Table S1:

IRSL protocol used to determine the equivalent dose. Step 1 is skipped for the first cycle (measuring the natural IRSL signal).

|  |  |  |
| --- | --- | --- |
| **Step** | **Procedure** | **Signal** |
| 1 | Irradiation with regeneration dose |  |
| 2 | Preheat at 270 °C for 120 s |  |
| 3 | Pause for 20 min |  |
| 4 | IRSL at 125 °C for 300 s | *L*x |
| 5 | Irradiation with test dose |  |
| 6 | Preheat at 270 °C for 120 s |  |
| 7 | Pause for 20 min |  |
| 8 | IRSL at 125 °C for 300 s | *T*x |
| 9 | Return to step 1 |  |

Table S2:

Analytical results, luminescence results and calculated ages.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Depth** | ***n*1** | **Recycling ratio** | **Recupe-ration** | ***D*e2** | **K** | **Th** | **U** | **Water content3** | **Cosmic *Ḋ*** | **Total *Ḋ*** | **Age** |
|  | [m] |  |  | [%] | [Gy] | [wt.%] | [µg g-1] | [µg g-1] | [wt.%] | [Gy ka-1] | [Gy ka-1] | [ka] |
| **Lanz - 1** |  |  |  |  |  |  |  |  |  |  |  |  |
| **BT1710** | 0.90 | 12/12 | 1.03 ± 0.08 | 8.2 ± 1.3 | 27.7 ± 1.3 | 0.098 ± 0.100 | 0.69 ± 0.15 | 1.15 ± 0.05 | 10 ± 5 | 0.190 ± 0.019 | 0.833 ± 0.046 | **33.3 ± 2.4** |
| **BT1709** | 4.65 | 12/12 | 1.01 ± 0.04 | 4.6 ± 0.2 | 36.1 ± 1.1 | 0.515 ± 0.052 | 2.68 ± 0.39 | 1.54 ± 0.12 | 10 ± 5 | 0.126 ± 0.013 | 1.532 ± 0.085 | **23.6 ± 1.5** |
| **BT1708** | 5.20 | 15/24 | 1.01 ± 0.04 | 4.7 ± 0.2 | 43.9 ± 1.4 | 0.369 ± 0.037 | 1.81 ± 0.24 | 1.33 ± 0.08 | 10 ± 5 | 0.118 ± 0.012 | 1.209 ± 0.065 | **36.3 ± 2.3** |
| **BT1707** | 7.80 | 10/10 | 1.04 ± 0.03 | 4.1 ± 0.4 | 88.0 ± 3.1 | 0.297 ± 0.030 | 2.86 ± 0.30 | 1.33 ± 0.09 | 10 ± 5 | 0.089 ± 0.009 | 1.230 ± 0.067 | **71.6 ± 4.6** |
| **BT1706** | 9,10 | 8/22 | 0.99 ± 0.06 | 3.8 ± 0.7 | 70.5 ± 3.9 | 0.485 ± 0.049 | 1.13 ± 0.19 | 1.32 ± 0.06 | 10 ± 5 | 0.081 ± 0.008 | 1.200 ± 0.067 | **58.8 ± 4.6** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Lanz-2** |  |  |  |  |  |  |  |  |  |  |  |  |
| **BT1711** | 3.10 | 12/21 | 0.99 ± 0.03 | 4.2 ± 0.4 | 37.7 ± 1.4 | 0.544 ± 0.054 | 2.47 ± 0.39 | 2.05 ± 0.12 | 10 ± 5 | 0.153 ± 0.015 | 1.762 ± 0.096 | **21.4 ± 1.4** |

1 Accepted in relation to measured number of aliquots.

2 *D*e was calculated as the unweighted average and includes an added systematic uncertainty of 3% estimated to be representative for uncertainties in β-source calibration. The given uncertainty refers to the 1σ standard error.

3 Interstitial water content estimated to representative for the burial period.

For calculation of the α-dose rate, an *a*-value of 0.08 ± 0.01 is assumed based on Schmidt et al. (2018).