previous cycle.

147 • We agree and will change the graph accordingly.

148 • Fig. 3: The shape of the recycling PET-IRSL curve (R6) is different from the first
149 measurement (R3). Is this typical? Could you discuss the reasons and
150 implications?

151 So far, we have not undertaken any systematic analyses of the signal curves, a
152 procedure, which would have to be automated (ideally supported by
153 machine-learning algorithms). But yes, sometimes, individual deviations are
154 possible. One likely cause could be that grains have moved in the course of a

155 complete SAR measurement. But we do not have any systematic observations
156 on that issue.

157

158 The signal curves in Figure 3 belong to MS_28a, which was our first De-
159 determination at all, here HDS-1776 (cf. also the black filled circles in Figure
160 16b). This “emotional relation” was the reason to choose it for Figure 3,
161 without checking it for being perfect. The corresponding De-value curve is
162 seen in Figure 4a of the manuscript. As the measurement delivered a flat end-
163 to-end plateau, it grew even more on our heart. The curves in Figure 3 are the
164 raw data, without any Lx/Tx normalization. If the SAR normalization
165 procedure performs well, any deviations between different cycles should be
166 adequately corrected. As there are no anomalies in the De-value curve
167 around the PET-peak position (this is where the deviation occurs) in Figure 4a,
168 the normalization seemed to work well. There are also no significant
169 differences in the repeatedly measured dose point (not shown in the
170 manuscript; the graphs will be uploaded on Zenodo) suggesting good dose
171 recovery. These observations strengthen our confidence in the PET-IRSL SAR
172 approach.

- 173
- 174 • I would suggest to remove all doses in seconds from the text and figures (or
175 at least put dose in Gy on the main (left-hand) y-axis). The unit of dose is Gy,
176 and the conversion to irradiation time can be made using the source
177 calibration values provided in the manuscript.
 - 178 • You are absolutely right, doses in seconds does not make any sense at all. We
will change the axis labelling to “irradiation time [s]”.

179 Yet, unless it will be possible to instruct the luminescence readers to apply a
180 certain dose to an aliquot in Gy, there will be people in our working group/the
181 luminescence community who do not think in “Gy” but in “seconds”, and who
182 we do not want to exclude. For “seconds”, round lots (like in this manuscript
183 2500 s, 1000 s and 100 s) can be chosen. Seconds irradiation time do not
184 change according to the law of radioactive decay of $^{90}\text{Sr}/^{90}\text{Y}$ and stay the same
185 if a study lasts for a longer time, while the dose in Gy changes not
186 considerably, but somewhat after the decimal point. We consider it as
187 important not to change the sizes of the regeneration dose points building up
188 a dose-response curve (cf. our 40%-70%-100%-130%-160%-0%-repeated dose
189 point (usually 40% or 100%) concept), unless a completely new set of dose-
190 recovery etc. tests was successfully performed with a new set of dose points.
191 This concept can also be easily implemented with seconds irradiation time.
192 For these reasons, we would like to be allowed to take the inclusive approach,
193 which uses both, irradiation time in seconds and dose in Gy.

- 194 • For the dose recovery tests, doses remaining after bleaching (remnant dose)
195 seem not to be subtracted. Why not? Similar for a-value determination; this is
196 mentioned in line 755 but not put into practice.
- 197 • To our understanding, the doses recovered with a zero-dose test are a
198 product/artefact of the applied SAR procedure. They usually grow with
199 increasing preheat temperature (as also demonstrated in **Figure R-JW 3**). We
200 prefer to reserve the term remnant dose/residual dose to the potentially
201 bleachable dose which has not been bleached due to partial/insufficient
202 bleaching, as, e.g., in our partial bleaching (PBL) tests or in natural samples
203 that saw only limited light during the last event of sediment reworking. Our
204 test, with 12 h bleaching ("superbleach"; cf. lines 719–721; Supplement 3, Fig.
205 S3.16) clearly shows that there is charge which cannot be optically bleached
206 (with the means of the solar simulator), but is stimulated thermally during the
207 preheating and apparently (partially) transported into the IR-sensitive traps to
208 appear as above-zero PET-IRSL SAR De-values.

209 To demonstrate that issue again, we now have performed also for sample
210 HDS-1776 a complete set of zero-dose tests, with preheat temperatures 200–
211 320 °C. The results are shown in **Fig. R-JW 3**. The De-values grow with
212 increasing preheat temperature and associated PET_{max} and hotbleach
213 temperatures. For the other two samples HDS-1827 and HDS-1849 sets of
214 zero-dose tests with varying thermal SAR parameter values are given in the
215 supplement (cf. Supplements 2 and 3).

216 We did not consider it necessary to subtract the De-value curves of the zero-
217 dose tests from those of the dose-recovery tests or the natural samples,
218 because the dose-recovery tests delivered good results. Slight differences in
219 the shape of the De-value curves are possible (cf. **Fig. R-JW 4a vs R-JW 4b**;
220 please note that the reader settings have been changed from 120 s cool-down
221 time (measurements for the manuscript) to 300 s cool-down time
222 (measurements for the responses to the reviewers), which might contribute
223 to the difference). Therefore, one would have to perform a multitude of zero-
224 dose tests to derive a kind of "standard" De-value curve for subtraction.
225 Unfortunately, it is not possible to perform a zero-dose test for each
226 measured aliquot after the measurement for De-determination, because the
227 resulting De-value curves are (according to our limited experiences) always
228 flat lines around zero. Once the optically non-bleachable charge reservoirs
229 have been emptied by the first preheat, the De-value curves do not "emerge"
230 above zero any more.

231 The situation is different for a-value determination. If there are aliquots
232 remaining from previous measurements, these can be used for alpha-dosing
233 and a-value determination, without having to subtract any background. This is
234 the method which we prefer. Therefore, we showed the results of reused
235 aliquots in Figure 9, for which no background subtraction is necessary.

236 Whenever possible, we try to avoid subtracting any signal, as according to
237 Gaussian error propagation this increases the resulting De-value errors
238 (unnecessarily).

239 • When discussing the shape of the curve (section 7.1.1) in relation to
240 differences in dose for different sections (e.g. due to bleaching or fading), I
241 would suggest referring to the section where De is discussed.

242 We will indicate the respective sections.

243 • Section 7.1.3: 'upward trending g-values' – reading from left to right this would
244 be 'downward trending'.

245 This is correct. And it is not a good idea to change the perspective, once
246 looking to the right and once to the left, as we apparently did.

247 • Section 7.1.4: Identifying seven different curve shapes (1, 2a-f) based on the
248 available data seems a bit much, and thereby speculative. With regard to 2b -
249 the 'initial downward bent' – I would suggest calling it 'upward' (reading from
250 left to right, similar to g-value). Moreover, how do you distinguish this 'hook'
251 from the unstable component discussed in the fading section?

252 • Again, this is correct, and we should always look from left to right, i.e., from
253 the lower to the higher temperatures assisting the IRSL readout.

254 We will have to reword the section on the curve shapes: The different
255 numbers and letters were meant as a reading support. Actually, the changes
256 are continuous. We pitched on forms which are easily recognizable, such as,
257 e.g., a plateau, a steeper or a less steep slope. When you recognize these
258 shapes in the natural aliquots, you can easily tell, this one was only little
259 bleached, the other one considerably. The information could be relevant if
260 one tries to narrow down the time of an event, when there are no flat De-
261 value curves available.

262 At the present state we cannot distinguish between De-value curve changes
263 by partial bleaching or fading, as the investigation of the latter requires long-
264 term storage of dosed aliquots, and as stated in lines 827–833:

265 *"Therefore, at present, the PET-IRSL De-value curves observed on aliquots*
266 *carrying the natural luminescence signal (see Fig. 16–18) can be interpreted*
267 *only with respect to the results of the PBL tests. The true picture is likely*
268 *more complicated and should, in future studies, consider also changes due*
269 *to signal fading."*

270 Another possibility to distinguish shapes caused by partial bleaching from
271 shapes caused by fading could be to model long-term fading. Imagining a flat

272 De-value curve of a perfectly bleached sample and allowing it to fade for
273 100 a, 1000 a, 10 ka or any other time period relevant for the sample in
274 question. For the simulation/modelling one could use g-value curves gained
275 from some aliquots of a sample. Similarities with De-value curves from
276 aliquots carrying the natural luminescence signal could point to respective
277 signal fading. The strongly declining early g-values of HDS-1827 (cf. Fig. 10b)
278 suggest that they could cause an initial "hook".

279 A further possibility is to subject the De-value curve to a fading correction. If
280 the fading correction still provides a "hook" this could be interpreted as the
281 result of insufficient bleaching, otherwise as the result of fading.

282 Here we perform such a fading correction exemplarily. But please note that at
283 present we cannot exclude a measurement artifact with respect to the
284 strongly trending g-values of the early De-value signal intervals (lines 781–790)
285 and therefore this is meant only as a dry practice. For this exercise we use
286 measurement MS_114h of the sample HDS-1827 (cf. Fig. 17c of the
287 manuscript), which shows an initial "hook". For the tentative fading correction
288 after Huntley & Lamothe (2001) with the function "calc_FadingCorr" of the R
289 package Luminescence we use the g-value curve shown in Fig. 10b of the
290 manuscript. As the "hook" is no longer present after the fading correction
291 (**Fig. R-JW 5**), it has to be attributed to fading during the last ca 13 ka (cf. lower
292 yellow line representing the mean of the first ten De-signal integrals). The
293 value of the low-temperature PET-IRSL represents the maximum age of the
294 last event of sediment reworking.

295 Yet, the upper plateau – also indicating insufficient bleaching – remains also
296 after the fading correction (cf. upper yellow line at 18.3 ka). Compared to
297 other upper plateaus observed on sample HDS-1827 (e.g., Fig. 6a of the
298 manuscript) the length of the plateau appears shortened. Whereas the shape
299 of the curve of the uncorrected De-values and ages compares to the shape
300 described in lines 835 ff as (2b) (lines 840–842), the shape of the fading
301 corrected ages compares to the shape described as (2c) (lines 842–845).
302 Fading-corrected ages of ca 18–20 ka correspond to the end of the last
303 Pleniglacial and could indicate the penultimate (or any former) event of
304 sediment reworking. Without the "hook", the sediment on aliquot of MS_144h
305 would be slightly more bleached than one with an initial hook, but it might still
306 proxy an earlier event by the remaining upper plateau.

307

308 Writing and presentation:

- 309
- The manuscript is very complete, which is a good thing. However it could be
310 more concise in places, e.g. by reducing overlap between main text and figure
311 captions.

312 We will check on that and reduce overlap.

- 313 • Some parts of the manuscript could also be moved to the supplement (e.g.
314 when discussing the individual samples, and the separate aliquots shown in
315 fig. 17bc; 18bc)

316 Unfortunately, there are no smart graphs available for presenting the PET-
317 IRSL SAR De-value results of a dated sample, as they exist for classic dating
318 approaches. The latter may be presented, e.g., in an Abanico plot. It remains a
319 further aim to develop such easily readable graphs also for PET-IRSL SAR. For
320 the revised manuscript we can provide an intermediate solution, for which we
321 will display the whole population of De-value curves in light-grey in the
322 background, against which we will highlight those aliquots, which we want to
323 discuss in more detail, in colour in the foreground. This will also reduce the
324 number of (sub)figures. One example is given in **Fig. R-JW 6**.

- 325 • Some very long sentences make reading a bit of a struggle in places. Please
326 shorten and/or split these.

327 We will check on that too and make the text better readable.

328

329 **Citation:** <https://doi.org/10.5194/egusphere-2025-5978-RC1>

330

331 **References**

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349 Lauer, T., Krbetschek, M.R., Frechen, M., Tsukamoto, S., Hoselmann, C. & Weidenfeller, M.:
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351 Basin (Southwest Germany). – *Geochronometria* 38(1), 2011, 23–33,
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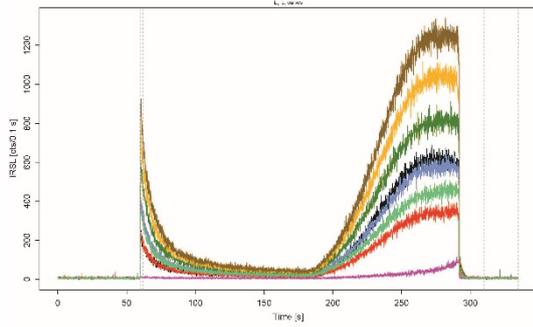
356 5th March 2026

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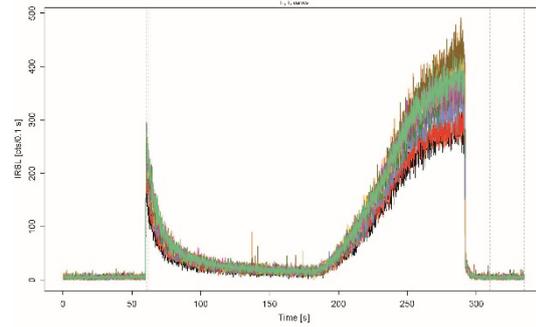
358 Annette Kadereit, Mariana Sontag-González, Sebastian Kreutzer, Marco Colombo, Christoph

359 Schmidt and Paul R. Hanson

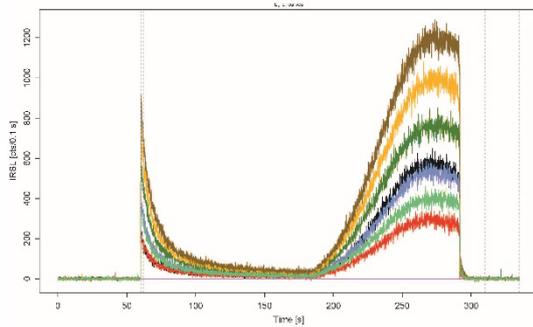
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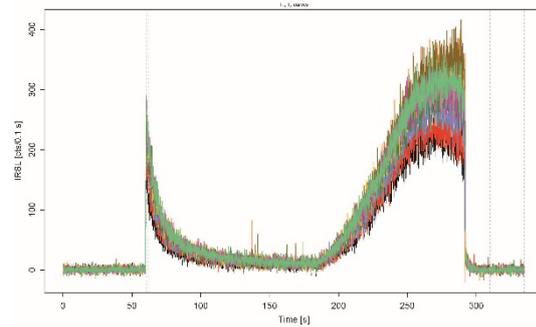
(a) PHT 320 °C, PET_{max} 280 °C – REG.sig. – NoBG.sub



(b) PHT 320 °C, PET_{max} 280 °C – NRM.sig.– NoBG.sub



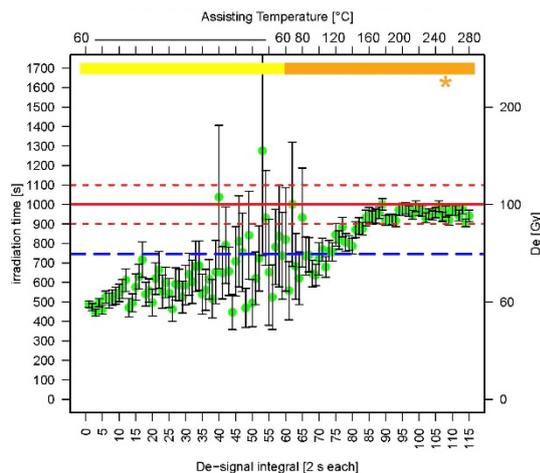
(c) PHT 320 °C, PET_{max} 280 °C – REG.sig. – BG.sub



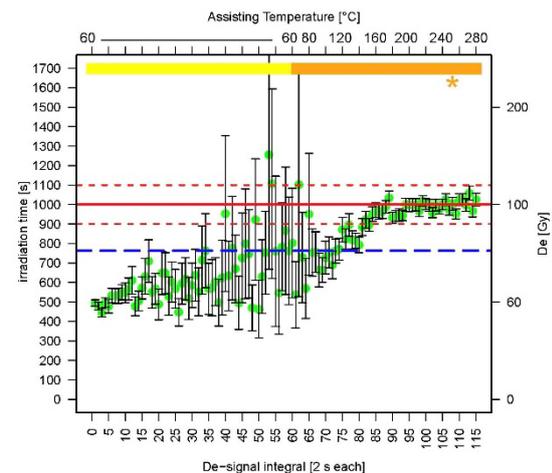
(d) PHT 320 °C, PET_{max} 280 °C – NRM.sig.– BG.sub

Colour code (excerpt): -- Zero-dose SAR cycle. -- Laboratory dose. -- Repeatedly given dose – first time. -- Repeatedly given dose – second time.

Fig. R-JW 1 PET-IRSL signal curves of the dose-recovery test on sample HDS-1827 with the “too hot” SAR parameters (shown in Fig. R-JW 3). Fit method “EXP”. MS_100c2, 120 s cool-down. (a, c) Regeneration dose cycles. (b, d) Normalization dose cycles. (a, b) Without subtracting the zero-dose signal. (c, d) Subtraction of the zero-dose signal. The aliquot shows a remarkable sensitivity change.



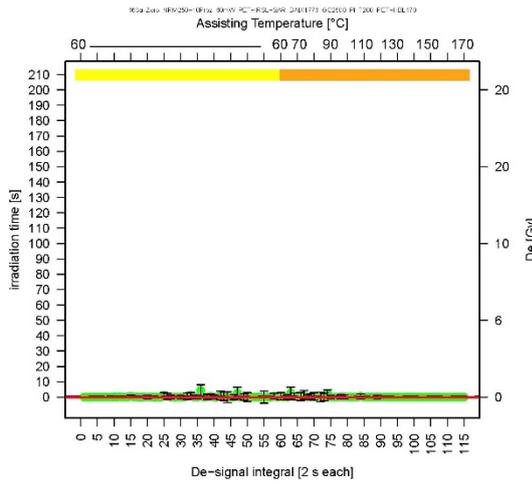
(a) PHT 320 °C, PET_{max} 280 °C



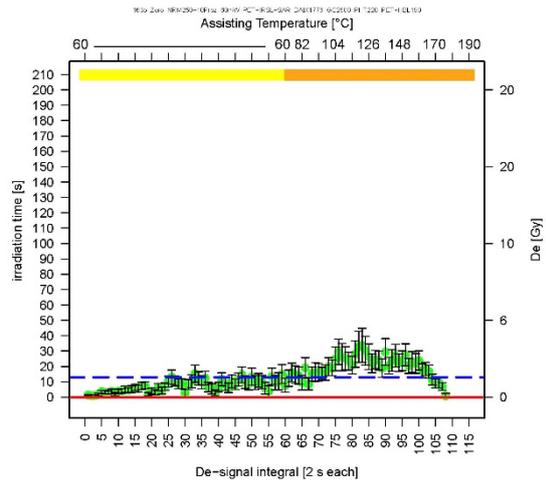
(b) PHT 320 °C, PET_{max} 280 °C

Fig. R-JW 2 Dose-recovery test on sample HDS-1827 with the “too hot” SAR parameters. Fit method “EXP”. (a) From Fig. 6a of the manuscript; background subtraction TL at 60 °C after IR switch-off (cf. “background at the end” in Figure 3). MS_100c2, 120 s cool-down (b) same measurement as Fig. R4a, but with subtracting the signal curve of the SAR zero-dose cycle prior to further data analysis.

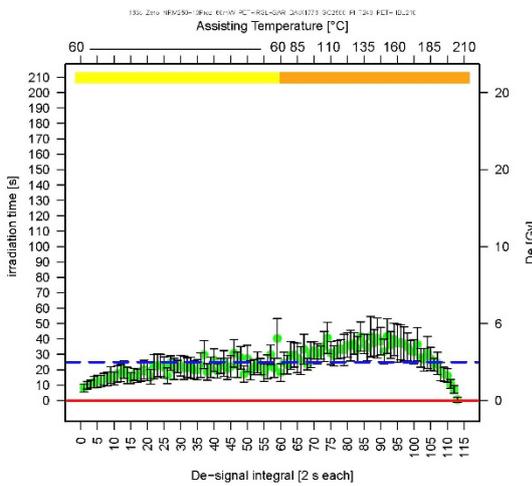
Response to the review of Jakob Wallinga of the manuscript 'A progressively elevated temperature (PET) IRSL SAR procedure – first experiments and results' by Kadereit et al.



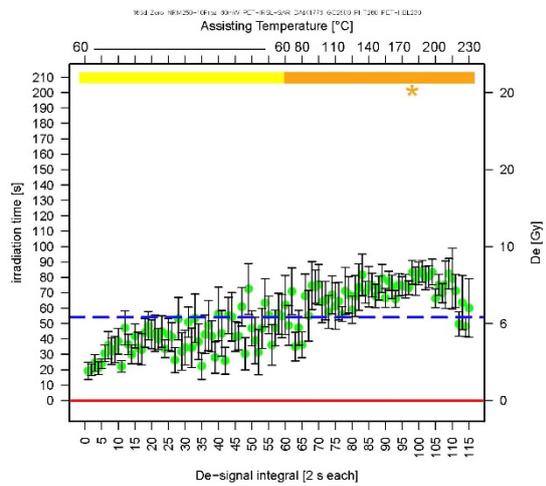
(a) PHT 200 °C, PET_{max} 170 °C – exp. fit - De.MC



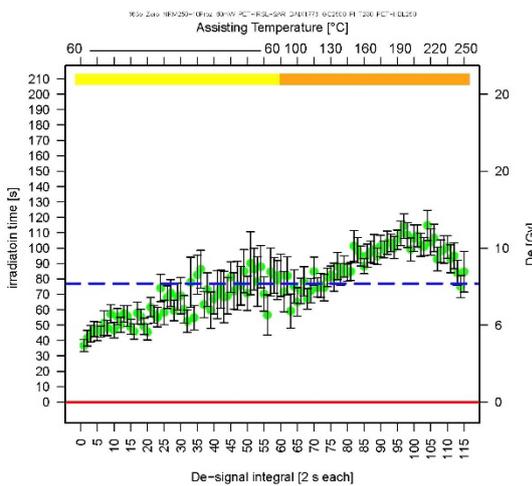
(b) PHT 220 °C, PET_{max} 190 °C



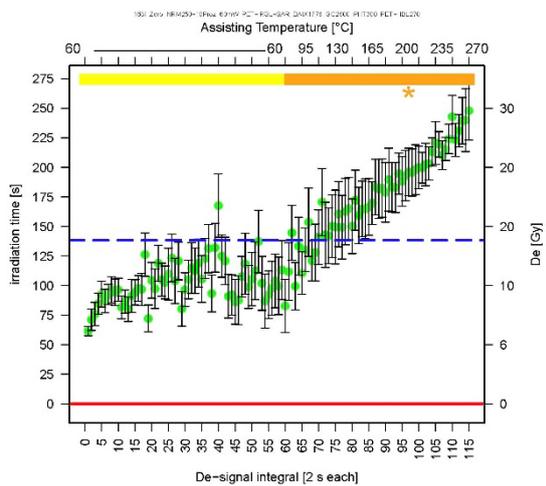
(c) PHT 240 °C, PET_{max} 210 °C



(d) PHT 260 °C, PET_{max} 230 °C

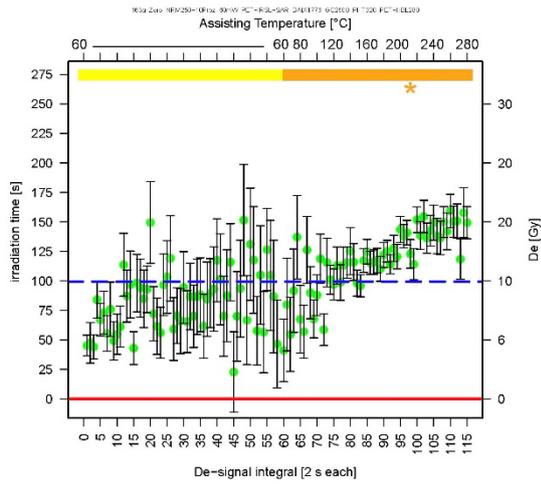


(e) PHT 280 °C, PET_{max} 250 °C



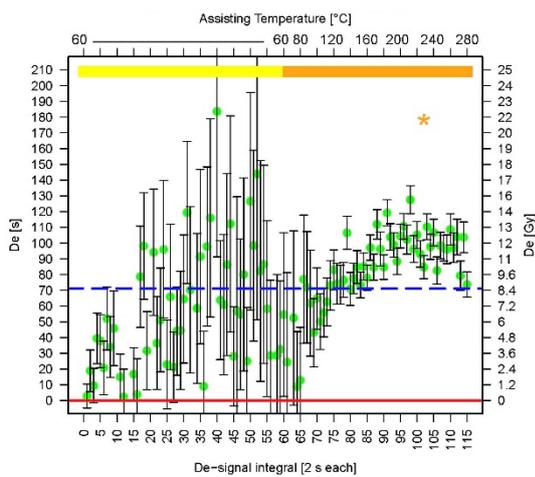
(f) PHT 300 °C, PET_{max} 270 °C

Response to the review of Jakob Wallinga of the manuscript ‘A progressively elevated temperature (PET) IRSL SAR procedure – first experiments and results’ by Kadereit et al.

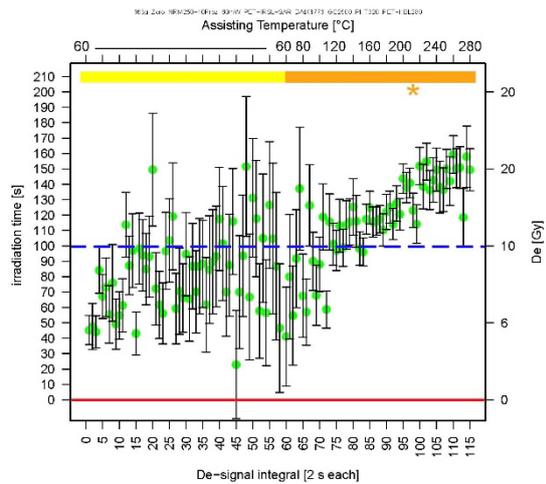


(g) PHT 320 °C, PET_{max} 280 °C

Fig. R-JW 3 Zero-dose test on samples HDS-1776. PHT increasing in steps of 20 K 200–320 °C, PET_{max} mostly increasing in steps of 20 K to 170–270 °C, and once with 10 K to 280 °C. Fit method “OTOR”. [MS_163a–162g, 300 s cool-down](#). (a–f) PET_{max} and HBL are 30 K below the preheat temperature for PHT 200–300 °C. (g) PET_{max} and HBL are 40 K below PHT 320 °C.



(a) PHT 320 °C, PET_{max} 280 °C



(b) PHT 320 °C, PET_{max} 280 °C

Fig. R-JW 4 Zero-dose test on samples HDS-1776. PHT 320 °C, PET_{max} and HBL 280 °C. Fit method “OTOR”. (a) From Fig. 7a of the maintext. [MS_61a, 120 s cool-down](#); (b) from Fig. 1g of this comment, but with y axis scaling like Fig. 2a. [MS_162g, 300 s cool-down](#).

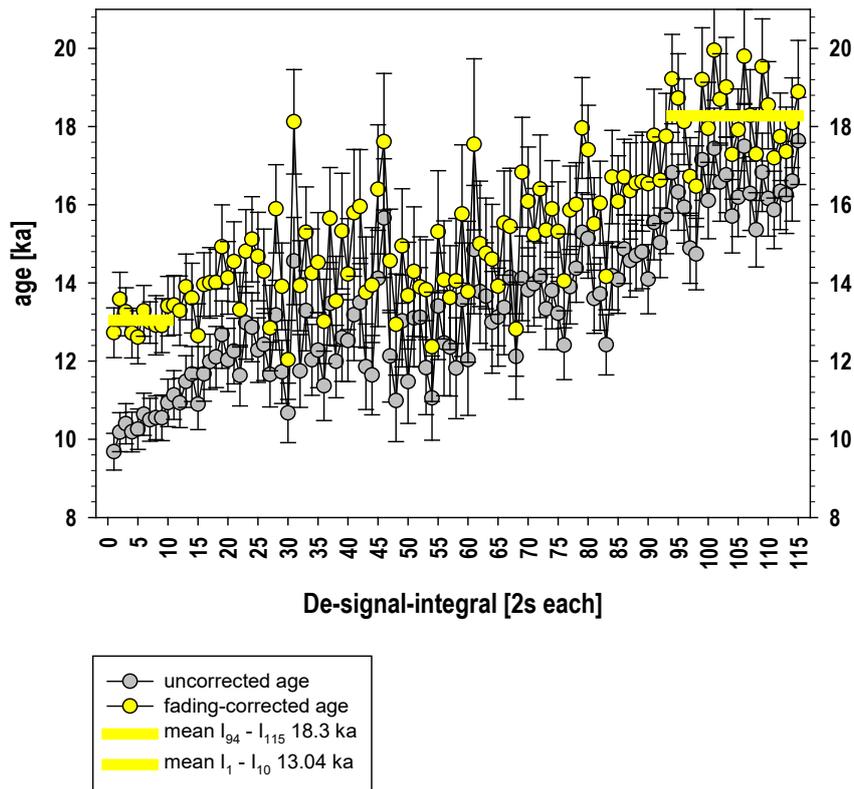
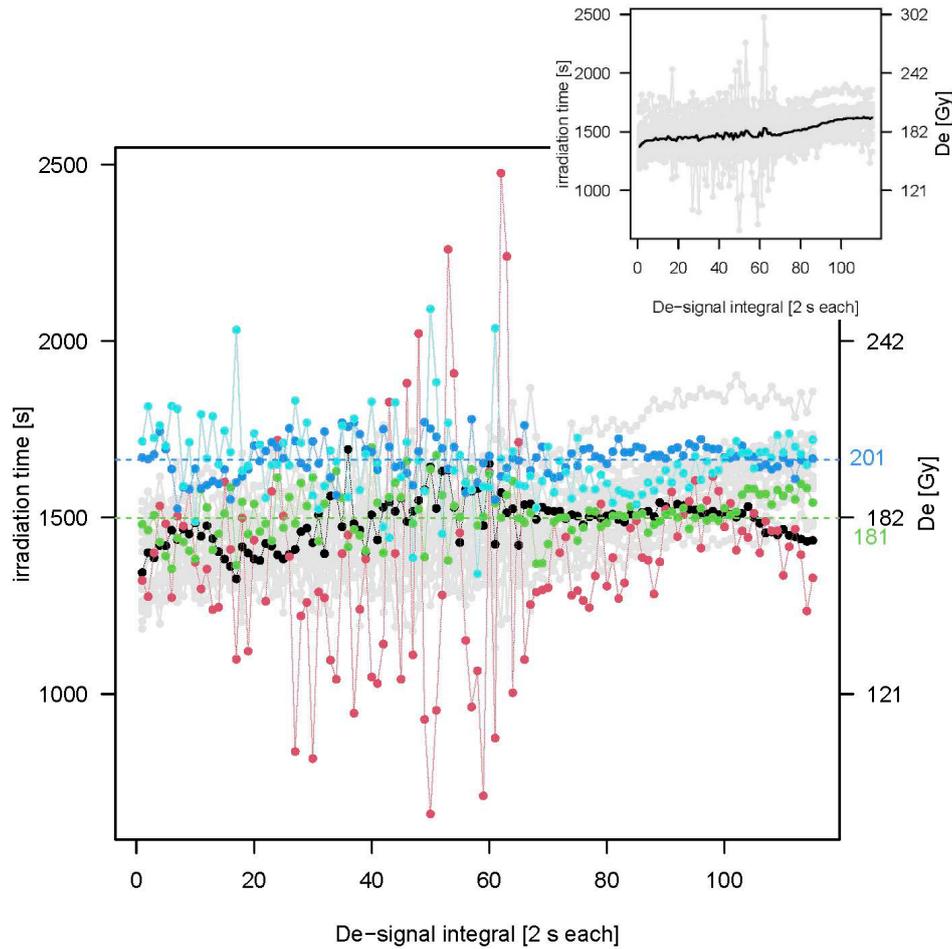


Fig. R-JW 5 Tentative fading correction after Huntley & Lamothe (2001) on the aliquot of measurement MS_114 h (cf. **Fig. 17c** of the manuscript) applying the function “calc_FadingCorr” of the R package Luminescence. The curve of the uncorrected Des shows an initial “hook”. Fading correction occurred with the g -values illustrated in **Fig. 10b** of the manuscript, which represent the means of five aliquots of HDS-1827. If the steeply declining g -values of the first few De-signal intervals of **Fig. 10b** are not a measurement artifact and if the aliquot of measurement MS_114h possesses comparable g -values, the initial “hook” would be eliminated by the fading correction. This would suggest that in the case of MS_114 h, the initial “hook” was caused by the signal fading during the last ca. 13 ka rather than insufficient bleaching prior to deposition.



Colour code: —●— MS_28a —●— MS_47k —●— MS_30c. —●— MS_47c —●— MS_45c (SG measurement)

Fig. R-JW 6 Example for the presentation of the De-value results of PET-IRSL SAR measurements (work in progress). The here presented graph is a compilation of Fig. 16a–16c of the manuscript. Greyish coloured De-value curves representing the whole set of measured aliquots. Black line in inset denoting the mean for each De-signal interval. De-value curves of special interest highlighted in colour (here: each representing an end-to-end plateau). Bluish coloured De-value curves (MS_28a, MS_47k) pointing to a dating event associated with a mean De value of 201 Gy; greenish coloured De-value curves (MS_30c, MS_47c) associated with a mean De value of 181 Gy. If the difference in palaeodose is not caused by differing potassium contents of the feldspar coarse-grains or other micro-dosimetric issues, it might point to two separate events of sediment reworking. The red De-value curve (MS_45c) is from a single-grain (SG) measurement (the only SG measurement of five which gave enough signal for De-value determination). It conforms to the 181 Gy level.