

**Table S3 (U-Th)/He Geochronology Analysis**

Name	U	U sd	Th	Th sd	eU	He (ncc)	He error	He	Mass	FT	Shape	Dia.	Length	Uncorr.	He Age	He Age	U-Pb age	U-Pb Age	Post-dep. $\alpha$ - ejecc. corr. age
	ppm		ppm		ppm	ncc		ncc/g	mg			um	um	Age	(Ma)	Error	(Ma)	Error	
EC17-1B Zr 83	238.9	3.51	65.7	1.01	254.3	12.1	0.01645	8375188	0.0014	0.69	np	74.7	128.8	266	386	4	1056	18	363
EC17-1B Zr 112	172.9	2.49	91.0	1.32	194.3	13.0	0.00680	8693775	0.0015	0.69	pp	76.0	128.5	359	517	5	1075	15	454
EC17-1B Zr 121	88.5	1.32	94.0	1.42	110.6	4.4	0.00323	3458611	0.0013	0.67	nn	69.8	131.0	253	377	3	1048	17	356
EC17-1B Zr 136	126.7	1.90	117.9	1.69	154.4	8.6	0.01815	5797879	0.0015	0.71	np	82.2	108.7	303	428	4	1054	16	394
EC17-1B Zr 139	128.5	1.88	109.0	1.57	154.1	7.8	0.00391	4612517	0.0017	0.73	pp	89.7	104.2	243	334	3	1174	14	328
EC17-1B Zr 167	331.5	4.82	260.9	3.80	392.8	20.8	0.01274	16375230	0.0013	0.69	nn	77.7	104.5	335	484	4	439	4	431
EC17-1B Zr 171	130.0	1.92	66.1	0.95	145.6	7.1	0.00257	5218673	0.0014	0.70	np	82.2	100.5	289	411	4	1182	10	382
EC17-1B Zr 173	224.6	3.30	64.2	0.93	239.7	6.9	0.00532	6380787	0.0011	0.66	nn	66.7	120.4	216	329	3	1063	19	323
EC17-1B Zr 176	1221.3	17.61	487.2	7.00	1335.8	25.8	0.01257	31277014	0.0008	0.66	pp	73.3	76.2	191	288	2	1175	17	296
EC17-1B Zr 186	242.7	3.61	86.0	1.23	262.9	10.4	0.00719	9185704	0.0011	0.67	np	71.1	111.1	282	420	4	1073	17	385
EC17-1B Zr 198	222.7	3.27	101.6	1.48	246.6	13.8	0.00938	7459715	0.0019	0.74	pp	97.2	97.6	245	331	3	1067	15	326
EC17-1B Zr 203	233.5	3.45	121.7	1.77	262.1	8.4	0.00613	8240612	0.0010	0.64	nn	62.3	131.0	255	399	3	1357	19	367
EC17-1B Zr 205	221.0	3.20	82.8	1.21	240.4	9.0	0.00892	6834560	0.0013	0.70	nn	80.8	99.8	231	329	3	1165	16	324
EC17-1B Zr 206	128.2	1.88	52.1	0.77	140.5	5.5	0.01164	4482522	0.0012	0.68	np	74.2	110.4	258	378	3	1073	17	357
EC17-1B Zr 220	46.2	0.68	32.7	0.48	53.9	2.9	0.00612	1345898	0.0021	0.74	np	92.3	125.0	203	275	3	1137	17	284
EC17-1B Zr 258	307.2	4.39	130.8	1.88	338.0	10.0	0.02098	9540206	0.0010	0.65	nn	65.4	121.7	229	352	3	1061	14	338
EC17-1B Zr 271	137.9	1.98	223.0	3.20	190.4	7.4	0.00584	4019616	0.0018	0.73	nn	87.9	117.7	172	237	2	1102	18	258
EC17-1B Zr 289	567.1	8.16	254.6	3.63	627.0	29.3	0.01371	21085954	0.0014	0.69	np	76.0	119.3	272	393	4	404	4	368
EC17-2 Zr 2	363.8	5.21	170.2	2.48	403.7	25.5	0.01740	15394405	0.0017	0.72	np	43.5	108.7	307	426	4	1066	13	394
EC17-2 Zr 14	137.4	1.99	142.4	2.04	170.9	18.9	0.00865	5957868	0.0032	0.75	nn	47.0	178.2	282	374	3	1040	20	359
EC17-2 Zr 25	300.9	4.33	105.5	1.51	325.7	26.2	0.01453	9998353	0.0026	0.75	pp	47.7	142.9	249	331	3	1158	11	327
EC17-2 Zr 29	190.0	2.71	253.3	3.61	249.5	25.6	0.01379	8662311	0.0030	0.76	pp	50.2	146.0	281	369	3	1048	21	355
EC17-2 Zr 36	293.9	4.22	120.6	1.76	322.3	29.7	0.01938	13239530	0.0022	0.75	np	48.6	117.9	330	442	4	1028	13	409
EC17-2 Zr 39	364.5	5.23	74.9	1.10	382.1	29.9	0.01949	12299843	0.0024	0.71	nn	38.2	206.9	260	368	4	1021	14	351
EC17-2 Zr 40	381.0	5.44	157.9	2.27	418.1	29.0	0.01828	14251120	0.0020	0.69	nn	36.4	190.4	275	397	3	1067	12	371
EC17-2 Zr 53	515.8	7.42	247.7	3.53	574.0	38.5	0.01884	21058556	0.0018	0.69	nn	35.8	177.1	296	431	4	1069	15	394
EC17-2 Zr 100	101.5	1.49	60.3	0.87	115.6	7.6	0.00666	3718990	0.0020	0.72	pp	40.9	152.4	260	363	3	1071	18	348
EC17-2 Zr 119	263.7	3.77	40.3	0.58	273.2	21.9	0.02051	10014957	0.0022	0.72	nn	40.4	165.9	296	412	4	1298	16	384
EC17-2 Zr 130	164.1	2.36	86.6	1.24	184.4	25.9	0.01894	7430584	0.0035	0.79	np	58.5	126.1	324	413	4	1169	12	391
EC17-2 Zr 141	280.3	4.01	87.0	1.26	300.8	33.4	0.02326	12141507	0.0028	0.76	np	51.7	127.9	325	426	4	1412	13	399
EC17-2 Zr 160	179.2	2.61	73.7	1.07	196.5	14.2	0.00814	7339411	0.0019	0.72	np	43.1	129.4	301	416	4	1172	11	387
EC17-2 Zr 163	279.3	3.99	86.9	1.28	299.7	26.2	0.06812	11676824	0.0022	0.73	nn	43.3	148.4	314	430	4	1443	10	398
EC17-2 Zr 171	230.5	3.30	73.1	1.05	247.6	16.5	0.00842	7379869	0.0022	0.72	nn	41.1	164.1	242	335	3	1021	14	329
EC17-2 Zr 174	312.4	4.49	84.4	1.24	332.2	14.9	0.02374	9781238	0.0015	0.71	pp	41.7	108.9	239	336	3	1235	12	329
EC17-2 Zr 175	516.3	7.37	134.4	1.93	547.9	57.2	0.03973	19047421	0.0030	0.76	nn	49.5	152.4	281	370	4	1150	16	356
EC17-2 Zr 219	45.1	0.65	18.8	0.27	49.5	8.2	0.00707	2163508	0.0038	0.76	np	47.9	204.1	351	462	5	965	19	426

EC17-2 Zr 226	159.8	2.28	103.4	1.47	184.1	17.2	0.01218	7390932	0.0023	0.76	pp	51.7	108.0	323	427	4	1051	11	399
EC17-2 Zr 251	262.2	3.74	148.6	2.18	297.1	22.3	0.01078	12037135	0.0018	0.68	np	34.9	188.6	326	478	4	1162	17	425
EC17-2 Zr 255	61.6	0.89	31.8	0.45	69.0	7.6	0.01579	2347742	0.0032	0.79	np	62.3	103.6	275	349	4	1162	20	341
EC17-2 Zr 273	82.2	1.20	17.7	0.27	86.3	5.6	0.00993	2870279	0.0019	0.74	pp	46.4	112.0	269	365	4	1077	13	351
EC17-2 Zr 284	166.3	2.41	137.0	1.98	198.4	9.2	0.00550	5822826	0.0016	0.71	nn	41.1	116.8	238	335	3	1031	15	328
EC17-2 Zr 306	141.6	2.10	81.6	1.18	160.8	11.4	0.00777	5765954	0.0020	0.74	np	48.6	104.0	289	390	4	1066	14	370
EC17-3 Zr 32	350.1	5.01	78.2	1.13	368.5	38.4	0.02851	11516774	0.0033	0.77	nn	53.2	146.1	253	327	3	1171	15	324
EC17-3 Zr 40	74.4	1.08	50.1	0.73	86.1	4.8	0.00888	3155185	0.0015	0.72	np	43.9	96.8	296	411	4	1052	25	383
EC17-3 Zr 116	231.3	3.33	92.2	1.34	253.0	19.5	0.04597	10502455	0.0019	0.72	nn	43.3	122.8	334	461	4	1179	16	420
EC17-3 Zr 138	46.7	0.68	43.7	0.63	57.0	8.5	0.00812	1761448	0.0048	0.79	nn	54.8	200.1	250	318	3	1065	21	317
EC17-3 Zr 159	242.4	3.49	95.3	1.36	264.8	27.6	0.00963	9835277	0.0028	0.76	nn	48.8	146.4	299	396	4	1049	15	376
EC17-3 Zr 162	150.9	2.16	26.9	0.38	157.2	26.0	0.01512	5324821	0.0049	0.77	nn	50.8	235.0	273	353	4	1287	16	344
EC17-3 Zr 166	49.2	0.73	22.8	0.40	54.6	3.5	0.00589	2804587	0.0013	0.69	pp	38.0	108.0	410	596	5	1049	23	507
EC17-3 Zr 169	183.4	2.61	95.3	1.36	205.8	26.2	0.01340	8874080	0.0029	0.74	nn	45.1	180.4	346	465	4	1181	15	426
EC17-3 Zr 203	122.9	1.79	38.6	0.55	132.0	13.1	0.00765	4077428	0.0032	0.76	np	48.8	167.8	250	329	3	1171	16	325
EC17-3 Zr 218	148.9	2.12	58.7	0.84	162.7	16.1	0.00653	5256353	0.0031	0.74	np	43.5	201.0	261	354	3	1052	20	343
EC17-3 Zr 225	186.9	2.67	186.8	2.65	230.8	13.4	0.01015	7644125	0.0018	0.71	np	41.1	129.2	268	375	3	1050	12	357
EC17-3 Zr 227	284.2	4.06	66.9	0.95	299.9	30.1	0.02690	12249470	0.0025	0.75	np	49.5	124.6	328	436	4	1415	16	405
EC17-3 Zr 229	174.9	2.49	96.4	1.37	197.5	15.0	0.01162	6239117	0.0024	0.72	np	40.2	184.6	256	356	3	1064	18	344
EC17-3 Zr 245	280.3	4.09	124.6	1.80	309.6	26.0	0.02170	10346111	0.0025	0.75	np	48.8	130.7	270	359	4	1042	15	347
EC17-3 Zr 276	203.6	2.91	121.1	1.73	232.1	20.1	0.01159	9471416	0.0021	0.73	pp	44.2	135.4	328	449	4	1047	15	412
EC17-3 Zr 307	64.8	0.93	58.2	0.83	78.4	9.9	0.00734	3430193	0.0029	0.73	nn	42.0	204.5	351	481	4	1068	23	435
SL17-5 Zr 11	125.7	1.83	74.7	1.07	143.2	18.4	0.01449	6238579	0.0029	0.75	nn	47.3	163.7	350	465	4	1194	13	427
SL17-5 Zr 30	78.3	1.15	100.2	1.43	101.9	9.7	0.00821	4476899	0.0022	0.75	nn	50.1	106.7	353	471	4	1663	14	431
SL17-5 Zr 47	55.4	0.80	41.3	0.59	65.1	7.4	0.00578	2772532	0.0027	0.75	nn	47.9	144.0	342	455	4	1097	21	420
SL17-5 Zr 54	121.8	1.75	51.4	0.74	133.9	12.7	0.01295	6521788	0.0019	0.74	np	47.9	104.9	390	526	5	1009	15	471
SL17-5 Zr 55	62.0	0.88	30.4	0.44	69.2	9.0	0.01205	3304525	0.0027	0.74	np	43.9	174.3	382	518	5	1043	21	464
SL17-5 Zr 58	88.0	1.26	61.1	0.88	102.4	23.2	0.01393	10693868	0.0022	0.74	nn	46.4	125.0	805	1088	9	1290	16	886
SL17-5 Zr 65	126.9	1.86	112.6	1.61	153.4	24.3	0.03387	16173099	0.0015	0.68	nn	35.8	145.8	813	1192	10	1063	18	912
SL17-5 Zr 74	215.9	3.13	78.3	1.12	234.3	36.6	0.02289	19763273	0.0018	0.70	np	38.6	153.7	657	934	8	1049	14	750
SL17-5 Zr 91	148.0	2.11	79.5	1.14	166.7	16.7	0.00829	6684104	0.0025	0.73	np	42.0	175.8	323	444	4	1172	14	408
SL17-5 Zr 109	95.7	1.39	63.3	0.95	110.6	9.5	0.00752	5985286	0.0016	0.72	np	42.6	108.5	431	603	5	2365	8	520
SL17-5 Zr 178	103.8	1.48	95.8	1.37	126.3	12.5	0.00586	5918287	0.0021	0.73	nn	42.6	143.8	376	518	4	462	6	461
SL17-5 Zr 182	87.8	1.25	28.5	0.42	94.5	9.5	0.00528	3996560	0.0024	0.73	np	41.7	170.3	340	468	4	1153	11	425
SL17-5 Zr 194	60.4	0.94	31.1	0.45	67.7	6.5	0.00542	2529250	0.0026	0.73	nn	43.5	169.0	301	410	4	1026	19	384
SL17-5 Zr 195	149.4	2.21	151.9	2.19	185.1	16.1	0.00747	6623149	0.0024	0.76	np	50.4	118.8	289	383	3	1177	14	365
SL17-5 Zr 196	71.5	1.03	61.6	0.89	85.9	7.4	0.00742	3794332	0.0020	0.73	nn	44.8	120.8	355	485	4	454	3	438
SL17-5 Zr 202	63.8	0.94	28.9	0.42	70.6	7.3	0.00603	2714756	0.0027	0.74	nn	45.7	159.5	310	416	4	2878	12	390
SL17-5 Zr 205	97.2	1.43	41.1	0.61	106.8	10.2	0.00689	4279708	0.0024	0.71	nn	39.5	188.6	322	451	4	1123	19	411

SL17-5 Zr 206	59.4	0.87	19.4	0.30	64.0	8.3	0.00763	2546235	0.0033	0.74	nn	44.2	207.6	320	431	4	1155	14	400
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