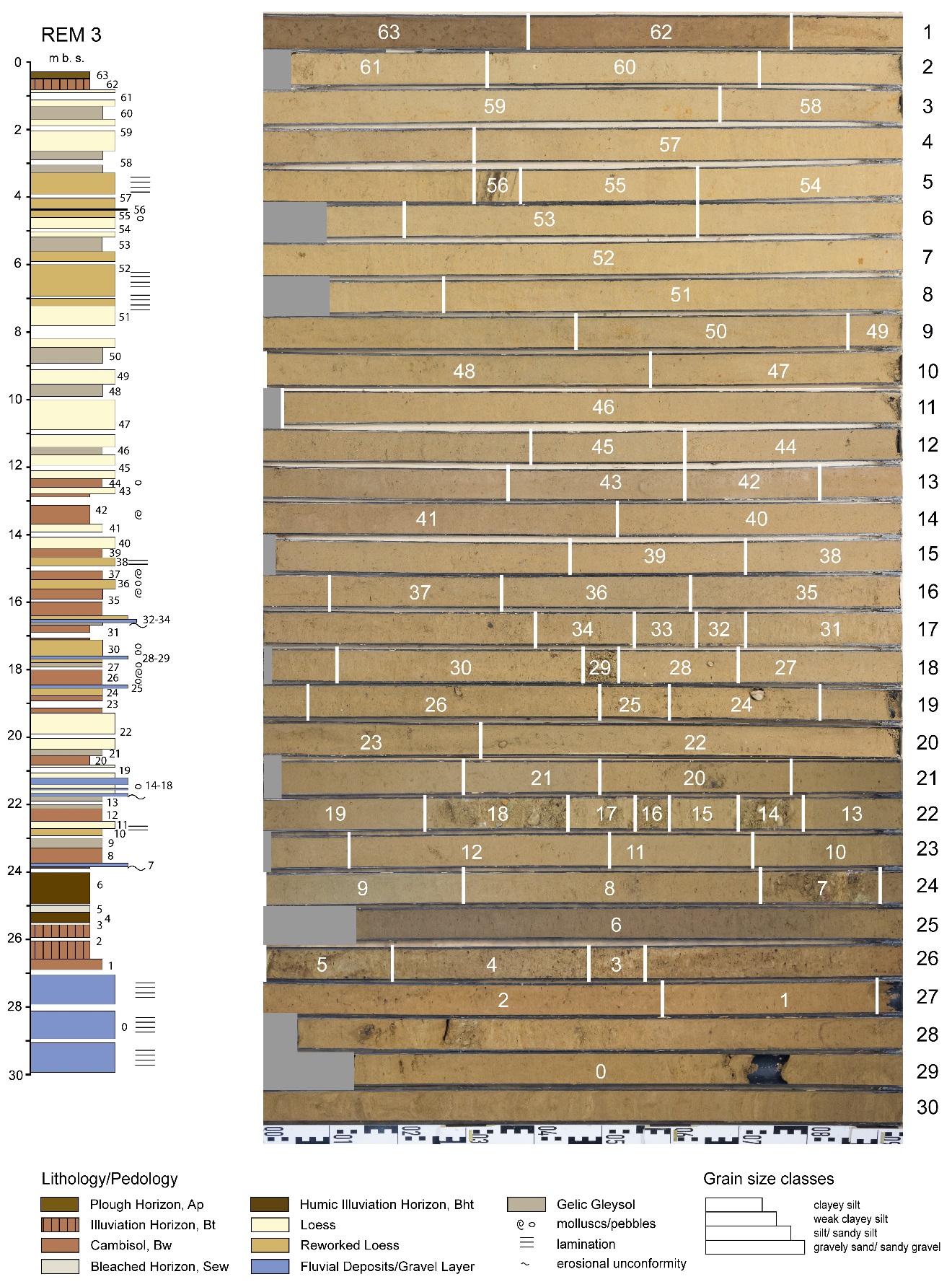
**Supplementary Information**

**Stratigraphy**

**Figure S1.** Photograph of core REM3A, collected adjacent REM3B, and stratigraphic log as documented in Vinnepand et al. (2020).

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**Luminescence Measurements**

Equivalent dose measurements, profile RP1

**Table S1.** Overview of luminescence samples collected from the profile RP1. The number of aliquots measured for each size and mineral fraction, determined by availability, is provided in the respective columns. Equivalent dose is given as the mean of the accepted aliquots.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Depth (m)** | **Approx. De (Gy)** | **Stratigraphic description** | **Luminescence sensitivity measurements (number of aliquots)** | | |
| **Quartz** | | **Polymineral** |
| **63-100 µm** | **100-200 µm** | **4-11 µm** |
| MAL10349 | 3.50 ± 0.05 | 80 | Primary loess (MIS2) | 21 | 0 | 18 |
| MAL10348 | 4.25 ± 0.05 | 80 | Primary loess (MIS3) | 24 | 18 | 18 |
| MAL10347 | 4.95 ± 0.05 | 80 | Weak paleosol (MIS3) | 24 | 14 | 18 |
| MAL10346 | 6.35 ± 0.05 | 96 | Primary loess (MIS3) | 24 | 24 | 18 |

**Table S2.** Summary of equivalent dose values for the different mineral and grain-size fractions measured for profile RP1 (see Fischer et al. 2021 for more details). The number of aliquots measured for each sample is given as n.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Depth from surface (m)** | **Quartz De (Gy)** | | | | **Polymineral De (Gy)** | |
| **100-200 µm** | **n** | **63-100 µm** | **n** | **4-11 µm** | **n** |
| MAL10349 | 3.50 ± 0.05 | - | - | 59.3 ± 2.4 | 21 | 77.7 ± 1.1 | 17 |
| MAL10348 | 4.25 ± 0.05 | 72.8 ± 3.3 | 9 | 70.2 ± 2.7 | 18 | 80.4 ± 1.8 | 17 |
| MAL10347 | 4.95 ± 0.05 | 91.7 ± 5.6 | 4 | 79.3 ± 4.4 | 20 | 81.4 ± 1.4 | 13 |
| MAL10346 | 6.35 ± 0.05 | 81.2 ± 6.0 | 18 | 86.0 ± 3.5 | 21 | 100 ± 1.3 | 18 |

**Figure S2.** Equivalent dose vs. depth for the different mineral and grain-size fractions measured for profile RP1. Uncertainties shown are for 1σ.

Equivalent dose measurements, REM3B core

**Table S3.** Overview of samples from core REM3B measured for this study with respect to measurement protocol, mineral and grain-size fraction. From a total of 102 samples collected from the core, 83 were measured for unprocessed IRSL50, 10 for 63-90 µm polymineral pIR200IR290, 8 for 63-90 µm K-feldspar pIR50IR290, 5 for 63-90 µm quartz OSL and 10 for 4-11 µm quartz OSL.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Depth (m)** | **IRSL50 (bulk)** | **pIR50IR290 (63-90 µm, polymineral)** | **pIR200IR290 (63-90 µm, K-feldspar)** | **OSL (63-90 µm, quartz)** | **OSL (4-11 µm, quartz)** |
| A0164 | 29.80 ± 0.05 |  |  |  |  | X |
| A0166 | 28.85 ± 0.05 |  |  |  |  | X |
| A0167 | 28.45 ± 0.05 |  |  |  |  | X |
| A0168 | 27.75 ± 0.05 |  |  |  |  | X |
| A0171 | 26.35 ± 0.05 | X |  |  |  | X |
| A0172 | 25.30 ± 0.05 |  |  |  |  | X |
| A0174 | 24.25 ± 0.05 | X |  |  |  | X |
| A0175 | 23.65 ± 0.05 | X |  |  |  | X |
| A0176 | 23.45 ± 0.05 | X |  |  |  | X |
| A0177 | 23.20 ± 0.05 | X |  |  |  | X |
| A0179 | 22.55 ± 0.05 | X |  |  |  |  |
| A0180 | 22.35 ± 0.05 | X |  |  |  |  |
| A0181 | 22.15 ± 0.05 | X |  |  |  |  |
| A0182 | 21.85 ± 0.05 | X |  |  |  |  |
| A0183 | 21.65 ± 0.05 | X |  |  |  |  |
| A0184 | 21.35 ± 0.05 | X |  |  |  |  |
| A0185 | 21.15 ± 0.05 | X |  |  |  |  |
| A0186 | 20.80 ± 0.05 | X |  |  |  |  |
| A0187 | 20.55 ± 0.05 | X |  |  |  |  |
| A0188 | 20.35 ± 0.05 | X |  |  |  |  |
| A0189 | 20.10 ± 0.05 | X |  |  |  |  |
| A0190 | 19.80 ± 0.05 | X |  |  |  |  |
| A0191 | 19.45 ± 0.05 | X |  |  |  |  |
| A0192 | 19.15 ± 0.05 | X |  |  |  |  |
| A0193 | 18.80 ± 0.05 | X |  |  |  |  |
| A0194 | 18.55 ± 0.05 | X |  |  |  |  |
| A0195 | 18.15 ± 0.05 | X |  |  |  |  |
| A0196 | 17.80 ± 0.05 | X |  |  |  |  |
| A0197 | 17.60 ± 0.05 | X |  |  |  |  |
| A0198 | 17.35 ± 0.05 | X |  |  |  |  |
| A0199 | 17.15 ± 0.05 | X |  |  |  |  |
| A0200 | 16.80 ± 0.05 | X |  |  |  |  |
| A0201 | 16.55 ± 0.05 | X |  | X |  |  |
| A0202 | 16.35 ± 0.05 | X |  |  |  |  |
| A0203 | 16.15 ± 0.05 | X |  |  |  |  |
| A0204 | 15.80 ± 0.05 | X |  |  |  |  |
| A0205 | 15.45 ± 0.05 | X |  |  |  |  |
| A0206 | 15.15 ± 0.05 | X |  |  |  |  |
| A0207 | 14.85 ± 0.05 | X |  |  |  |  |
| A0208 | 14.65 ± 0.05 | X |  |  |  |  |
| A0209 | 14.35 ± 0.05 | X |  |  |  |  |
| A0210 | 14.15 ± 0.05 | X |  |  |  |  |
| A0211 | 13.85 ± 0.05 | X |  |  |  |  |
| A0212 | 13.65 ± 0.05 | X |  |  |  |  |
| A0213 | 13.45 ± 0.05 | X |  |  |  |  |
| A0214 | 13.20 ± 0.05 | X |  |  |  |  |
| A0215 | 12.85 ± 0.05 | X |  |  |  |  |
| A0216 | 12.65 ± 0.05 |  |  | X |  |  |
| A0217 | 12.45 ± 0.05 | X |  |  |  |  |
| A0218 | 12.25 ± 0.05 | X |  |  |  |  |
| A0219 | 12.10 ± 0.05 | X |  |  |  |  |
| A0220 | 11.80 ± 0.05 |  |  | X |  |  |
| A0221 | 11.50 ± 0.05 | X |  |  |  |  |
| A0222 | 11.30 ± 0.05 | X |  |  |  |  |
| A0223 | 11.10 ± 0.05 | X |  |  |  |  |
| A0347 | 10.80 ± 0.05 | X |  |  |  |  |
| A0348 | 10.50 ± 0.05 |  |  | X |  |  |
| A0349 | 10.30 ± 0.05 | X |  |  |  |  |
| A0350 | 10.10 ± 0.05 | X |  |  |  |  |
| A0351 | 9.80 ± 0.05 | X |  |  |  |  |
| A0352 | 9.60 ± 0.05 | X |  |  |  |  |
| A0353 | 9.40 ± 0.05 | X |  |  |  |  |
| A0354 | 9.20 ± 0.05 |  |  | X |  |  |
| A0355 | 8.75 ± 0.05 | X |  |  |  |  |
| A0356 | 8.55 ± 0.05 | X |  |  |  |  |
| A0357 | 8.35 ± 0.05 | X |  |  |  |  |
| A0358 | 8.15 ± 0.05 | X |  |  |  |  |
| A0359 | 7.80 ± 0.05 | X |  |  |  |  |
| A0360 | 7.60 ± 0.05 |  |  | X |  |  |
| A0361 | 7.40 ± 0.05 | X |  |  |  |  |
| A0362 | 7.15 ± 0.05 | X |  |  |  |  |
| A0363 | 6.85 ± 0.05 | X |  |  |  |  |
| A0364 | 6.65 ± 0.05 | X |  |  |  |  |
| A0365 | 6.45 ± 0.05 |  |  | X | X |  |
| A0366 | 6.25 ± 0.05 | X |  |  |  |  |
| A0367 | 6.10 ± 0.05 | X |  |  |  |  |
| A0368 | 5.81 ± 0.05 | X |  |  |  |  |
| A0369 | 5.65 ± 0.05 | X |  |  |  |  |
| A0370 | 5.45 ± 0.05 |  |  | X | X |  |
| A0371 | 5.25 ± 0.05 | X |  |  |  |  |
| A0372 | 5.10 ± 0.05 | X |  |  |  |  |
| A0373 | 4.80 ± 0.05 | X |  |  |  |  |
| A0374 | 4.60 ± 0.05 | X |  |  |  |  |
| A0375 | 4.45 ± 0.05 |  |  | X | X |  |
| A0376 | 4.25 ± 0.05 |  |  | X | X |  |
| A0377 | 4.10 ± 0.05 | X |  |  |  |  |
| A0378 | 3.75 ± 0.05 | X |  |  |  |  |
| A0379 | 3.45 ± 0.05 |  | X | X | X |  |
| A0380 | 3.15 ± 0.05 | X | X |  |  |  |
| A0381 | 2.85 ± 0.05 | X | X |  |  |  |
| A0382 | 2.55 ± 0.05 | X | X |  |  |  |
| A0383 | 2.35 ± 0.05 | X | X |  |  |  |
| A0384 | 2.15 ± 0.05 | X | X |  |  |  |
| A0385 | 1.80 ± 0.05 | X | X |  |  |  |
| A0386 | 1.50 ± 0.05 | X |  |  |  |  |
| A0387 | 1.25 ± 0.05 | X | X |  |  |  |
| A0388 | 0.75 ± 0.05 | X |  |  |  |  |

**Table S4.** Dose recovery and residual dose results for selected samples from core REM3B measured using the pIR200IR290 protocol. Three aliquots were measured for the dose recovery test, and six each for the residual dose tests.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sample** | **Dose recovery** | | | **Residual dose** | |
| **Applied dose (Gy)** | **Measured dose (Gy)** | **Ratio** | **Bleaching method** | **Dose (Gy)** |
| A0375 | 104 | 107 ± 5 | 1.02 | 60 days direct sunlight | 6.75 ± 0.3 |
| A0376 | - | | | 300 hours LED lamp | 32.7 ± 4.0 |

**Table S5.** Summary of depths and averaged De values and test dose sensitivity values for the ten fine-grained (4-11µm) and five very fine sand (63-90 µm) quartz OSL samples measured in this study. Three aliquots were measured for each sample, using a measurement protocol involving three regenerative dose steps, preheat/cutheat temperatures of 260/240°C and a test dose of c. 37 Gy. Minimum equivalent doses are assumed to represent signal saturation.

|  |  |  |  |
| --- | --- | --- | --- |
| **Sample** | **Depth (m)** | **Grain-size fraction (µm)** | **Averaged De (Gy)** |
| A0164 | 29.80 ± 0.05 | 4-11 | No signal |
| A0166 | 28.85 ± 0.05 | >290 |
| A0167 | 28.45 ± 0.05 | >290 |
| A0168 | 27.75 ± 0.05 | >290 |
| A0171 | 26.35 ± 0.05 | >102 |
| A0172 | 25.30 ± 0.05 | >474 |
| A0174 | 24.25 ± 0.05 | >239 |
| A0175 | 23.65 ± 0.05 | 191 ± 9 |
| A0176 | 23.45 ± 0.05 | 209 ± 18 |
| A0177 | 23.20 ± 0.05 | 78.1 ± 38.6 |
| A0365 | 6.45 ± 0.05 | 63-90 | 55.1 ± 8.3 |
| A0370 | 5.45 ± 0.05 | 51.0 ± 12.1 |
| A0375 | 4.45 ± 0.05 | 63.5 ± 9.9 |
| A0376 | 4.25 ± 0.05 | 135 ± 94 |
| A0379 | 3.45 ± 0.05 | 50.0 ± 7.0 |

**Table S6.** Summary of depths, number of aliquots measured, measurement protocol and averaged uncorrected De values for the 18 very fine sand (63-90µm) feldspar samples measured in this study using pIR-IRprotocols. The De uncertainty is given as the standard error.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sample** | **Depth (m)** | **Number of aliquots measured** | **Measurement protocol** | **Averaged De (Gy) ± se** |
| A0201 | 16.60 ± 0.05 | 6 | pIR200IR290 | 174 ± 3 |
| A0216 | 12.65 ± 0.05 | 6 | 133 ± 3 |
| A0220 | 11.80 ± 0.05 | 6 | 114 ± 3 |
| A0348 | 10.50 ± 0.05 | 6 | 120 ± 4 |
| A0354 | 9.20 ± 0.05 | 6 | 116 ± 8 |
| A0360 | 7.60 ± 0.05 | 6 | 117 ± 3 |
| A0365 | 6.45 ± 0.05 | 12 | 122 ± 11 |
| A0370 | 5.45 ± 0.05 | 12 | 131 ± 6 |
| A0375 | 4.45 ± 0.05 | 12 | 112 ± 4 |
| A0376 | 4.25 ± 0.05 | 6 | 113 ± 4 |
| A0379 | 3.45 ± 0.05 | 6 | pIR200IR290 | 113 ± 4 |
| 24 | pIR50IR290 | 85.8 ± 1.0 |
| A0380 | 3.45 ± 0.05 | 24 | pIR50IR290 | 77.0 ± 1.5 |
| A0381 | 3.15 ± 0.05 | 24 | 81.7 ± 3.4 |
| A0382 | 2.85 ± 0.05 | 24 | 87.8 ± 2.6 |
| A0383 | 2.55 ± 0.05 | 24 | 87.7 ± 1.1 |
| A0384 | 2.15 ± 0.05 | 24 | 84.1 ± 4.1 |
| A0385 | 1.80 ± 0.05 | 24 | 83.4 ± 1.8 |
| A0387 | 1.25 ± 0.05 | 24 | 77.5 ± 0.9 |

**Figure S3.** Differences in equivalent dose vs. depth for the different mineral and grain size fractions down the REM3B core, using pIR-IRSL equivalent dose values *uncorrected* for residual dose. The IRSL50 results are based on bulk, unprocessed sample.

Sensitivity measurements

**Table S7.** Summary of depths, averaged De values and test dose sensitivity values for the bulk IRSL50 measurements from the REM3B core. Three aliquots were measured for each sample, applying a test dose of c. 37 Gy following measurement of the natural IRSL signal at 50°C. Equivalent dose is given as the mean of the accepted aliquots.

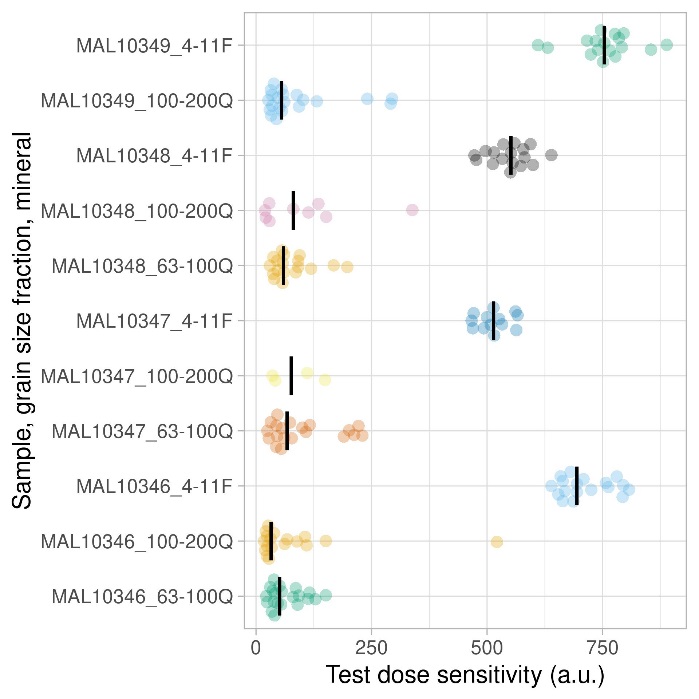
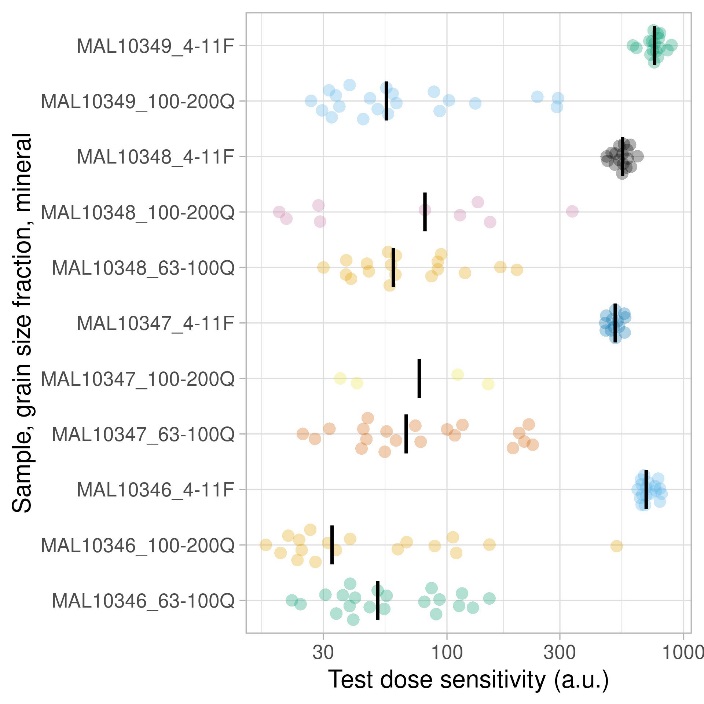
|  |  |  |  |
| --- | --- | --- | --- |
| **Sample** | **Depth (m)** | **Approximate De (Gy)** | **Sensitivity (cts/s/Gy) ± 1σ** |
| A0171 | 26.35 ± 0.05 | 108 | 2980 ± 1513 |
| A0174 | 24.25 ± 0.05 | 67 | 1259 ± 1027 |
| A0175 | 23.65 ± 0.05 | 61 | 3088 ± 2115 |
| A0176 | 23.45 ± 0.05 | 55 | 4855 ± 562 |
| A0177 | 23.20 ± 0.05 | 60 | 6411 ± 3140 |
| A0179 | 22.55 ± 0.05 | 62 | 5769 ± 2067 |
| A0180 | 22.35 ± 0.05 | 57 | 6285 ± 1133 |
| A0181 | 22.15 ± 0.05 | 54 | 10016 ± 3149 |
| A0182 | 21.85 ± 0.05 | 55 | 9768 ± 2240 |
| A0183 | 21.65 ± 0.05 | 61 | 6512 ± 1368 |
| A0184 | 21.35 ± 0.05 | 56 | 4339 ± 3224 |
| A0185 | 21.15 ± 0.05 | 55 | 6414 ± 1583 |
| A0186 | 20.80 ± 0.05 | 59 | 5892 ± 1191 |
| A0187 | 20.55 ± 0.05 | 65 | 5473 ± 985 |
| A0188 | 20.35 ± 0.05 | 56 | 6189 ± 2591 |
| A0189 | 20.10 ± 0.05 | 60 | 6577 ± 465 |
| A0190 | 19.80 ± 0.05 | 61 | 6901 ± 1349 |
| A0191 | 19.45 ± 0.05 | 59 | 5811 ± 1405 |
| A0192 | 19.15 ± 0.05 | 59 | 3574 ± 972 |
| A0193 | 18.80 ± 0.05 | 64 | 4632 ± 2671 |
| A0194 | 18.55 ± 0.05 | 59 | 5932 ± 2793 |
| A0195 | 18.15 ± 0.05 | 57 | 3871 ± 2123 |
| A0196 | 17.80 ± 0.05 | 53 | 5014 ± 1927 |
| A0197 | 17.60 ± 0.05 | 55 | 3988 ± 1972 |
| A0198 | 17.35 ± 0.05 | 56 | 4087 ± 130 |
| A0199 | 17.15 ± 0.05 | 56 | 4612 ± 496 |
| A0200 | 16.80 ± 0.05 | 50 | 5673 ± 1201 |
| A0201 | 16.55 ± 0.05 | 53 | 7767 ± 676 |
| A0202 | 16.35 ± 0.05 | 48 | 4067 ± 10 |
| A0203 | 16.15 ± 0.05 | 46 | 4411 ± 4525 |
| A0204 | 15.80 ± 0.05 | 43 | 4252 ± 1835 |
| A0205 | 15.45 ± 0.05 | 44 | 4984 ± 1475 |
| A0206 | 15.15 ± 0.05 | 44 | 6868 ± 2365 |
| A0207 | 14.85 ± 0.05 | 42 | 10013 ± 2312 |
| A0208 | 14.65 ± 0.05 | 44 | 12048 ± 2868 |
| A0209 | 14.35 ± 0.05 | 43 | 10922 ± 526 |
| A0210 | 14.15 ± 0.05 | 40 | 7022 ± 2306 |
| A0211 | 13.85 ± 0.05 | 41 | 5656 ± 2103 |
| A0212 | 13.65 ± 0.05 | 42 | 4356 ± 825 |
| A0213 | 13.45 ± 0.05 | 41 | 5881 ± 1798 |
| A0214 | 13.20 ± 0.05 | 42 | 3795 ± 2393 |
| A0215 | 12.85 ± 0.05 | 41 | 2859 ± 1380 |
| A0217 | 12.45 ± 0.05 | 40 | 4004 ± 99 |
| A0218 | 12.25 ± 0.05 | 40 | 6024 ± 1844 |
| A0219 | 12.10 ± 0.05 | 36 | 9457 ± 4669 |
| A0221 | 11.50 ± 0.05 | 36 | 7505 ± 674 |
| A0222 | 11.30 ± 0.05 | 34 | 10127 ± 5499 |
| A0223 | 11.10 ± 0.05 | 37 | 6342 ± 1475 |
| A0347 | 10.80 ± 0.05 | 35 | 8559 ± 4055 |
| A0349 | 10.30 ± 0.05 | 33 | 8615 ± 2753 |
| A0350 | 10.10 ± 0.05 | 32 | 7136 ± 5420 |
| A0351 | 9.80 ± 0.05 | 32 | 7380 ± 3412 |
| A0352 | 9.60 ± 0.05 | 32 | 7048 ± 1114 |
| A0353 | 9.40 ± 0.05 | 30 | 7890 ± 3359 |
| A0355 | 8.75 ± 0.05 | 31 | 6132 ± 1365 |
| A0356 | 8.55 ± 0.05 | 33 | 7086 ± 507 |
| A0357 | 8.35 ± 0.05 | 31 | 6025 ± 2173 |
| A0358 | 8.15 ± 0.05 | 31 | 7388 ± 982 |
| A0359 | 7.80 ± 0.05 | 33 | 7378 ± 2956 |
| A0361 | 7.40 ± 0.05 | 31 | 10536 ± 3801 |
| A0362 | 7.15 ± 0.05 | 30 | 12860 ± 1520 |
| A0363 | 6.85 ± 0.05 | 32 | 14730 ± 5158 |
| A0364 | 6.65 ± 0.05 | 32 | 11213 ± 3898 |
| A0366 | 6.25 ± 0.05 | 33 | 9223 ± 2026 |
| A0367 | 6.10 ± 0.05 | 33 | 10675 ± 483 |
| A0368 | 5.81 ± 0.05 | 35 | 10879 ± 2010 |
| A0369 | 5.65 ± 0.05 | 34 | 11195 ± 3145 |
| A0371 | 5.25 ± 0.05 | 32 | 20821 ± 3144 |
| A0372 | 5.10 ± 0.05 | 33 | 23798 ± 4648 |
| A0373 | 4.80 ± 0.05 | 31 | 19008 ± 4645 |
| A0374 | 4.60 ± 0.05 | 32 | 22835 ± 650 |
| A0377 | 4.10 ± 0.05 | 33 | 21749 ± 2602 |
| A0378 | 3.75 ± 0.05 | 32 | 29515 ± 3227 |
| A0380 | 3.15 ± 0.05 | 30 | 4946 ± 1244 |
| A0381 | 2.85 ± 0.05 | 28 | 6511 ± 2459 |
| A0382 | 2.55 ± 0.05 | 29 | 7640 ± 3245 |
| A0383 | 2.35 ± 0.05 | 29 | 4509 ± 404 |
| A0384 | 2.15 ± 0.05 | 28 | 5855 ± 1399 |
| A0385 | 1.80 ± 0.05 | 27 | 6400 ± 431 |
| A0386 | 1.50 ± 0.05 | 26 | 6982 ± 2741 |
| A0387 | 1.25 ± 0.05 | 26 | 9499 ± 2552 |
| A0388 | 0.75 ± 0.05 | 27 | 8169 ± 2899 |

**Table S8.** Summary of depths, average and standard deviation of test dose sensitivity values for the different mineral and grain-size fractions measured for profile RP1.

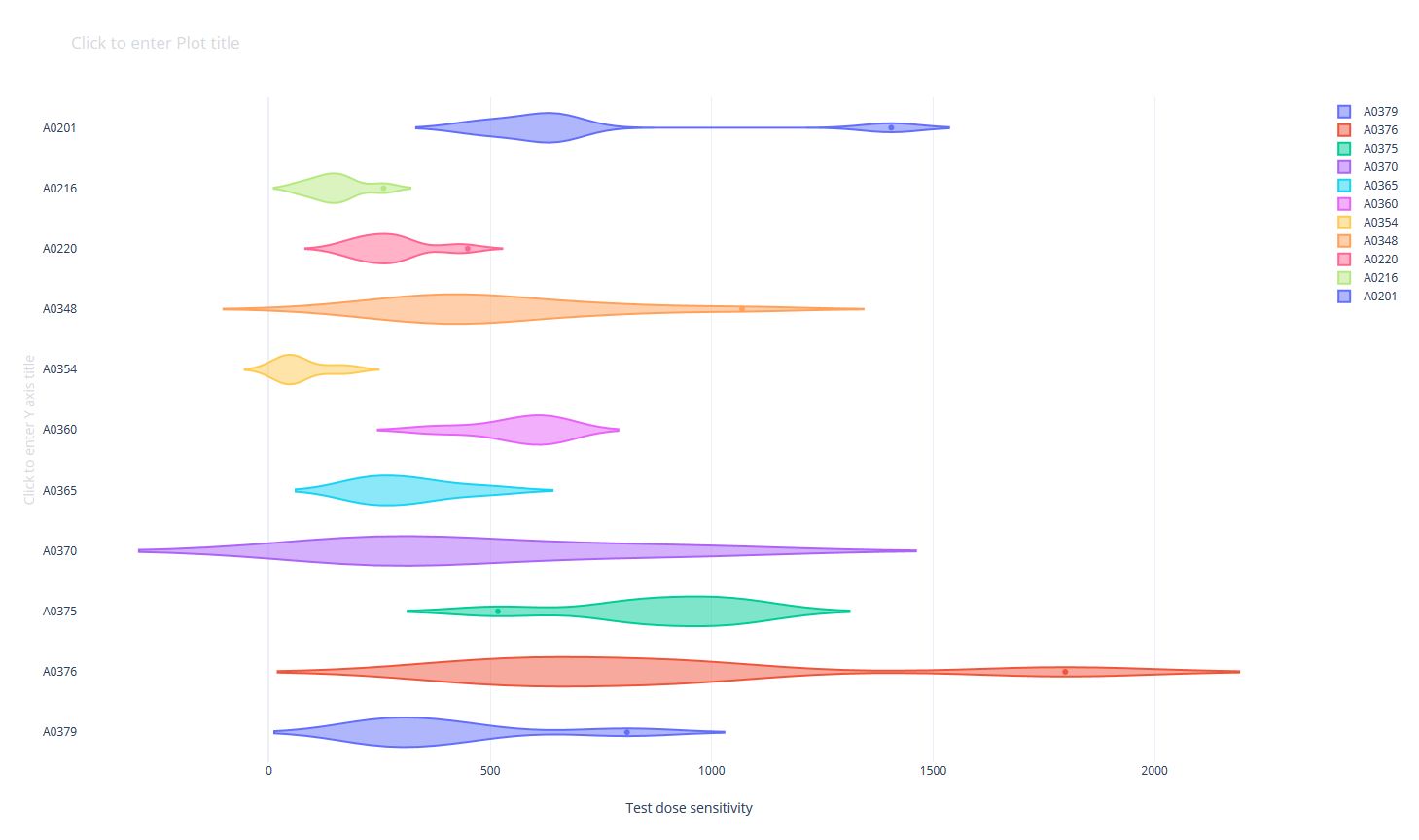
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sample** | **Depth from surface (m)** | **Sensitivity (cts/s/Gy) ± 1σ** | | |
| **100-200 µm quartz** | **63-100 µm quartz** | **4-11 µm polymineral** |
| MAL10349 | 3.50 ± 0.05 | - | 87.8 ± 83.6 | 756 ± 67.2 |
| MAL10348 | 4.25 ± 0.05 | 102 ± 103 | 76.6 ± 45.8 | 549 ± 44.7 |
| MAL10347 | 4.95 ± 0.05 | 84.4 ± 55.2 | 98.3 ± 71.7 | 514 ± 35 |
| MAL10346 | 6.35 ± 0.05 | 77.47 ± 117 | 65.3 ± 37.5 | 713 ± 55 |

**Figure S4.** Test dose sensitivity for the different mineral and grain-size samples measured for profile RP1, expressed as dot plots. The median of each set of values is marked by a black line. A logarithmic scale in (A) highlights differences between the quartz sensitivities, and a linear scale in (B) highlights differences between the polymineral fine-grained sensitivities.

**A. B.**

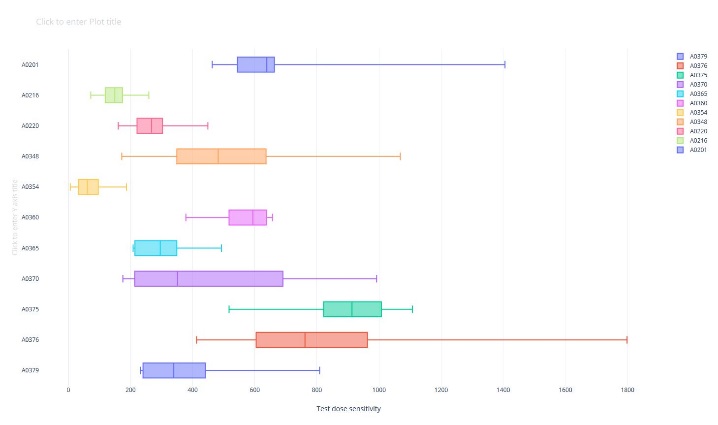


**Figure S5.** Test dose sensitivity for the very fine sand (63-90 µm) K-feldspar samples measured from RP1 in this study expressed as violin plot distributions.

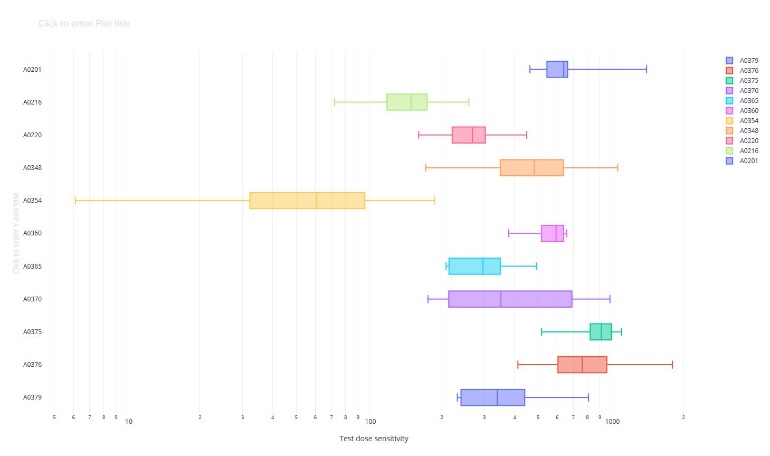
**

**Figure S6.** Test dose sensitivity for the very fine sand (63-90 µm) K-feldspar samples measured from RP1 in this study expressed as box plots with A) linear and B) logarithmic scale on the x-axis.

***A***

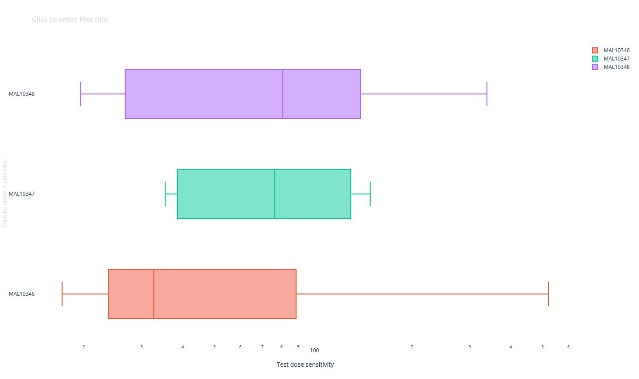
**

***B***

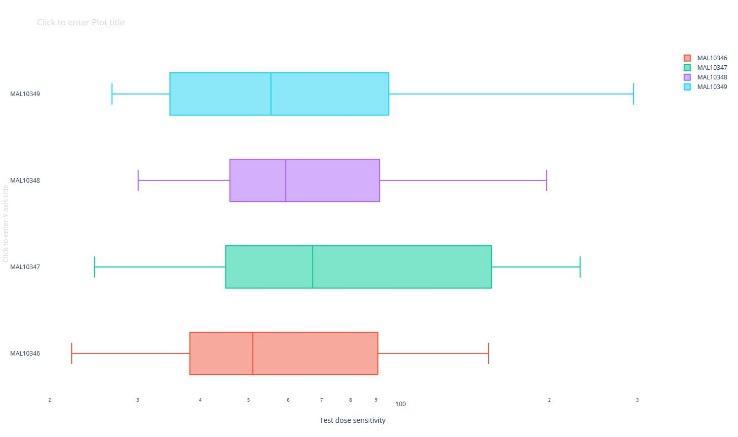
**

**Figure S7.** Box-plots of test-dose sensitivity for the A) 100-200 µm and B) 63-100 µm quartz fraction of samples measured from profile RP1, using a logarithmic scale.

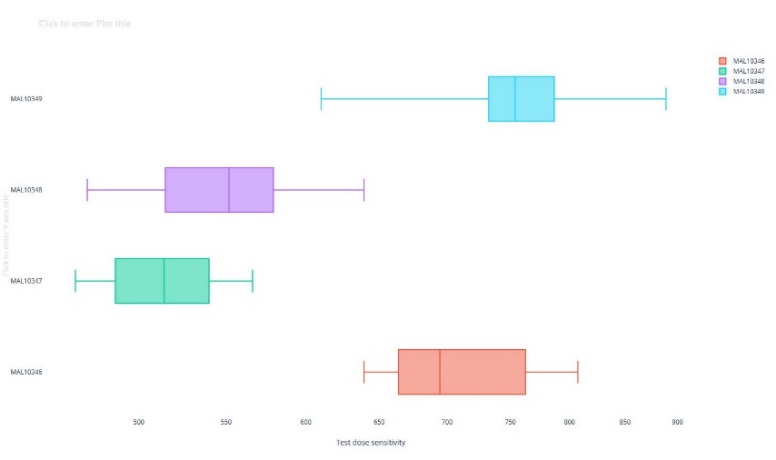
***A***



***B***



**Figure S8.** Box-plots of test-dose sensitivity for the 4-11 µm polymineral fraction of samples measured from profile RP1, using a logarithmic scale.

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**Table S9.** Summary of depths, averaged De values and test dose sensitivity values for the ten fine-grained (4-11µm) quartz OSL samples measured in this study. Three aliquots were measured for each sample, using a measurement protocol involving three regenerative dose steps, preheat/cutheat temperatures of 260/240°C and a test dose of c. 37 Gy. Minimum equivalent doses are assumed to represent signal saturation.

|  |  |  |  |
| --- | --- | --- | --- |
| **Sample** | **Depth (m)** | **Averaged De (Gy)** | **Sensitivity (cts/s/Gy) ± 1σ** |
| A0164 | 29.80 ± 0.05 | No signal | 26.9 ± 11.4 |
| A0166 | 28.85 ± 0.05 | >290 | 222 ± 75 |
| A0167 | 28.45 ± 0.05 | >290 | 646 ± 456 |
| A0168 | 27.75 ± 0.05 | >290 | 460 ± 27 |
| A0171 | 26.35 ± 0.05 | >102 | 405 ± 69 |
| A0172 | 25.30 ± 0.05 | >474 | 1698 ± 672 |
| A0174 | 24.25 ± 0.05 | >239 | 859 ± 139 |
| A0175 | 23.65 ± 0.05 | 191 ± 9 | 1321 ± 239 |
| A0176 | 23.45 ± 0.05 | 209 ± 18 | 719 ± 88 |
| A0177 | 23.20 ± 0.05 | 78.1 ± 38.6 | 1621 ± 2613 |

**Table S10.** Summary of depths, averaged De values and test dose sensitivity values for the five very fine sand (63-90 µm) quartz OSL samples measured in this study. Three aliquots were measured for each sample, using a measurement protocol involving two regenerative dose steps, preheat/cutheat temperatures of 260/240°C and a test dose of c. 37 Gy.

|  |  |  |  |
| --- | --- | --- | --- |
| **Sample** | **Depth (m)** | **Averaged De (Gy)** | **Sensitivity (cts/s/Gy) ± 1σ** |
| A0365 | 6.45 ± 0.05 | 55.1 ± 8.3 | 86.2 ± 15.9 |
| A0370 | 5.45 ± 0.05 | 51.0 ± 12.1 | 221 ± 84 |
| A0375 | 4.45 ± 0.05 | 63.5 ± 9.9 | 195 ± 153 |
| A0376 | 4.25 ± 0.05 | 135 ± 94 | 573 ± 132 |
| A0379 | 3.45 ± 0.05 | 50.0 ± 7.0 | 275 ± 214 |

**Table S11.** Summary of depths, averaged uncorrected De values and test dose sensitivity values for the 11 very fine sand (63-90µm) K-feldspar samples measured in this study using the pIR-IRprotocols. The number of aliquots measured for each sample is listed and the De uncertainty is given as the standard error.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sample** | **Depth (m)** | **Number of aliquots measured** | **Measurement protocol** | **Averaged De (Gy) ± se** | **Sensitivity (cts/s/Gy) ± 1σ** |
| A0201 | 16.60 ± 0.05 | 6 | pIR200IR290 | 174 ± 3 | 400 ± 216 |
| A0216 | 12.65 ± 0.05 | 6 | 133 ± 3 | 884 ± 492 |
| A0220 | 11.80 ± 0.05 | 6 | 114 ± 3 | 880 ± 208 |
| A0348 | 10.50 ± 0.05 | 6 | 120 ± 4 | 462 ± 317 |
| A0354 | 9.20 ± 0.05 | 6 | 116 ± 8 | 309 ± 107 |
| A0360 | 7.60 ± 0.05 | 6 | 117 ± 3 | 563 ± 103 |
| A0365 | 6.45 ± 0.05 | 12 | 122 ± 11 | 72.7 ± 56.4 |
| A0370 | 5.45 ± 0.05 | 12 | 131 ± 6 | 512 ± 248 |
| A0375 | 4.45 ± 0.05 | 12 | 112 ± 4 | 277 ± 85 |
| A0376 | 4.25 ± 0.05 | 6 | 113 ± 4 | 726 ± 154 |
| A0379 | 3.45 ± 0.05 | 6 | pIR200IR290 | 113 ± 4 | 168 ± 63 |
| 24 | pIR50IR290 | 85.8 ± 1.0 | 4762 ± 2501 |
| A0380 | 3.45 ± 0.05 | 24 | pIR50IR290 | 77.0 ± 1.5 | 2243 ± 1533 |
| A0381 | 3.15 ± 0.05 | 24 | 81.7 ± 3.4 | 780 ± 426 |
| A0382 | 2.85 ± 0.05 | 24 | 87.8 ± 2.6 | 9478 ± 4034 |
| A0383 | 2.55 ± 0.05 | 24 | 87.7 ± 1.1 | 11098 ± 5365 |
| A0384 | 2.15 ± 0.05 | 24 | 84.1 ± 4.1 | 4939 ± 7907 |
| A0385 | 1.80 ± 0.05 | 24 | 83.4 ± 1.8 | 5662 ± 2908 |
| A0387 | 1.25 ± 0.05 | 24 | 77.5 ± 0.9 | 3876 ± 2000 |

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