

Supplementary Table S1. U-Th isotopic data used for speleothem dating (samples Pla-11 and PJ from the Plavecká jaskyňa Cave; samples PE and PEC from the Pec Cave).

Lab. no.	Sample	U cont. [ppm]	2 σ error	$^{234}\text{U}/^{238}\text{U}$ AR	2 σ error	$^{230}\text{Th}/^{234}\text{U}$ AR	2 σ error	$^{230}\text{Th}/^{232}\text{Th}$ AR	2 σ error	Age [ka]	Corrected Age* [ka]	Initial $^{234}\text{U}/^{238}\text{U}$ AR**	2 σ error
1072	Pla-11 Plavecka/ popcorn: upper part	0.743	0.004	1.0673	0.0030	0.146	0.002	4.08	0.05	17.2 \pm 0.2	13.9 \pm 0.3	1.070	0.023
1071	Pla-11 Plavecka/ popcorn: lower part	0.424	0.003	1.1017	0.0030	0.957	0.006	4.14	0.03	293 $^{+9}_{-8}$	270 $^{+17}_{-10}$	1.216	0.077
1334	PE 1/1	0.0943	0.0006	1.0420	0.0079	1.138	0.040	25.49	0.89	open system?			
1335	PE 1/2	0.0990	0.0006	1.0438	0.0067	0.958	0.028	6.65	0.19	318 $^{+64}_{-41}$	303 $^{+79}_{-44}$	1.10	0.15
1336	PE 1/3	0.0272	0.0002	0.9878	0.0082	0.919	0.039	7.38	0.31	281 $^{+72}_{-44}$	269 $^{+88}_{-47}$	0.97	0.17
1320	PE 2/1	0.1746	0.0012	1.0254	0.0059	1.035	0.025	27.24	0.63	>600 (<1.2 Ma)			
1331	PE 2/2	0.2343	0.0015	1.0344	0.0046	0.5486	0.0073	20.36	0.26	86.7 \pm 1.7	84 \pm 2	1.044	0.025
1351	PE 2/3	0.2340	0.0013	1.0240	0.0036	0.897	0.018	16.22	0.32	243 $^{+18}_{-16}$	237 $^{+26}_{-22}$	1.046	0.097
1352	PE 2/4	0.1897	0.0010	1.0397	0.0039	0.997	0.036	23.71	0.87	443 $^{+\infty}_{-115}$	439 $^{+\infty}_{-120}$	1.14	0.31
1353	PE 2/5	0.3430	0.0018	1.1613	0.0032	0.9674	0.0057	14.856	0.081	288.4 $^{+6.7}_{-6.4}$	282.1 $^{+8.2}_{-8.0}$	1.355	0.039
1354	PE 2/6	0.4402	0.0024	0.9887	0.0024	0.7988	0.0053	37.02	0.24	176.9 \pm 2.7	174.2 \pm 3.2	0.982	0.018
1377	PE 3-1	0.1565	0.0009	1.1394	0.0036	0.8785	0.0093	23.43	0.24	210.2 $^{+6.0}_{-5.7}$	206.8 $^{+6.9}_{-6.3}$	1.248	0.038
1367	PE 3-2	0.1131	0.0006	1.1396	0.0051	1.0515	0.0098	54.25	0.45	>600 (<1.2 Ma)			
1376	PE 4/1-1	0.0878	0.0005	1.1250	0.0060	0.722	0.018	49.89	1.20	135.2 $^{+6.2}_{-5.9}$	133.4 $^{+7.0}_{-6.4}$	1.181	0.057
1333	PE 4/2/2	1.3149	0.0075	1.0270	0.0017	0.9558	0.0031	13.932	0.044	323.4 $^{+5.4}_{-5.1}$	315 $^{+9}_{-7}$	1.065	0.024
1349	PEC 1	0.1408	0.0008	1.0192	0.0047	1.061	0.020	6.00	0.11	>600 (<1.2 Ma)			
1365	PEC 1-1A	7.430	0.046	0.9594	0.0023	0.768	0.002	2232.12	5.79	163.64 $^{+0.97}_{-0.78}$		0.9358	0.0050
1356	PEC 2-1	0.2298	0.0013	1.0274	0.0038	0.8900	0.0082	180.60	1.55	236.0 $^{+7.0}_{-6.6}$	234 $^{+9}_{-8}$	1.053	0.036
1357	PEC 2-2	0.0988	0.0006	1.0353	0.0051	0.953	0.023	15.17	0.36	314 $^{+46}_{-34}$	306 $^{+57}_{-43}$	1.08	0.15
1358	PEC 3-1	0.1324	0.0007	1.0511	0.0040	1.179	0.027	29.67	0.68	open system?			
1359	PEC 3-2	2.408	0.014	1.1366	0.0029	0.8808	0.0033	889.35	2.96	212.1 $^{+2.0}_{-1.9}$		1.247	0.012
1360	PEC 3-2A	1.786	0.011	1.1732	0.0025	0.9386	0.0057	2024.11	12.68	253.8 $^{+5.1}_{-4.9}$		1.352	0.026
1361	PEC 3-3	0.1317	0.0007	1.0266	0.0040	0.961	0.010	64.62	0.64	334 $^{+22}_{-18}$	331 $^{+29}_{-22}$	1.067	0.071

1321	PEC 4/1	0.2087	0.0012	1.0468	0.0045	1.031	0.016	17.99	0.27	>600 (<1.2 Ma)			
1364	PEC 4/1-2	0.1008	0.0007	1.0453	0.0070	0.956	0.016	27.88	0.44	314 ⁺²⁹ ₋₂₃	309 ⁺³⁹ ₋₂₉	1.11	0.10
1322	PEC 4/2	0.2464	0.0014	1.0517	0.0032	0.9656	0.0080	120.82	0.95	329 ⁺¹⁵ ₋₁₄	327 ⁺¹⁹ ₋₁₇	1.129	0.059
1323	PEC 4/2/1	0.1128	0.0006	1.0551	0.0048	0.9529	0.0099	13.74	0.13	304 ⁺¹⁵ ₋₁₃	304 ⁺²⁰ ₋₁₇	1.129	0.063
1324	PEC 5/1	0.2732	0.0016	1.0563	0.0033	0.9364	0.0068	17.07	0.12	279.3 ^{+8.2} _{-7.7}	273.3 ^{+9.5} _{-9.2}	1.121	0.038
1325	PEC 5/2	0.3349	0.0021	1.0770	0.0031	0.9039	0.0066	14.78	0.10	238.9 ^{+5.5} _{-5.3}	232.6 ^{+7.1} _{-6.8}	1.148	0.037
1350	PJ 1/1	0.1004	0.0005	1.0714	0.0046	1.066	0.026	6.472	0.160	>600 (<1.2 Ma)			
1330	PJ 1/2	0.1043	0.0006	1.0730	0.0055	0.9831	0.013	10.906	0.130	355 ⁺³¹ ₋₂₅	345 ⁺³⁸ ₋₂₉	1.19	0.10
1366	PJ 5-rafts	0.2463	0.0013	1.3588	0.0033	0.9570	0.0053	4.834	0.025	244.4 ^{+4.0} _{-3.9}	228 ⁺⁹ ₋₈	1.678	0.059

Calculations use the decay constant of Jaffey et al. (1971) for ^{238}U ; Cheng et al. (2013) for ^{234}U and ^{230}Th , and Holden (1990) for ^{232}Th . Ages do not include uncertainties associated with decay constants. AR – activity ratio; * Corrected ages using typical silicate activity ratio $^{230}\text{Th}/^{232}\text{Th} = 0.83 \pm 0.42$ derived from the $^{232}\text{Th}/^{238}\text{U}$ activity ratio = 1.21 ± 0.6 , $^{230}\text{Th}/^{238}\text{U}$ activity ratio = 1.0 ± 0.1 , and $^{234}\text{U}/^{238}\text{U}$ activity ratio = 1.0 ± 0.1 (e.g., Cruz et al., 2005). ** Calculated based on $^{234}\text{U}/^{238}\text{U}$ AR corrected for detrital contamination and corrected age.

