Supplementary Table 1. MC-ICP-MS U-Th dating results of the eight flowstones.

Sample	Depth in the age model [mm from top]	^{238}U [ng g^{-1}]	^{232}Th [pg g^{-1}]	$^{230}Th/^{232}Th$ [atomic x 10^{-6}]	$\delta^{234}U$ measured*	Uncorrected age [a]	$\delta^{234}U$ initial corrected**	Corrected age [a, BP***]
LAS 1								
LAS1-3	3	219443 ± 219	17010 ± 356	22546 ± 473	10.3 ± 1.2	12084 ± 27	11 ± 1	12019 ± 27
L1-10	10	443727 ± 1649	4921 ± 120	158155 ± 3872	11.9 ± 1.8	12108 ± 57	12 ± 2	12041 ± 57
L1-22	22	434831 ± 1354	552 ± 59	1415906 ± 152062	13.3 ± 1.5	12419 ± 50	14 ± 2	12352 ± 50
L1-31	31	434589 ± 1145	552 ± 59	1415906 ± 152062	14.4 ± 1.3	12412 ± 43	15 ± 1	12345 ± 43
L1-38.5	38	387378 ± 457	96503 ± 1935	7167 ± 144	16.1 ± 1.4	12284 ± 28	17 ± 1	12214 ± 28
L1-40.5	41	1384435 ± 1925	12555 ± 255	198062 ± 4033	16.0 ± 1.4	12364 ± 29	17 ± 1	12301 ± 29
L1-43	43	1361832 ± 3216	243 ± 84	10111353 ± 3482521	14.4 ± 1.3	12456 ± 39	15 ± 1	12389 ± 39
L1-45	45	1459336 ± 3758	23525 ± 482	114871 ± 2357	15.0 ± 1.4	12784 ± 44	16 ± 1	12716 ± 44
L1-50	50	1275552 ± 3379	571 ± 78	4149383 ± 570076	17.3 ± 1.5	12802 ± 45	18 ± 2	12735 ± 45
L1-52	52	632649 ± 1456	330 ± 58	3649956 ± 642838	22.3 ± 1.6	13053 ± 48	23 ± 2	12986 ± 48
LAS 2								
L2-11	12	238778 ± 402	2819 ± 136	149286 ± 7185	10.9 ± 1.5	12183 ± 33	11 ± 2	12119 ± 33
LAS2-12	13	68314 ± 66	3375 ± 113	35537 ± 1194	10.1 ± 1.3	12145 ± 42	10 ± 1	12081 ± 42
L12-16	20	314480 ± 409	181 ± 48	3086558 ± 822558	17.0 ± 1.2	12198 ± 27	18 ± 1	12131 ± 27
L2-17	21	455975 ± 1145	319 ± 69	2576732 ± 554331	13.4 ± 1.6	12458 ± 42	14 ± 2	12394 ± 42
LAS2-21	24	27938 ± 32	410 ± 260	123065 ± 77988	10.1 ± 1.6	12529 ± 70	10 ± 2	12465 ± 70
LAS2-25	30	285788 ± 384	576 ± 48	906097 ± 74962	15.7 ± 1.5	12597 ± 31	16 ± 2	12534 ± 31

LAS 2-35	34	73036 ± 68	6636 ± 149	20182 ± 457	13.6 ± 1.3	12670 ± 38	14 ± 1	12604 ± 38
LAS2-45	46	175689 ± 209	4291 ± 91	75915 ± 1622	15.4 ± 1.3	12796 ± 33	16 ± 1	12733 ± 33
L2-47	49	665296 ± 714	736 ± 85	1712570 ± 197285	21.8 ± 1.3	12995 ± 28	23 ± 1	12931 ± 28
L2-49	51	1824510 ± 2862	1702 ± 111	2080311 ± 135204	21.0 ± 1.5	13351 ± 33	22 ± 2	13287 ± 33
L2-50	52	1375439 ± 3112	186 ± 61	14415784 ± 4761029	23.0 ± 1.6	13353 ± 43	24 ± 2	13290 ± 43
LAS2-54	55	544508 ± 842	2416 ± 157	445427 ± 29025	26.2 ± 1.3	13536 ± 34	27 ± 1	13473 ± 34
L2-58	59	1586242 ± 2562	11018 ± 239	289295 ± 9537	22.4 ± 1.5	13767 ± 35	23 ± 2	13703 ± 35
LAS2-67	67	195206 ± 231	1365 ± 45	303149 ± 7357	25.1 ± 1.4	13897 ± 31	26 ± 1	13833 ± 31
LAS2-76	76	353979 ± 939	2402 ± 58	100372 ± 2800	31.2 ± 1.5	14053 ± 49	32 ± 2	13989 ± 49
LAS2-84	81	258158 ± 311	5319 ± 148	149286 ± 7185	23.6 ± 1.4	14246 ± 33	25 ± 1	14183 ± 33
LAS 6								
L6-19	2	94229 ± 77	6148 ± 126	26163 ± 540	14.1 ± 1.4	11740 ± 31	15 ± 1	11676 ± 31
L6-24	7	128068 ± 108	1862 ± 43	117870 ± 2753	11.1 ± 1.2	11826 ± 26	12 ± 1	11764 ± 26
L6-29	12	242379 ± 618	3823 ± 80	108645 ± 2286	8.7 ± 1.7	11855 ± 41	9 ± 2	11790 ± 41
L6-47	31	276360 ± 443	1482 ± 36	323217 ± 7824	11.7 ± 1.6	11958 ± 34	12 ± 2	11896 ± 34
L6-54	37	619679 ± 1045	30361 ± 611	35457 ± 715	6.8 ± 1.5	12052 ± 31	7 ± 2	11986 ± 31
L6-58	41	187622 ± 178	5218 ±112	62380 ± 1343	10.8 ± 1.3	11985 ± 27	11 ± 1	11922 ± 27
L6-72	57	252690 ± 324	12757 ± 259	34508 ± 703	11.2 ± 1.5	12032 ± 30	12 ± 2	11969 ± 30
L6-79	63	345945 ± 412	17971 ± 366	33695 ± 687	9.6 ± 1.3	12112 ± 27	10 ± 1	12049 ± 27
L6-84	67	68666 ± 102	661 ± 75	181395 ± 20557	11.7 ± 1.5	12052 ± 32	12 ± 2	11988 ± 32
L6-90	73	419926 ± 949	18229 ± 367	40168 ± 811	10.9 ± 1.4	12048 ± 37	11 ± 1	11982 ± 37

L6-130	88	533529 ± 1488	7962 ± 171	117007 ± 2510	6.4 ± 1.6	12124 ± 44	7 ± 2	12059 ± 44
LAS 10								
L10-15	15	6056 ± 10	20387 ± 409	479 ± 10	98.2 ± 1.8	10166 ± 47	101 ± 2	10013 ± 79
L10-19	19	7410 ± 10	1788 ± 40	6569 ± 148	94.5 ± 1.2	10014 ± 29	97 ± 1	9944 ± 29
L10-20-2	20	7486 ± 7	3268 ± 71	3698 ± 82	97.2 ± 1.6	10180 ± 59	100 ± 2	10105 ± 60
L10-24	24	6916 ± 24	848 ± 19	13025 ± 296	97.0 ± 1.2	10064 ± 54	100 ± 1	9997 ± 54
L10-26-2	26	8408 ± 9	6402 ± 129	2113 ± 43	96.3 ± 1.2	10152 ± 22	99 ± 1	10068 ± 26
LAS10-30	30	8064 ± 9	6429 ± 135	2007 ± 44	96.7 ± 1.3	10090 ± 70	99 ± 1	10005 ± 71
L10-32	32	9188 ± 12	505 ± 14	29182 ± 818	93.6 ± 1.5	10135 ± 25	96 ± 1	10070 ± 25
LAS-10/35	36	6692 ± 6	3511 ± 78	3095 ± 70	92.2 ± 1.5	10292 ± 54	95 ± 2	10214 ± 55
LAS 19								
LAS19-66	1	10993 ± 13	4595 ± 106	4064 ± 94	86.4 ± 1.5	10850 ± 43	89 ± 2	10776 ± 44
L19-81-2	18	9027 ± 15	10573 ± 216	1475 ± 31	86.8 ± 1.3	11039 ± 49	90 ± 1	10944 ± 54
LAS19-87	24	10752 ± 11	6493 ± 135	2873 ± 61	83.9 ± 1.4	11120 ± 44	87 ± 1	11041 ± 46
L19-97	28	8910 ± 9	5747 ± 122	2718 ± 59	88.4 ± 1.4	11196 ± 49	91 ± 1	11114 ± 51
L19-101-2	31	9029 ± 11	3992 ± 80	3997 ± 80	90.5 ± 1.6	11267 ± 27	93 ± 2	11191 ± 28
LAS19-107	38	12613 ± 15	29387 ± 592	764 ± 16	83.9 ± 1.4	11420 ± 51	87 ± 1	11294 ± 68
L19-114-2	45	5776 ± 5	3272 ± 68	3149 ± 66	82.5 ± 1.4	11467 ± 40	85 ± 1	11388 ± 41
L19-124-2	56	10743 ± 14	15393 ± 311	1261 ± 26	78.6 ± 1.5	11669 ± 48	81 ± 2	11567 ± 55
L19-138	73	14282 ± 22	5278 ± 106	4910 ± 99	76.4 ± 1.6	11745 ± 29	79 ± 2	11671 ± 30

L19-143	77	12783 ± 15	20100 ± 408	1161 ± 24	81.5 ± 1.5	11766 ± 53	84 ± 2	11661 ± 61
LAS-19/145	81	1409 ± 1	2300 ± 50	1120 ± 25	83.1 ± 1.4	11762 ± 89	86 ± 1	11654 ± 94
L19-149	86	12172 ± 21	64500 ± 1296	351 ± 7	78.1 ± 1.6	12053 ± 45	81 ± 2	11847 ± 111
L19-153	91	11809 ± 12	57198 ± 1146	387 ± 8	80.9 ± 1.3	12093 ± 28	84 ± 1	11900 ± 96
LAS19-157	93	12713 ± 14	20774 ± 417	1140 ± 23	75.2 ± 1.5	12088 ± 38	78 ± 2	11981 ± 49
LAS 21								
L21-6	8	97294 ± 108	1564 ± 45	106024 ± 3038	12.1 ± 1.3	11746 ± 27	13 ± 1	11682 ± 27
L21-8	12	278486 ± 401	36328 ± 732	13104 ± 264	12.3 ± 1.3	11780 ± 27	13 ± 1	11713 ± 27
L21-15	15	222527 ± 321	109 ± 73	3526658 ± 2364796	12.3 ± 1.4	11886 ± 28	13 ± 1	11822 ± 28
L21-21-2	24	320654 ± 324	286 ± 302	1951055 ± 2059465	11.2 ± 1.3	12034 ± 26	12 ± 1	11970 ± 26
L21-27	29	274999 ± 381	61 ± 44	7853298 ± 5659669	12.2 ± 1.4	12075 ± 28	13 ± 1	12011 ± 28
L21-33	37	402032 ± 608	337 ± 69	2092616 ± 428059	10.5 ± 1.3	12119 ± 29	11 ± 1	12055 ± 29
L21-38	33	117658 ± 140	180 ± 33	1161570 ± 214214	11.3 ± 1.3	12254 ± 28	12 ± 1	12190 ± 28
L21-42	47	1073579 ± 2087	34845 ± 699	55037 ± 1105	11.7 ± 1.3	12349 ± 32	12 ± 1	12284 ± 32
LAS 34								
L34-1	34	1031939 ± 1297	21410 ± 433	100107 ± 2026	27.8 ± 1.1	14249 ± 31	29 ± 1	14184 ± 31
L34-7	30	1188889 ± 1456	950 ± 57	2561905 ± 154832	29.3 ± 1.3	14016 ± 31	30 ± 1	13952 ± 31
L34-10-2	27	1413757 ± 2169	2653 ± 6724	1085887 ± 2752307	25.4 ± 1.5	13996 ± 36	26 ± 2	13932 ± 36
L34-17	22	724817 ± 1591	1527 ± 2750	948395 ± 1707529	25.2 ± 1.0	13715 ± 48	26 ± 1	13651 ± 48
L34-18	19	937933 ± 1323	12565 ± 265	146429 ± 3092	25.0 ± 1.4	13447 ± 32	26 ± 1	13382 ± 32

L34-20	17	728718 ± 857	6908 ± 166	203723 ± 4907	21.3 ± 1.3	13276 ± 31	22 ± 1	13212 ± 31
LAS 72								
L72-1	1	242688 ± 389	2139 ± 53	170234 ± 4215	29.1 ± 1.5	10093 ± 34	30 ± 2	10028 ± 34
L72-7	7	762474 ± 1189	11496 ± 239	99610 ± 2069	29.9 ± 1.3	10093 ± 23	31 ± 1	10028 ± 23
L72-13	13	324525 ± 348	1785 ± 51	275878 ± 7883	30.9 ± 1.2	10193 ± 20	32 ± 1	10127 ± 20
L72-14	14	574890 ± 845	358 ± 210	2526393 ± 1485226	26.1 ± 1.5	10640 ± 27	27 ± 2	10573 ± 27
L72-20	20	86755 ± 116	97 ± 6	1413740 ± 92379	26.9 ± 1.2	10719 ± 22	28 ± 1	10654 ± 22
L72-31	31	396512 ± 414	8137 ± 64947	78945 ± 630146	24.4 ± 1.2	10991 ± 28	25 ± 1	10923 ± 28
L72-35	35	835618 ± 1285	293 ± 94	4645863 ± 1482958	22.4 ± 1.3	11084 ± 26	23 ± 1	11020 ± 26
L72-45	45	956369 ± 1808	2066 ± 65	780994 ± 24621	19.7 ± 1.6	11526 ± 32	20 ± 2	11462 ± 32
L72-51	51	684115 ± 1633	32553 ± 661	35949 ± 732	18.8 ± 1.7	11708 ± 41	19 ± 2	11642 ± 41

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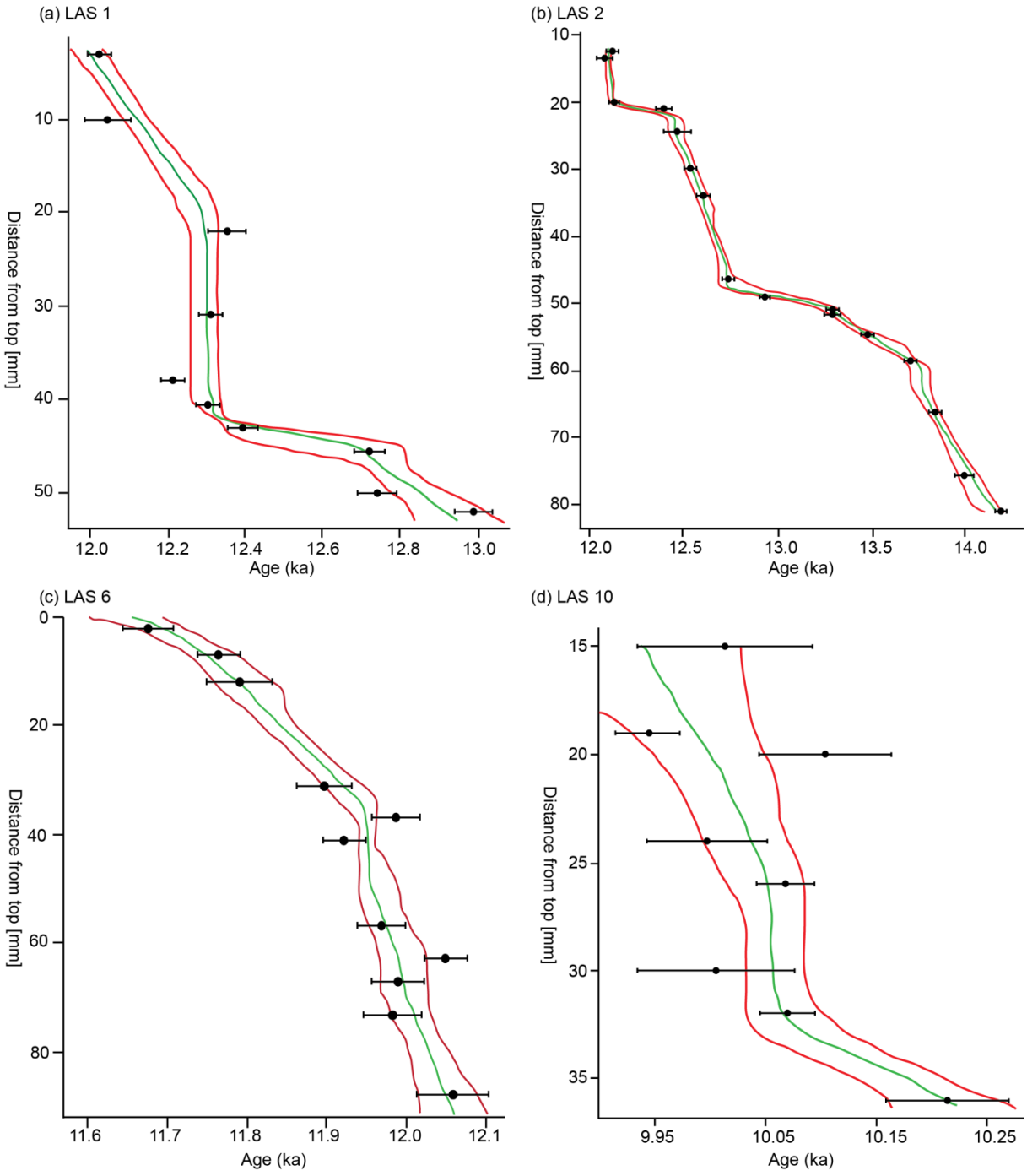
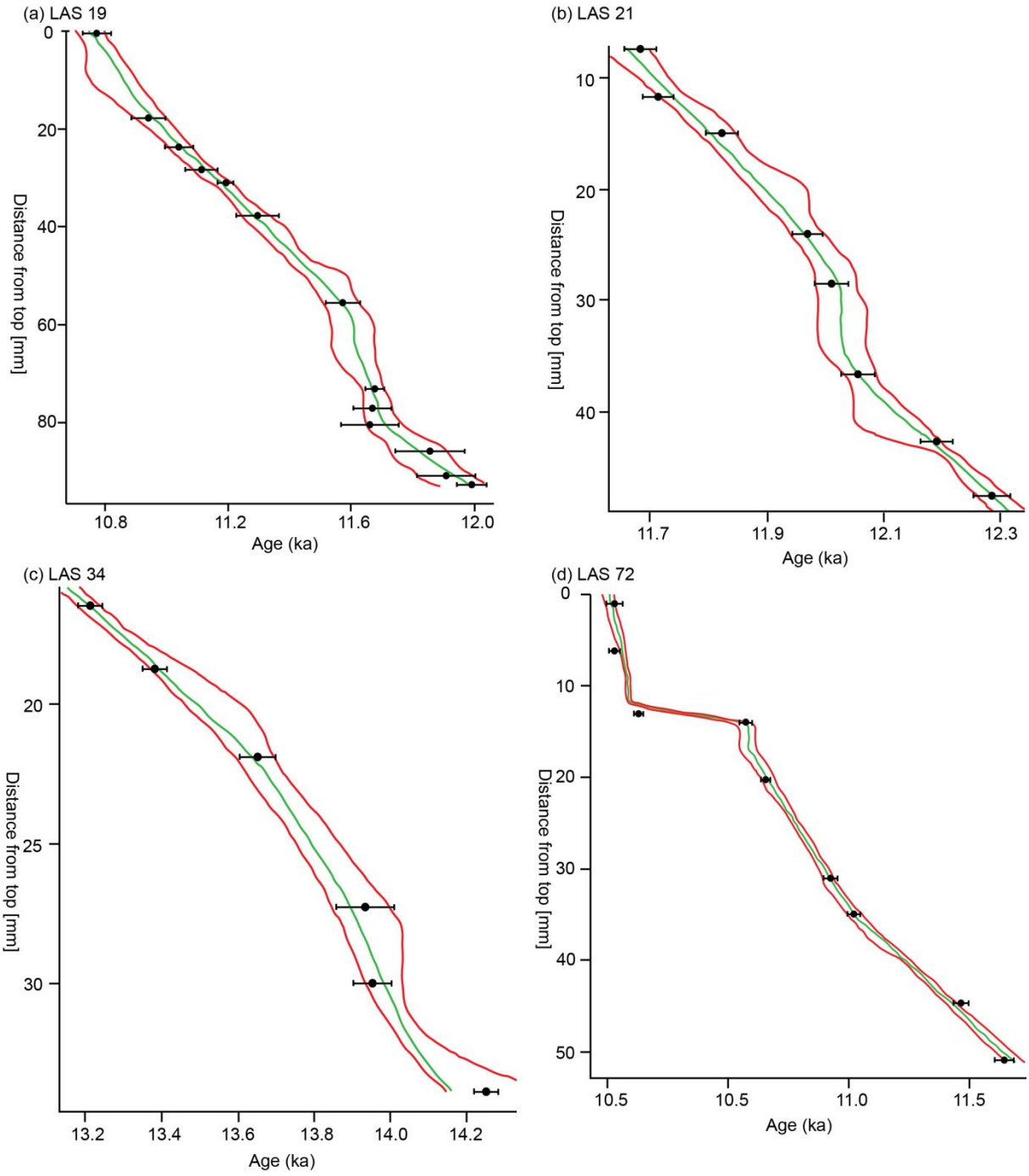
*$\delta^{234}U = ([^{234}U/^{238}U]_{activity} - 1)x1000$. ** $\delta^{234}U_{initial}$ was calculated based on ^{230}Th age (T), i.e., $\delta^{234}U_{initial} = \delta^{234}U_{measured} \times e^{\lambda 234 \times T}$.

Corrected ^{230}Th ages assume the initial $^{230}Th/^{232}Th$ atomic ratio of $4.4 \pm 2.2 \times 10^{-6}$. Those are the values for a material at secular equilibrium, with the bulk earth $^{232}Th/^{238}U$ value of 3.8. The errors are arbitrarily assumed to be 50%.

***B.P. stands for "Before Present" where the "Present" is defined as the year 1950 AD.



Supplementary Figure 1: Depth-age models of LAS 1 (a), LAS 2 (b), LAS 6 (c) and LAS 10 (d). The red lines show 95%-confidence limits of the age model (green line).



Supplementary Figure 2: Depth-age models of LAS 19 (a), LAS 21 (b), LAS 34 (c) and LAS 72 (d). The red lines show 95%-confidence limits of the age model (green line).