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DATA REPOSITORY - *Lithosphere*

Late Miocene upper crustal deformation within the interior of the southern Puna Plateau, central Andes

by Zhou and Schoenbohm

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$^{40}Ar/^{39}Ar$ geochronology Method

The $^{40}Ar/^{39}Ar$ analyses were performed at the USGS in Denver, Colorado. Samples were prepared by crushing and isolating chips approximately $1mm^3$ from fresh rock free of obvious alteration and phenocrysts. The basalt chips were washed in de-ionized water and together with standards, were irradiated for 20 mega watt hours in the central thimble position of the USGS TRIGA reactor using cadmium lining to prevent nucleogenic production of ^{40}Ar. The neutron flux was monitored using Fish Canyon Tuff sanidine, using an age of 28.20 Ma ± 0.08 Ma [*Kuiper et al.* 2008] and isotopic production ratios were determined from irradiated $CaF_2$and KCl salts. For this irradiation, the following production values were measured: $^{(36/37)}Ca = 2.447 \times 10^{-4} \pm .47$; $^{(39/37)}Ca = 6.5 \times 10^{-4} \pm 0.53$; and $^{(38/39)}K = 1.29 \times 10^{-2} \pm 0.01$. The irradiated basalt samples and standards were loaded into 3 mm wells within a stainless steel planchette attached to a fully automated ultra high vacuum extraction line constructed of stainless steel. Samples were incrementally degassed using a 20W CO_2laser equipped with a beam homogenizing lens. The gas was expanded and purified by exposure to a cold finger maintained at $-140^{o}C$ and two hot SAES GP50 getters. Following purification the gas was expanded into a Mass Analyser Products 215-50 mass spectrometer and argon isotopes were measured by peak jumping using an electron multiplier operated in analog mode. Data were acquired during 10 cycles and time zero intercepts were determined by best-fit regressions to the data. Data were corrected for mass discrimination, blanks, radioactive decay subsequent to irradiation, and interfering nucleogenic reactions.

Table DR1. Zircon U-Pb ages from volcanic ash samples, dated by SIMS

sample	grain	238U/206Pb	±	238U/206Pb	207Pb/206Pb	±	207Pb/206Pb	204Pb/206Pb ×1000	±	204Pb/206Pb ×1000	Correlation of Tera-Wasserburg Concordia Ellipses	206Pb/238U age [Ma]	±	206Pb/238U age [Ma]	U ppm	Th ppm	UO+/U+	% 206Pb* radiogenic	% deviation from calibration	remarks
Sample PV11A-04	1	372		16	0.3812		0.0244	30.7		3.8	-0.48	9.98		1.11	469	654	8.5	57.2	0	
	2	667		21	0.0857		0.0058	2.18		1.51	-0.38	9.26		0.32	859	286	9	94.9	0	
	3	631		17	0.0918		0.003	3.88		0.96	-0.05	9.71		0.27	1317	2668	8.7	94.2	0	
	4	585		22	0.1848		0.0083	15.5		3.4	-0.16	9.15		0.45	366	651	8.9	82.3	0	
	5	652		19	0.1051		0.0052	6.17		1.31	-0.4	9.23		0.29	1156	1401	8.8	92.5	0	
	6	709		22	0.0864		0.0042	3.08		1.17	-0.21	8.71		0.29	702	977	9.2	94.9	0.9	
	7	737		22	0.0832		0.0053	3.95		2.04	-0.18	8.41		0.27	292	320	9.5	95.3	3.8	
	8	100		6	0.7388		0.0235	46.2		6.1	0.2	7.42		4.69	53	89	9.7	11.4	0	
	9	656		16	0.0863		0.0031	5.01		1.26	-0.3	9.4		0.25	1079	2013	8.9	94.9	0	
	10	648		24	0.126		0.0122	7.86		3.81	-0.24	9.01		0.41	178	370	9	89.8	0	
	11	702		19	0.0806		0.0054	2.17		1.03	-0.03	8.86		0.25	635	206	9	95.6	0	
	12	645		26	0.0945		0.0081	3.56		1.78	-0.13	9.45		0.42	361	664	9	93.8	0	
	13	658		22	0.1046		0.0101	5.37		1.64	-0.54	9.14		0.36	600	150	8.9	92.5	0	
	14	666		27	0.1204		0.0079	6.5		2.06	-0.27	8.84		0.42	435	296	9.1	90.5	0	
	15	659		24	0.0886		0.0076	2.89		2.17	-0.42	9.33		0.37	309	364	9	94.6	0	
	16	737		16	0.0674		0.0042	1.97		0.98	0.05	8.59		0.2	644	410	9.1	97.3	0	
	17	665		28	0.2021		0.0191	2.2		2.56	-0.29	7.84		0.49	74	58	9.7	80.1	7	
	18	617		29	0.1565		0.0125	8.53		3.02	-0.42	9.06		0.54	247	303	9.2	85.9	1.5	
	19	643		24	0.1096		0.0099	7.36		2.22	-0.14	9.3		0.39	454	488	8.8	91.9	0	
											w.m.	9.01								
											1 s.e.	0.08								
											MSWD	1.7								
											n grains	19								
Sample PV11A-05	1	11.3		0.3	0.0588		0.001	0.178		0.059	0.11	546		13	289	63	8.9	100	0	excluded
	2	693		17	0.092		0.0098	6.98		2.55	-0.37	8.83		0.26	382	220	9.1	94.2	0	
	3	703		18	0.0732		0.0049	1.24		0.75	-0.28	8.94		0.24	754	181	9.1	96.6	0	
	4	688		23	0.0719		0.0047	1.27		0.95	-0.04	9.14		0.32	513	177	9.1	96.7	0	
	5	681		17	0.074		0.0039	3.22		1.06	-0.38	9.21		0.25	993	410	8.9	96.4	0	
	6	2.31		0.05	0.177		0.0005	0.028		0.0114	0.01	2207		47	233	590	9.2	94.3	1.6	excluded
	7	15.5		0.6	0.0592		0.0016	0.302		0.139	-0.17	400		16	118	63	9.1	99.4	0	excluded
	8	683		19	0.0756		0.0073	3.28		1.82	-0.21	9.16		0.27	425	869	9	96.2	0	
	9	4.59		0.36	0.0716		0.0031	b.d.		b.d.	0.05	1290		91	103	52	8.5	101.6	0	excluded
	10	637		20	0.1279		0.0089	5.4		2.08	-0.06	9.15		0.35	415	667	9	89.6	0	
	11	692		37	0.0917		0.0131	7.19		3.6	-0.38	8.86		0.53	190	236	9.2	94.2	1.4	
	12	673		23	0.0947		0.0075	3.67		1.6	-0.27	9.07		0.34	481	184	9	93.8	0	

Table DR1. Zircon U-Pb ages from volcanic ash samples, dated by SIMS

sample	grain	238U/206Pb	±	238U/206Pb	207Pb/206Pb	±	207Pb/206Pb	204Pb/206Pb ×1000	±	204Pb/206Pb ×1000	Correlation of Tera-Wasserburg Concordia Ellipses	206Pb/238U age [Ma]	±	206Pb/238U age [Ma]	U ppm	Th ppm	UO+/U+	% 206Pb* radiogenic	% deviation from calibration	remarks
	13	39.9	3.4	0.7774	0.0044		39	2.5			0	10.6		18.6	583	241	8.8	6.5	0	
	14	159	8	0.6418	0.0114		41.3	3.4			-0.1	9.74		2.8	458	239	8.7	23.8	0	
	15	77.6	1.5	0.0608	0.0023		0.664	0.256			-0.19	81.3		1.7	382	142	9	98.3	0	excluded
	16	170	3	0.0676	0.0038		1.55	0.66			-0.17	36.8		0.7	262	110	9.8	97.3	7.2	excluded
	17	669	20	0.1296	0.0132		5.99	2.91			-0.39	8.69		0.34	222	273	9.1	89.3	0.1	
	18	600	31	0.1658	0.0132		6.04	3.13			-0.32	9.18		0.61	189	212	8.8	84.7	0	
	19	567	16	0.1613	0.007		11.1	3.1			0.07	9.78		0.33	322	79	9	85.3	0	
										w.m.		9.09								
										1 s.e.		0.09								
										MSWD		0.6								
										n grains		13								
Sample PV11A-06	1	424	13	0.3411	0.0156		27.9	4			0.03	9.56		0.56	399	182	8.9	62.3	0	
	2	582	23	0.1602	0.0156		9.24	3.32			-0.42	9.54		0.51	235	78	9	85.4	0	
	3	137	4	0.6637	0.01		43.6	3.5			-0.17	9.98		2.25	379	186	8.7	21	0	
	4	664	21	0.0784	0.0063		0.543	0.544			-0.36	9.39		0.32	581	551	9.1	95.9	0	
	5	614	170	0.1146	0.0222		6.03	1.95			-0.07	9.66		2.94	517	354	9.4	91.3	3.6	
	6	720	30	0.0847	0.0106		3.02	1.56			-0.44	8.6		0.4	369	163	9.5	95.1	4.8	
	7	593	15	0.1562	0.0091		16	3.1			-0.43	9.43		0.32	518	269	8.9	85.9	0	
	8	653	21	0.0785	0.0045		1.18	0.89			-0.06	9.55		0.32	470	446	9	95.9	0	
	9	651	20	0.0845	0.0052		1.45	1.1			-0.25	9.49		0.31	357	157	9	95.1	0	
	10	709	18	0.0758	0.0047		3.19	1.55			0.08	8.83		0.24	455	219	9.2	96.2	0.9	
	11	693	18	0.0623	0.003		1.93	1.17			-0.26	9.19		0.25	758	467	9	97.9	0	
	12	54.4	4.7	0.7722	0.0145		50	3.3			0.01	8.57		13.97	299	175	8.6	7.2	0	
	13	739	35	0.1116	0.0238		4.76	2.46			-0.47	8.08		0.5	249	144	9.5	91.6	4.8	
	14	646	21	0.0969	0.0062		3.49	1.49			-0.04	9.41		0.33	497	260	8.9	93.5	0	
	15	495	18	0.2396	0.0199		13.3	2.7			-0.48	9.89		0.63	508	584	8.9	75.3	0	
	16	577	24	0.1751	0.0164		14	4.4			-0.11	9.41		0.53	203	78	9	83.5	0	
	17	673	25	0.0985	0.0089		4.12	1.93			-0.45	9.02		0.38	390	156	9	93.3	0	
	18	619	17	0.1914	0.0152		10.9	3.1			0.13	8.56		0.34	347	316	9.5	81.4	4.2	
	19	654	13	0.0794	0.0054		4.46	1.37			-0.28	9.51		0.21	842	1185	9	95.8	0	
	20	524	21	0.2587	0.0282		11.7	3			-0.54	9.03		0.72	353	172	9	72.8	0	
										w.m.		9.22								
										1 s.e.		0.08								
										MSWD		1.1								
										n grains		20								

Table DR1. Zircon U-Pb ages from volcanic ash samples, dated by SIMS

sample	grain	238U/ 206Pb	±	238U/ 206Pb	207Pb/ 206Pb	±	207Pb/ 206Pb	204Pb/ 206Pb ×1000	±	204Pb/ 206Pb ×1000	Correlation of Tera-Wasserburg Concordia Ellipses	206Pb/ 238U age [Ma]	±	206Pb/ 238U age [Ma]	U ppm	Th ppm	UO+/ U+	% 206Pb* radiogenic	% deviation from calibration	remarks
Sample PV11A-07	1	483		17	0.2273		0.0139	48.3		8.3	-0.26	10.3		0.5	190	90	8.4	76.8	-0.5	
	2	11.8		0.4	0.0595		0.001	0.152		0.088	-0.04	523		16	95	77	8.9	99.8	0	excluded
	3	427		13	0.2402		0.0081	55.4		7.5	0.16	11.4		0.5	257	77	8.6	75.2	0	excluded
	4	669		18	0.0569		0.0036	2.13		1.23	-0.07	9.59		0.27	394	276	8.8	98.6	0	
	5	626		25	0.1183		0.0144	18.95		6.02	-0.55	9.43		0.47	136	231	8.9	90.8	0	
	6	677		24	0.0736		0.0066	5.19		2.77	-0.26	9.27		0.35	195	193	8.9	96.5	0	
	7	238		7	0.0937		0.0059	4.35		1.24	0.65	25.4		0.8	305	240	8.7	94	0	excluded
	8	1663		73	0.1225		0.018	13		7.5	-0.25	3.59		0.19	175	226	8.8	90.2	0	excluded
	9	734		25	0.0723		0.0069	2.58		1.82	-0.21	8.57		0.31	223	301	9.2	96.7	1.5	
	10	679		19	0.0633		0.0042	4.5		2.01	-0.09	9.36		0.26	324	438	9	97.8	0	
	11	117		4	0.6877		0.0079	49.6		4.1	-0.05	10		2.5	240	255	8.4	18	0	
	12	28		1	0.2297		0.0017	11.8		0.3	-0.11	172		6	1314	239	9.2	76.9	1.4	excluded
	13	437		18	0.3382		0.0131	46.7		7.3	0.17	9.32		0.67	186	104	8.6	62.7	0	
	14	649		30	0.0816		0.0104	18.7		6.7	-0.26	9.56		0.48	120	87	8.9	95.5	0	
	15	555		21	0.1577		0.0145	17.5		5	0.05	10		0.5	188	318	8.5	85.7	0	
	16	11.6		0.4	0.0592		0.0006	0.23		0.09	0.02	533		16	138	71	8.7	99.9	0	excluded
	17	621		25	0.1087		0.0053	6.48		2.23	-0.12	9.64		0.43	380	532	8.6	92	0	
	18	42.6		1.2	0.1082		0.0024	0.295		0.148	0.05	138		4	241	180	8.9	92.4	0	excluded
	19	25.2		0.6	0.1166		0.0007	3.68		0.16	-0.1	230		6	2346	391	9.1	91.5	0	excluded
	20	622		19	0.0892		0.0058	15.9		4.5	-0.02	9.87		0.33	233	138	8.5	94.5	0	
	21	435		24	0.3089		0.021	35.2		6	-0.32	9.92		0.99	190	97	8.5	66.4	0	
	22	683		31	0.0711		0.0071	1.33		1.33	0.12	9.22		0.43	209	86	8.8	96.8	0	
	23	387		26	0.3208		0.034	35.3		5.7	-0.49	10.9		1.6	175	100	8.6	64.9	0	
	24	623		14	0.0875		0.0079	12.2		3.8	-0.17	9.89		0.26	235	184	8.6	94.7	0	
	25	12.8		0.7	0.0573		0.0026	0.212		0.161	-0.14	484		26	44	29	8.8	99.9	0	excluded
											w.m.	9.51								
											1 s.e.	0.1								
											MSWD	1.2								
											n grains	16								
Sample PV11A-22	1	750		21	0.0627		0.0038	1.18		0.83	-0.2	8.49		0.25	501	277	9.1	97.9	0	
	2	652		18	0.0674		0.0037	7.4		1.65	0.08	9.7		0.27	774	380	8.8	97.3	0	
	3	616		15	0.078		0.006	18.5		4.2	-0.06	10.1		0.3	433	23	8.7	95.9	0	excluded
	4	697		18	0.0515		0.0024	0.467		0.282	-0.09	9.27		0.24	1764	926	8.9	99.3	0	
	5	646		22	0.0668		0.0033	5.36		1.08	-0.37	9.8		0.35	1318	502	8.8	97.4	0	excluded
	6	659		16	0.057		0.0027	3.17		1.06	0.09	9.73		0.24	899	286	8.6	98.6	0	excluded
	7	283		9	0.0526		0.0019	1		0.4	0.05	22.7		0.7	858	743	8.5	99.2	0	excluded

Table DR1. Zircon U-Pb ages from volcanic ash samples, dated by SIMS

sample	grain	238U/206Pb	±	238U/206Pb	±	207Pb/206Pb	±	207Pb/206Pb	±	204Pb/206Pb ×1000	±	204Pb/206Pb ×1000	±	Correlation of Tera-Wasserburg Concordia Ellipses	206Pb/238U age [Ma]	±	206Pb/238U age [Ma]	±	U ppm	Th ppm	UO+/U+	% 206Pb* radiogenic	% deviation from calibration	remarks
	8	708		16		0.0566		0.004		0.732		0.517		-0.06	9.06		0.22		804	108	9	98.7	0	
	9	699		18		0.0534		0.0018		0.438		0.327		-0.12	9.22		0.24		1445	93	8.8	99.1	0	
	10	320		12		0.4889		0.0139		36.5		6.9		0.01	8.82		0.94		105	104	9	43.4	0	
	11	740		19		0.0507		0.0023		b.d.		b.d.		0.02	8.74		0.22		1476	210	9.2	99.4	0.9	
	12	699		15		0.049		0.0022		1.07		0.46		-0.08	9.27		0.2		1489	158	8.8	99.6	0	
	13	560		13		0.0497		0.0024		1.16		0.42		0.35	11.5		0.3		1774	25	8.6	99.6	0	excluded
	14	635		15		0.0855		0.0041		7.25		1.89		-0.16	9.73		0.25		652	594	8.6	95	0	excluded
	15	644		23		0.0741		0.0076		4.26		1.38		-0.6	9.74		0.38		626	483	8.9	96.4	0	excluded
	16	115		4		0.6947		0.006		42.5		2.6		0.08	9.63		2.53		587	288	8.9	17.1	0	
	17	662		20		0.047		0.0023		0.62		0.341		-0.12	9.81		0.29		1844	57	8.8	99.9	0	excluded
	18	690		19		0.0505		0.002		0.786		0.454		-0.18	9.37		0.26		1186	55	8.7	99.5	0	
	19	723		26		0.0524		0.0026		0.357		0.357		0.13	8.93		0.32		884	49	8.8	99.2	0	
	20	445		8		0.287		0.0071		16.7		1.3		-0.03	10.1		0.3		1805	352	9	69.2	0	excluded
	21	698		19		0.0537		0.0022		1.79		0.71		0.47	9.23		0.25		1186	63	8.6	99	0	
	22	738		17		0.0537		0.0023		0.343		0.343		-0.27	8.73		0.21		960	74	9.2	99	1.4	
	23	669		17		0.0509		0.002		0.197		0.197		0.01	9.66		0.25		1492	28	8.7	99.4	0	
	24	711		19		0.055		0.0026		1.13		0.68		-0.31	9.05		0.25		801	18	8.9	98.9	0	
	25	595		16		0.1114		0.0057		9.77		2.11		-0.3	10		0.3		596	327	8.6	91.7	0	excluded
														w.m.	9.11									
														1 s.e.	0.07									
														MSWD	1.8									
														n grains	15									
Sample PV11A-61	1	147		7		0.6701		0.0084		40.9		4.4		0.09	8.96		2.46		193	299	8.8	20.2	0	
	2	552		27		0.1696		0.0164		13		2.9		-0.51	9.92		0.66		426	267	8.5	84.2	0	
	3	546		23		0.209		0.012		15.7		3.5		-0.43	9.42		0.57		475	506	8.7	79.2	0	
	4	376		11		0.3916		0.0097		26.3		3.7		0.11	9.65		0.58		430	659	8.5	55.8	0	
	5	680		18		0.0652		0.0034		1.94		0.79		-0.03	9.33		0.26		1028	1741	8.8	97.6	0	
	6	552		24		0.2163		0.0208		10.6		3.4		-0.48	9.22		0.63		269	208	8.6	78.3	0	
	7	26.5		0.6		0.0633		0.0015		1.12		0.2		-0.33	235		5		311	232	9.4	98.4	-4.1	excluded
	8	624		19		0.1209		0.006		6.69		1.78		-0.26	9.42		0.33		846	2181	8.8	90.5	0	
	9	710		20		0.0744		0.0042		3.37		1.51		-0.12	8.83		0.25		481	176	8.9	96.4	0	
	10	650		20		0.122		0.0052		7.78		1.82		-0.16	9.04		0.31		721	1084	8.8	90.3	0	
	11	646		19		0.1396		0.0051		7.52		1.98		0.1	8.87		0.3		538	1099	9.3	88.1	1.8	
	12	215		8		0.0995		0.0068		2.7		1.56		-0.22	28		1.1		95	35	9.1	93.2	0.4	excluded
	13	643		19		0.1249		0.0107		6.38		2.78		-0.23	9.1		0.33		245	107	8.8	89.9	0	
	14	407		15		0.3657		0.0116		29.6		4.2		-0.2	9.46		0.7		425	588	8.5	59.2	0	

Table DR1. Zircon U-Pb ages from volcanic ash samples, dated by SIMS

sample	grain	238U/206Pb	±	238U/206Pb	±	207Pb/206Pb	±	207Pb/206Pb	±	204Pb/206Pb ×1000	±	204Pb/206Pb ×1000	Correlation of Tera-Wasserburg Concordia Ellipses	206Pb/238U age [Ma]	±	206Pb/238U age [Ma]	±	U ppm	Th ppm	UO+/U+	% 206Pb* radiogenic	% deviation from calibration	remarks
	15	651	22	0.1401	0.0194	6.515	3.508		-0.16	8.8	0.42	177	254	8.8	88	0	
	16	5.42	0.15	0.0747	0.0006	0.109	0.052		0.04	1093	28	100	20	8.7	100.2	0	excluded
	17	598	17	0.1375	0.01	7.53	2		-0.31	9.6	0.35	545	811	8.7	88.3	0	
	18	18.2	0.5	0.0538	0.0005	0.048	0.021		-0.11	344	9	842	596	8.9	99.9	0	excluded
	19	27.1	0.6	0.0703	0.001	1.22	0.14		-0.21	228	5	697	269	9.3	97.5	2	excluded
	20	513	34	0.3127	0.0287	25.5	5.8		-0.45	8.36	1.1	171	221	8.9	65.9	0	
								w.m.		9.17							
								1 s.e.		0.1							
								MSWD		0.7							
								n grains		15							
Sample PV11A-72	1	466	20	0.2384	0.015	26.9	7.1		0.09	10.5	0.6	123	102	8.7	75.4	0	
	2	359	12	0.3391	0.0164	22.3	4.6		-0.12	11.3	0.8	197	293	8.5	62.6	0	
	3	11.8	0.3	0.0609	0.0013	0.428	0.147		-0.07	522	15	104	72	8.9	99.6	0	excluded
	4	606	24	0.0848	0.0111	2.16	2.16		0.09	10.2	0.4	129	133	8.8	95.1	0	
	5	12.5	0.5	0.0658	0.0009	0.161	0.054		-0.09	490	20	309	68	8.6	98.9	0	excluded
	6	10.8	0.7	0.0602	0.0019	1.05	0.28		-0.07	568	34	77	28	8.3	99.8	-1	excluded
	7	66.8	2.5	0.0776	0.0052	7.78	1.67		-0.25	92.3	3.6	110	91	8.7	96.2	0	excluded
	8	600	33	0.1182	0.0085	8.77	3.67		0.16	9.8	0.6	174	157	8.7	90.8	0	
								w.m.		10.33							
								1 s.e.		0.29							
								MSWD		0.8							
								n grains		4							
Sample PV10A-01	1	664	22	0.0613	0.009	1.92	1.92		0.1	9.6	0.33	308	176	6.9	98.1	0	
	2	696	26	0.068	0.0057	2.73	1.93		0.1	9.08	0.35	390	612	7.1	97.2	0	
	3	112	7	0.0575	0.0023	0.845	0.439		-0.01	56.6	3.6	484	117	6.7	98.7	0	excluded
	4	5.85	0.17	0.0725	0.0006	0.022	0.019		0.04	1018	28	306	48	6.9	100.1	0	excluded
	5	719	21	0.0527	0.0032	1.499	0.866		-0.04	8.97	0.27	1348	1136	6.9	99.2	0	
	6	25.8	1.2	0.808	0.012	51.9	3.5		0.05	6.59	15.33	379	571	6.9	2.6	0	
	7	18.8	0.7	0.0534	0.0019	0.169	0.168		-0.07	333	12	101	27	6.9	100	0	excluded
	8	22.5	0.6	0.0527	0.0016	0.209	0.16		0.07	280	7	162	97	7	99.9	0	excluded
	9	706	21	0.0514	0.0032	0.593	0.594		-0.12	9.15	0.27	1000	659	7.1	99.3	0	
	10	674	21	0.0529	0.0045	-	-		0.18	9.56	0.3	931	159	7	99.1	0	
	11	21.9	0.8	0.0526	0.001	0.102	0.078		0.03	288	10	336	159	7.2	99.9	0	excluded
	12	732	25	0.0564	0.0052	0.696	0.696		0.08	8.77	0.3	886	164	7.2	98.7	0.5	
	13	672	21	0.0577	0.0061	5.82	2.7		0.17	9.53	0.31	742	898	7.1	98.5	0	

Table DR1. Zircon U-Pb ages from volcanic ash samples, dated by SIMS

sample	grain	238U/206Pb	±	238U/206Pb	207Pb/206Pb	±	207Pb/206Pb	204Pb/206Pb ×1000	±	204Pb/206Pb ×1000	Correlation of Tera-Wasserburg Concordia Ellipses	206Pb/238U age [Ma]	±	206Pb/238U age [Ma]	U ppm	Th ppm	UO+/U+	% 206Pb* radiogenic	% deviation from calibration	remarks
	14	15.6	0.4	0.0551	0.0009		0.007	0.013			0.01	402	11	488	72	7.2	100	0.4	excluded
	15	651	23	0.0639	0.0047		6.44	2.01			0.22	9.76	0.36	952	175	7.1	97.7	0	
	16	711	25	0.0557	0.0037		1.34	1			-0.3	9.03	0.33	809	162	7.3	98.8	0.9	
	17	699	19	0.0575	0.0043		1.84	0.89			0	9.17	0.25	1281	218	7.3	98.6	1.7	
	18	651	26	0.0625	0.0039		1.46	1.03			0.01	9.78	0.39	903	181	7.1	97.9	0	
	19	14.1	0.3	0.057	0.0009		0.015	0.018			-0.02	442	11	517	143	7.4	99.8	2.8	excluded
	20	295	8	0.0514	0.0031		1.08	0.66			-0.14	21.8	0.6	589	64	7.3	99.4	1.3	excluded
											w.m.	9.27							
											1 s.e.	0.09							
											MSWD	1							
											n grains	12							
Sample PV10A-02	1	711	23	0.0552	0.0036		1.29	0.91			-0.15	9.05	0.29	1011	150	6.9	98.9	0	
	2	20.6	0.8	0.0755	0.0025		1.22	0.4			-0.07	297	12	146	104	6.9	97	0	excluded
	3	671	18	0.0495	0.0031		0.431	0.431			0.04	9.64	0.26	1307	213	6.9	99.6	0	excluded
	4	747	32	0.0845	0.0115		11	6.5			-0.21	8.29	0.39	154	77	7.1	95.1	0	
	5	680	19	0.0525	0.002		0.266	0.234			-0.02	9.48	0.26	2698	4778	7	99.2	0	excluded
	6	802	29	0.0627	0.0078		8.08	4.67			0.17	7.95	0.3	230	146	7.2	97.9	0.2	
	7	644	24	0.0645	0.0029		17.1	3			-0.14	9.86	0.37	1136	199	6.8	97.7	0	excluded
	8	465	15	0.0586	0.003		0.941	0.69			0.26	13.7	0.4	840	156	6.8	98.4	0	excluded
	9	693	28	0.0621	0.0069		7.16	3.3			0.51	9.19	0.38	395	414	6.9	98	0	excluded
	10	685	19	0.0635	0.0033		2.28	1.14			-0.12	9.28	0.27	1068	225	6.9	97.8	0	excluded
	11	801	20	0.0521	0.0034		1.34	0.98			0.14	8.07	0.2	1192	954	7.6	99.2	5.4	
	12	20	1	0.0551	0.0016		0.061	0.061			0.15	314	8	258	114	7.4	99.7	2.6	excluded
	13	673	25	0.0558	0.0035		1.21	0.85			-0.03	9.54	0.35	982	414	7.2	98.8	0	excluded
	14	752	24	0.0599	0.0051	-		-			-0.03	8.5	0.28	504	442	7.3	98.3	1.5	
	15	664	24	0.0573	0.0068		3.42	2.42			0.24	9.65	0.36	401	223	7	98.6	0	excluded
											w.m.	8.32							
											1 s.e.	0.12							
											MSWD	2.4							
											n grains	5							
Sample PV10A-03	1	609	12	0.0493	0.0013		0.188	0.109			-0.05	10.6	0.2	6578	3007	7.4	99.6	3.4	excluded
	2	688	20	0.0724	0.0066		5.54	3.2			-0.03	9.13	0.29	244	121	7.3	96.6	1.4	
	3	591	18	0.0597	0.0027		1.15	0.66			0.04	10.8	0.3	1325	443	6.8	98.3	0	excluded
	4	601	17	0.0492	0.0019		0.979	0.438			0.01	10.8	0.3	2583	826	6.9	99.6	0	excluded
	5	665	23	0.0581	0.0076		10.7	4			0.5	9.63	0.35	346	208	7	98.5	0	

Table DR1. Zircon U-Pb ages from volcanic ash samples, dated by SIMS

sample	grain	238U/ 206Pb	±	238U/ 206Pb	207Pb/ 206Pb	±	207Pb/ 206Pb	204Pb/ 206Pb ×1000	±	204Pb/ 206Pb ×1000	Correlation of Tera-Wasserburg Concordia Ellipses	206Pb/ 238U age [Ma]	±	206Pb/ 238U age [Ma]	U ppm	Th ppm	UO+/ U+	% 206Pb* radiogenic	% deviation from calibration	remarks
	6	647	18	0.0592	0.0056		1.05	0.63			0.19	9.88	0.29		1510	401	7	98.3	0	
	7	639	23	0.0725	0.0102		1.46	1.46			0.41	9.82	0.39		387	146	6.8	96.6	0	
	8	620	23	0.049	0.0032		1.1	0.78			0.02	10.4	0.4		917	520	6.9	99.6	0	
	9	620	19	0.0573	0.0039		0.477	0.477			-0.14	10.3	0.3		1206	598	6.9	98.6	0	
	10	657	19	0.0481	0.0034	-		-			0.12	9.87	0.29		1374	401	7.2	99.8	0.5	
	11	668	16	0.0475	0.0015		0.348	0.201			0.26	9.71	0.24		4478	2318	7.4	99.8	2.7	
	12	604	17	0.0511	0.0023		1.09	0.49			-0.2	10.7	0.3		2287	756	7.2	99.4	0.1	excluded
	13	588	18	0.0706	0.0031		2.27	0.76			-0.17	10.7	0.3		2184	811	7.2	96.9	0	excluded
	14	645	17	0.0498	0.0028	-		-			0.06	10	0.3		1747	587	7.4	99.5	2.4	
	15	680	21	0.0563	0.0038		0.193	0.358			-0.14	9.44	0.3		793	618	7.2	98.7	0	
										w.m.		9.8								
										1 s.e.		0.1								
										MSWD		1.5								
										n grains		10								
Sample PV10A-04	1	23	0.7	0.094	0.0024		2.76	0.41			0.13	260	8		313	199	7.2	94.5	0	excluded
	2	5.7	0.52	0.0924	0.0021		0.035	0.014			0.01	1017	89		907	94	6.8	97.4	0	excluded
	3	111	7	0.685	0.029		46.6	8.4			0.16	10.7	4.9		87	73	6.7	18.3	0	
	4	666	23	0.0691	0.0051		19	4.6			0.09	9.48	0.34		621	533	6.8	97.1	0	
	5	649	27	0.0817	0.0082		13.8	5.5			0	9.56	0.43		256	263	6.9	95.5	0	
	6	37230	4740	0.921	0.128		156	92			-0.01	0.07	0.04		464	142	7.4	-11.9	2.5	excluded
	7	19.5	0.4	0.0706	0.0044		1.83	0.33			0.07	315	7		383	130	7.1	97.7	0	excluded
	8	1655	161	0.815	0.036		54.6	10.6			-0.06	0.15	0.58		747	232	7	1.7	0	excluded
	9	3.62	0.11	0.0969	0.0005		0.022	0.013			0.03	1572	44		439	130	7	100	0	excluded
	10	657	23	0.0794	0.0095		6.3	4.46			-0.03	9.47	0.36		180	134	7.1	95.8	0	
	11	612	30	0.15	0.014		5.53	3.19			0.04	9.22	0.55		304	218	7.1	86.7	0	
	12	4.54	0.19	0.0816	0.0008		0.057	0.029			-0.01	1287	48		246	34	7.2	100.3	0	excluded
	13	3.4	0.13	0.112	0.001		0.063	0.026			-0.01	1639	56		258	176	7.2	98.5	0	excluded
	14	3.56	0.16	0.0977	0.0008		0.071	0.032			0.01	1598	65		227	65	7.2	100.1	0	excluded
	15	409	24	0.318	0.016		21.5	7.2			-0.13	10.4	1		163	101	7	65.3	0	
	16	10.7	0.3	0.0581	0.0005		0.219	0.066			-0.04	576	17		511	157	7	100.1	0	
	17	537	53	0.158	0.022		36.8	26			0.39	10.4	1.2		464	312	7.1	85.7	0	excluded
	18	412	28	0.32	0.024		37.3	5.6			-0.38	10.2	1.3		562	555	7.1	65	0	
	19	409	18	0.307	0.012		22.9	3.9			-0.12	10.6	0.8		637	561	7	66.6	0	
	20	590	15	0.0531	0.0026		3.19	0.85			-0.07	10.9	0.3		2031	590	7.4	99.1	2.5	excluded
										w.m.		9.59								
										1 s.e.		0.19								

Table DR1. Zircon U-Pb ages from volcanic ash samples, dated by SIMS

sample	grain	238U/206Pb	±	238U/206Pb	±	207Pb/206Pb	±	207Pb/206Pb	±	204Pb/206Pb ×1000	±	204Pb/206Pb ×1000	Correlation of Tera-Wasserburg Concordia Ellipses	206Pb/238U age [Ma]	±	206Pb/238U age [Ma]	±	U ppm	Th ppm	UO+/U+	% 206Pb* radiogenic	% deviation from calibration	remarks
													MSWD	0.4									
													n grains	9									
Sample PV10A-05	1	585	17	0.0512	0.0021	0.166	0.197						0	11		0.3		2067	212	6.9	99.4	0	
	2	423	17	0.206	0.008	30.8	6						-0.09	12.2		0.7		345	118	6.6	79.6	-1.1	excluded
	3	626	26	0.0725	0.0063	-	-						-0.15	10		0.4		346	219	6.7	96.6	0	
	4	658	28	0.0614	0.0069	1.38	1.63						0.14	9.68		0.43		263	50	7	98.1	0	
	5	617	28	0.0753	0.0108	-	-						0.02	10.1		0.5		181	28	6.9	96.3	0	
	6	645	27	0.0579	0.0056	1.7	1.7						-0.16	9.92		0.43		316	58	7	98.5	0	
	7	629	21	0.0503	0.0045	0.924	0.924						-0.05	10.3		0.4		580	127	6.9	99.5	0	
	8	613	21	0.0482	0.0041	0.95	0.95						0.14	10.6		0.4		514	300	7.1	99.8	0	
	9	585	26	0.0911	0.008	7.99	3.58						-0.1	10.5		0.5		257	110	7	94.3	0	
	10	57.2	6.1	0.756	0.019	56.5	6.4						-0.04	10.5		17		128	68	6.4	9.3	-10.6	excluded
	11	686	60	0.063	0.0064	-	-						-0.16	9.27		0.83		277	83	7.5	97.9	3.5	
	12	641	33	0.0805	0.0127	7.12	7.12						0.31	9.7		0.54		118	43	7.4	95.6	2.1	
	13	608	21	0.0616	0.0061	0.674	0.801						-0.19	10.5		0.4		539	315	7.1	98	0	
	14	636	32	0.0649	0.0068	-	-						0.07	9.97		0.52		301	65	7.2	97.6	0.3	
	15	667	23	0.0641	0.0071	3.59	2.75						0.34	9.53		0.35		236	65	7.4	97.7	2.9	
	16	643	32	0.0459	0.0063	-	-						0.45	10.1		0.5		348	130	7	100	0	
	17	561	45	0.104	0.014	7.13	7.14						0.45	10.7		0.9		75	26	7.1	92.6	0	
	18	630	36	0.0714	0.0122	-	-						0.1	9.99		0.61		97	33	7.2	96.8	0.2	
	19	611	19	0.0547	0.004	2.91	1.6						0.19	10.5		0.3		613	154	7.2	98.9	0	
	20	669	21	0.0604	0.0053	0.871	0.871						0.2	9.54		0.31		567	229	7.5	98.2	4	
													w.m.	10.1									
													1 s.e.	0.1									
													MSWD	1.3									
													n grains	18									
Sample PV10A-06	1	497	29	0.165	0.016	8.75	5.25						0.29	11.1		0.8		159	56	6.7	84.9	-7.7	excluded
	2	609	40	0.0734	0.0102	9.37	5.41						0.02	10.3		0.7		204	36	6.7	96.5	0	
	3	668	26	0.0674	0.0075	5.27	3.73						-0.07	9.46		0.39		241	79	6.8	97.3	0	
	4	532	25	0.111	0.009	6.37	2.85						-0.03	11.2		0.6		386	116	6.6	91.8	-7.9	excluded
	5	597	26	0.0624	0.0078	-	-						-0.25	10.7		0.5		231	72	6.9	97.9	0	
	6	627	22	0.0681	0.0057	3.54	2.34						0.11	10.1		0.4		348	79	6.9	97.2	0	
	7	601	27	0.0676	0.0062	2.76	2.11						0.15	10.5		0.5		345	61	6.8	97.3	0	
	8	631	25	0.0587	0.0087	1.63	1.63						-0.03	10.1		0.4		336	105	6.8	98.4	0	
	9	614	30	0.0647	0.0084	3.22	3.22						0.29	10.3		0.5		179	59	6.9	97.6	0	

Table DR1. Zircon U-Pb ages from volcanic ash samples, dated by SIMS

sample	grain	238U/206Pb	±	238U/206Pb	±	207Pb/206Pb	±	207Pb/206Pb	±	204Pb/206Pb ×1000	±	204Pb/206Pb ×1000	±	Correlation of Tera-Wasserburg Concordia Ellipses	206Pb/238U age [Ma]	±	206Pb/238U age [Ma]	±	U ppm	Th ppm	UO+/U+	% 206Pb* radiogenic	% deviation from calibration	remarks
	10	628	29	0.0802	0.0096	10.7		5.6		-0.02	9.9	0.48		183	43	6.9	95.7	0						
	11	693	27	0.0527	0.0049	-		-		0.15	9.31	0.37		384	156	7.4	99.2	2.4						
	12	637	28	0.057	0.0069	3.55		2.51		0.44	10.1	0.4		295	73	7.2	98.6	0						
	13	677	22	0.0548	0.0093	3.9		2.99		-0.06	9.5	0.33		282	76	7.4	98.9	3						
	14	581	24	0.0568	0.007	6.07		3.28		-0.03	11	0.5		367	74	6.9	98.7	-0.8						
	15	377	45	0.223	0.039	82.2		31.4		0.2	13.3	2.2		43	18	6.7	77.4	-4.1	excluded					
									w.m.		9.99													
									1 s.e.		0.12													
									MSWD		1.5													
									n grains		12													
Sample PV09A-01	1	10.9	0.4	0.0586	0.0011	0.935		0.208		-0.01	566	19		261	61	7.1	100	0	excluded					
	2	568	22	0.205	0.011	54.8		5.3		-0.35	9.13	0.5		996	677	7.3	79.7	1.2						
	3	659	28	0.0636	0.0069	27.9		7.8		-0.08	9.65	0.42		240	157	7.2	97.8	0.1						
	4	694	43	0.081	0.0127	54.6		22.2		-0.12	8.95	0.6		105	30	7.2	95.6	0.4						
	5	450	19	0.0499	0.0034	2.71		1.36		0.11	14.3	0.6		607	241	7	99.5	0	excluded					
	6	702	30	0.0719	0.0087	24.4		9.1		0.22	8.97	0.41		164	146	7.2	96.7	0						
	7	702	21	0.0558	0.0037	1.64		1.16		0.03	9.15	0.28		773	513	7.2	98.8	0.3						
	8	681	31	0.0827	0.0104	24.1		9.1		0.53	9.11	0.44		153	106	7.3	95.3	1.1						
	9	607	69	0.132	0.031	50.1		23		-0.32	9.53	1.3		100	103	7.1	89	0						
	10	32992	5355	0.403	0.072	406		118		0.31	0.19	0.04		896	279	7.1	54.4	0	excluded					
	11	631	29	0.0816	0.0088	14.7		6.8		0.15	9.84	0.48		225	119	7.1	95.5	0						
	12	690	29	0.0679	0.0076	25.8		7.8		-0.08	9.16	0.4		301	223	7.1	97.2	0						
	13	392	32	0.377	0.028	21.1		6.2		-0.24	9.57	1.69		169	82	7.1	57.7	0						
	14	450	20	0.0598	0.0089	25.7		7.5		0.02	14.1	0.7		198	135	7.1	98.3	0	excluded					
	15	646	33	0.0681	0.0139	9.41		5.2		0.03	9.77	0.54		224	88	7.2	97.2	0						
	16	140	8	0.644	0.014	50.5		5.6		0.04	10.9	3.2		338	357	6.8	23.6	-2.5						
	17	99	8	0.655	0.014	91.8		5.5		-0.07	14.5	6.8		371	166	7	22.1	-0.2	excluded					
	18	641	28	0.0822	0.0082	30		7.9		0.19	9.68	0.4		266	104	7.1	95.4	0						
	19	41999	7003	0.958	0.207	489		238		-0.08	0.06	0.1		350	170	7.2	-16.6	0	excluded					
	20	705	31	0.0555	0.0064	17.8		7.5		-0.19	9.11	0.4		284	194	7.2	98.8	0						
									w.m.		9.3													
									1 s.e.		0.13													
									MSWD		0.4													
									n grains		14													

Table DR1. Zircon U-Pb ages from volcanic ash samples, dated by SIMS

sample	grain	238U/206Pb	±	238U/206Pb	±	207Pb/206Pb	±	204Pb/206Pb ×1000	±	204Pb/206Pb ×1000	Correlation of Tera-Wasserburg Concordia Ellipses	206Pb/238U age [Ma]	±	206Pb/238U age [Ma]	±	U ppm	Th ppm	UO+/U+	% 206Pb* radiogenic	% deviation from calibration	remarks
Sample PV09A-03	1	659	20	0.0498	0.003	0.433		0.433			0.08	9.82		0.29		1422	862	7.2	99.5	0.4	
	2	676	23	0.057	0.0048	-		-			-0.12	9.48		0.32		574	216	7.2	98.6	0.4	
	3	267	18	0.475	0.023	28.7		3.6			-0.3	11		2.2		658	253	7.1	45.1	0	excluded
	4	670	21	0.0468	0.0036	0.835		0.835			0.1	9.69		0.31		773	295	7.2	99.9	0	
	5	678	17	0.05	0.0021	0.665		0.384			0.22	9.54		0.24		2245	2361	7.5	99.5	3.4	
	6	607	24	0.055	0.006	1.93		1.93			-0.15	10.6		0.4		391	129	6.9	98.9	-0.3	
	7	641	18	0.0483	0.0035	0.685		0.685			0	10.1		0.3		645	262	7.3	99.7	0	
	8	622	22	0.053	0.0044	1.54		1.02			0.02	10.4		0.4		934	442	7	99.1	0	
	9	595	24	0.0592	0.0043	0.158		0.293			0.05	10.7		0.4		1005	575	6.9	98.4	-0.4	
	10	665	22	0.0526	0.0045	0.638		0.638			0	9.7		0.32		800	295	7.3	99.2	1	
	11	578	22	0.0477	0.0043	0.592		0.592			-0.12	11.2		0.4		1182	1147	6.9	99.8	-1.6	excluded
	12	7.13	0.26	0.0703	0.0006	0.007		0.007			-0.01	843		29		750	10	7.2	99.6	0	excluded
	13	631	18	0.0669	0.0032	1.55		0.78			0.06	10		0.3		1394	508	7.2	97.4	0	
	14	505	22	0.0603	0.0049	21		4.2			0.38	12.6		0.6		806	355	6.8	98.2	-3.1	excluded
	15	760	21	0.0584	0.0036	0.926		0.655			0	8.43		0.24		1199	394	7.6	98.4	5.1	excluded
										w.m.		9.9									
										1 s.e.		0.1									
										MSWD		1.5									
										n grains		10									
Sample P-Ash-01	1	609.01	24.03	0.05		0					0.03	10.66		0.42		801.83	368.32	8.95	99.98		
	2	624.61	24.34	0.06		0					0	10.21		0.41		627.61	311.78	9.06	98.13		
	3	673.85	28.56	0.06		0					0.05	9.53		0.41		585.18	210.64	8.97	98.67		
	4	618.05	27.04	0.05		0					0.16	10.47		0.46		1146.28	648.27	8.77	99.61		
	5	621.5	25.22	0.05		0					0.03	10.36		0.42		607.26	312.08	8.88	99.18		
	6	609.76	20.41	0.06		0					0.08	10.52		0.36		792.64	396	9.12	98.73		
	7	604.96	23.42	0.06		0					0.16	10.53		0.42		866.6	589.56	9.23	98.16		
	8	596.3	22.05	0.05		0					0.17	10.84		0.4		689.65	305.45	9.06	99.52		
	9	644.75	31.72	0.06		0.01					0.74	9.95		0.49		896.87	549.69	9.04	98.82		
										w.m.		10.36									
										±1s		0.14									
										MSWD		0.9									
										n		9									

Table DR2. Ar/Ar geochronology data

Watts	Relative Isotopic Abundances (x 10^{-14} A)										Derived Results						
	^{40}Ar		^{39}Ar		^{38}Ar		^{37}Ar		^{36}Ar		^{39}Ar Mol	^{39}Ar %	Ca/K		%^{40}Ar*	Age (Ma)	
		±1σ		±1σ		±1σ		±1σ		±1σ	∞ 10^{-14}	of total		±1σ			±1σ
PV11B-01, whole rock, J = .001075 ± 0.000001																	
1.2	98416.69	25.30	1393.84	12.89	107.21	6.04	612.14	6.22	305.402	0.713	0.07	0.69	1.69	0.02	8.39	11.45	0.84
1.5	106955.90	30.08	3256.75	12.38	108.63	6.38	1126.15	6.30	291.142	0.629	0.16	1.62	1.33	0.01	19.71	12.51	0.35
1.8	200057.50	50.64	8912.40	14.62	196.20	6.24	2133.82	6.24	484.914	0.979	0.44	4.44	0.92	0.00	28.52	12.37	0.22
2.1	526346.20	130.25	33709.32	31.33	625.36	6.26	3989.12	6.47	1063.335	1.599	1.65	16.80	0.46	0.00	40.41	12.19	0.13
2.3	344867.10	80.40	42623.15	37.79	634.22	6.13	3072.53	6.59	286.153	0.720	2.09	21.24	0.28	0.00	75.61	11.82	0.04
2.5	151114.60	39.81	19475.98	21.53	246.03	5.98	1804.99	6.34	110.923	0.421	0.95	9.71	0.36	0.00	78.48	11.76	0.04
2.7	101510.00	29.12	14121.94	16.96	187.30	5.97	1537.42	6.19	54.773	0.300	0.69	7.04	0.42	0.00	84.27	11.70	0.04
3.0	124940.30	32.98	18251.62	20.29	259.85	5.98	2452.33	6.59	50.044	0.327	0.89	9.10	0.52	0.00	88.44	11.70	0.03
3.3	93257.39	28.16	13865.62	17.42	203.05	5.91	2620.22	6.67	33.245	0.273	0.68	6.91	0.73	0.00	89.86	11.68	0.03
3.6	54029.72	18.79	8080.46	16.45	128.42	6.31	2775.52	6.37	19.647	0.203	0.40	4.03	1.32	0.00	89.97	11.63	0.04
4.0	34632.32	17.00	5159.72	13.47	62.52	6.38	2354.56	6.45	12.381	0.195	0.25	2.57	1.76	0.01	90.38	11.73	0.05
5.0	49606.43	17.89	7183.52	14.03	113.28	5.84	4965.99	7.13	22.842	0.220	0.35	3.58	2.67	0.01	87.79	11.72	0.04
6.0	28385.63	14.42	4166.29	13.26	63.11	6.45	2793.03	6.56	11.958	0.170	0.20	2.08	2.59	0.01	88.93	11.71	0.05
7.0	57004.40	19.70	8439.83	15.13	132.98	5.85	7003.05	8.07	23.723	0.237	0.41	4.21	3.20	0.01	89.42	11.68	0.04
8.0	57518.26	20.62	8475.38	15.14	146.15	6.11	8178.01	8.35	25.631	0.238	0.42	4.22	3.72	0.01	88.82	11.66	0.04
9.0	23762.74	14.42	3536.57	13.14	36.68	6.10	2920.29	6.08	9.193	0.170	0.17	1.76	3.19	0.01	90.28	11.73	0.06
P07 PVSUR3-011, whole rock, J = .004151 ± 0.000001																	
0.2	54753.23	74.83	50202.41	58.05	729.04	2.63	14901.34	53.22	177.810	0.970	1.11	9.91	0.58	0.00	4.90	0.40	0.05
0.4	79695.40	70.28	83701.45	63.05	1201.50	3.42	45180.76	89.52	260.860	1.000	1.85	16.53	1.06	0.00	6.39	0.45	0.04
0.6	79916.71	98.05	92217.47	94.07	1293.43	3.62	63646.56	72.53	268.580	1.100	2.04	18.21	1.35	0.00	5.52	0.36	0.04
0.8	60060.31	67.53	80313.64	67.06	1126.26	3.22	63813.27	89.57	200.860	0.940	1.78	15.86	1.56	0.00	8.03	0.45	0.04
1	31475.03	52.96	44124.29	52.05	624.27	2.43	42724.79	71.86	105.490	0.700	0.98	8.71	1.90	0.00	10.10	0.54	0.04
1.2	14624.56	36.22	18845.48	18.04	267.20	1.64	21564.62	52.54	51.350	0.560	0.42	3.72	2.24	0.01	6.25	0.36	0.07
1.4	9428.92	33.40	10726.43	15.04	153.45	1.45	13591.78	48.24	33.030	0.530	0.24	2.12	2.48	0.01	6.27	0.41	0.12
1.6	12033.84	37.19	12585.50	16.04	186.50	1.26	14207.21	47.63	41.110	0.530	0.28	2.49	2.21	0.01	6.88	0.49	0.10
2	42006.38	75.49	43069.71	56.05	600.92	3.12	53075.92	134.03	145.940	1.100	0.95	8.51	2.42	0.01	5.79	0.42	0.06
2.4	25861.45	56.06	26982.64	39.04	396.07	2.13	58413.10	82.55	98.760	0.730	0.60	5.33	4.24	0.01	3.22	0.23	0.07
2.8	12175.21	34.43	13179.73	17.04	193.25	1.74	37517.42	66.41	47.160	0.610	0.29	2.60	5.58	0.01	7.96	0.55	0.11
3.2	10729.32	33.93	12121.61	12.04	180.57	1.35	44010.35	71.27	45.930	0.610	0.27	2.39	7.12	0.01	3.70	0.24	0.12

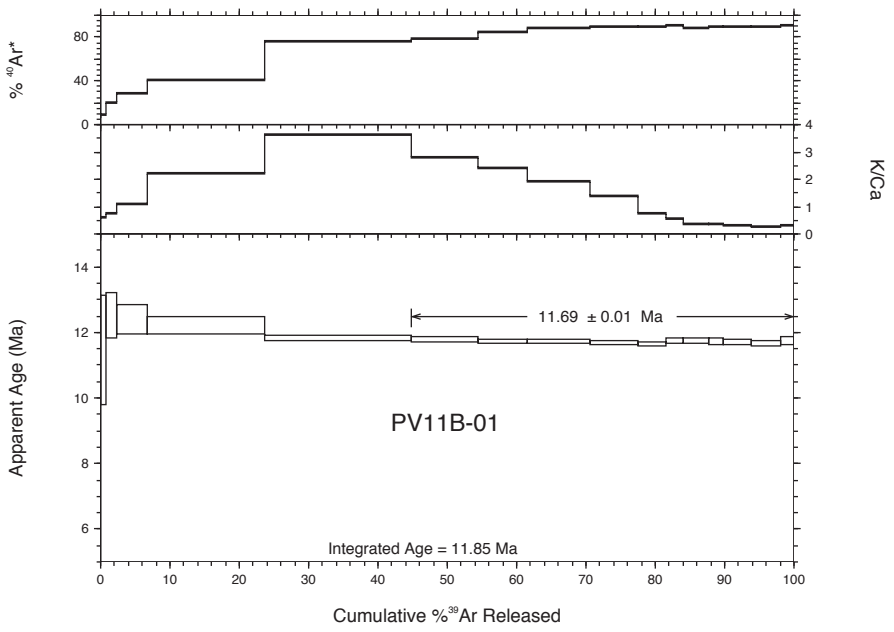
Table DR2. Ar/Ar geochronology data

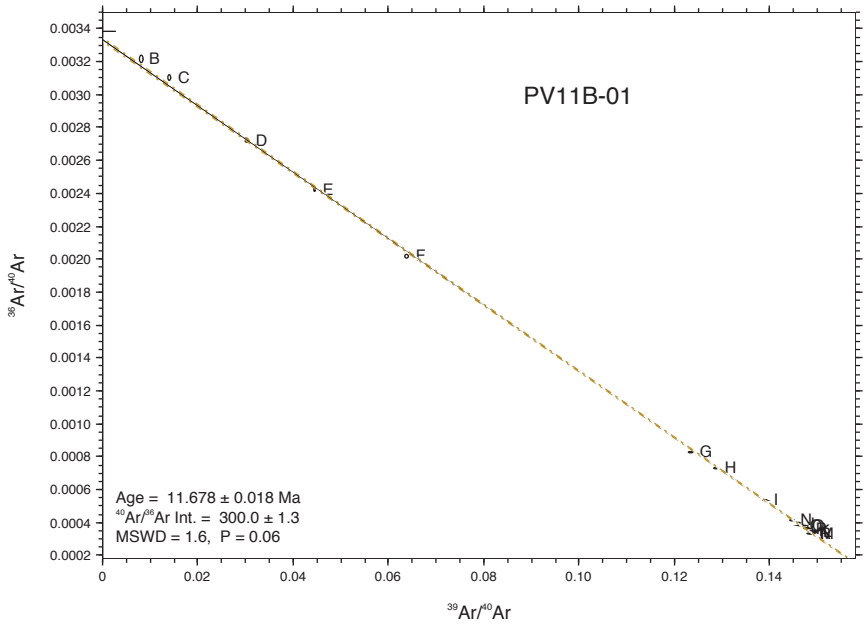
Watts	Relative Isotopic Abundances (x 10^{-14} A)										Derived Results						
	^{40}Ar	±1σ	^{39}Ar	±1σ	^{38}Ar	±1σ	^{37}Ar	±1σ	^{36}Ar	±1σ	^{39}Ar Mol ∞ 10^{-14}	^{39}Ar % of total	Ca/K	±1σ	$\%^{40}Ar^{*}$	Age (Ma)	±1σ
3.6	8589.50	34.33	10147.19	11.05	149.84	1.16	42087.01	65.75	38.330	0.540	0.22	2.00	8.13	0.02	4.46	0.28	0.13
4	8286.53	33.39	8140.26	8.76	121.80	1.35	47617.93	82.65	38.330	0.490	0.18	1.61	11.47	0.02	6.22	0.47	0.15
P09B-09, whole rock, J = .0002117 ± 0.000001																	
0.3	15900.95	31.00	463.06	1.60	16.11	0.51	954.10	8.53	50.450	0.520	0.01	3.33	4.04	0.04	5.76	0.76	0.13
0.6	13863.22	24.00	858.24	2.10	19.49	0.54	1097.56	9.50	42.840	0.490	0.02	6.18	2.51	0.02	8.39	0.52	0.07
0.9	17723.24	23.00	1340.26	2.30	25.94	0.59	1261.67	10.83	53.400	0.510	0.03	9.65	1.85	0.02	10.64	0.54	0.05
1.2	19210.38	46.00	1431.50	3.00	31.22	0.61	1449.95	11.68	57.980	0.480	0.03	10.30	1.99	0.02	10.52	0.54	0.04
1.5	19770.64	33.00	1174.35	2.10	26.91	0.56	1496.44	9.76	61.050	0.520	0.03	8.45	2.50	0.02	8.43	0.54	0.05
1.8	18183.93	37.00	911.42	3.30	23.01	0.57	1392.03	9.89	56.370	0.460	0.02	6.56	2.99	0.02	8.07	0.62	0.06
2.1	15200.70	20.00	619.89	1.80	17.88	0.51	1029.21	9.17	47.270	0.480	0.01	4.46	3.25	0.03	7.72	0.72	0.09
2.5	35604.21	27.00	1133.54	2.50	38.06	0.60	1996.17	13.29	115.170	0.630	0.02	8.16	3.45	0.02	3.88	0.47	0.07
3	90264.50	63.00	3246.21	4.50	101.49	0.75	5986.94	20.56	287.620	0.960	0.07	23.36	3.61	0.01	5.41	0.58	0.04
3.5	53706.61	40.00	1737.86	2.70	60.83	0.58	6171.27	21.79	172.080	0.810	0.04	12.51	6.96	0.03	5.29	0.63	0.06
4	17978.48	22.00	535.89	1.70	19.07	0.46	5034.43	18.17	58.850	0.540	0.01	3.86	18.41	0.09	4.59	0.59	0.12
4.5	15731.43	31.00	442.89	1.30	16.15	0.51	3647.76	16.97	50.800	0.490	0.01	3.19	16.14	0.09	5.49	0.75	0.13
P09B-12, whole rock, J = .004170 ± 0.000001																	
0.9	18305.19	72.00	357.89	3.70	14.78	0.50	548.82	3.23	54.680	0.880	0.01	4.33	3.01	0.04	11.04	0.43	0.06
1.3	30723.85	97.00	896.24	4.20	28.70	0.58	1109.72	3.86	84.800	1.000	0.02	10.83	2.43	0.01	17.86	0.46	0.03
1.6	26459.45	70.00	1005.96	3.30	26.21	0.59	934.17	4.57	68.210	0.930	0.02	12.16	1.82	0.01	23.29	0.46	0.02
1.9	25901.94	65.00	1315.78	4.90	27.52	0.67	1041.09	5.28	62.310	1.000	0.03	15.90	1.55	0.01	28.47	0.42	0.02
2.2	22244.72	58.00	1362.48	5.20	24.34	0.61	1013.55	5.28	49.870	1.300	0.03	16.47	1.46	0.01	33.40	0.41	0.02
2.5	18835.31	110.00	1163.42	3.30	23.58	0.81	937.35	4.58	41.600	0.850	0.03	14.06	1.58	0.01	34.42	0.42	0.02
3.5	27106.35	48.00	1336.62	3.90	28.83	0.61	1328.42	5.64	66.150	1.200	0.03	16.16	1.95	0.01	27.50	0.42	0.02
4.5	25852.25	43.00	600.48	2.60	22.76	0.53	955.40	4.24	73.830	0.950	0.01	7.26	3.12	0.02	15.00	0.49	0.04
5.5	14140.35	27.00	234.67	1.60	10.58	0.60	587.91	3.89	42.960	0.840	0.01	2.84	4.91	0.05	9.60	0.44	0.08
P07 PVSUR1-01, whole rock, J = .004151 ± 0.000001																	
0.2	72182.19	74.13	10677.04	12.04	239.07	1.35	6173.59	41.38	237.880	1.000	0.24	4.39	1.13	0.01	2.23	1.13	0.25

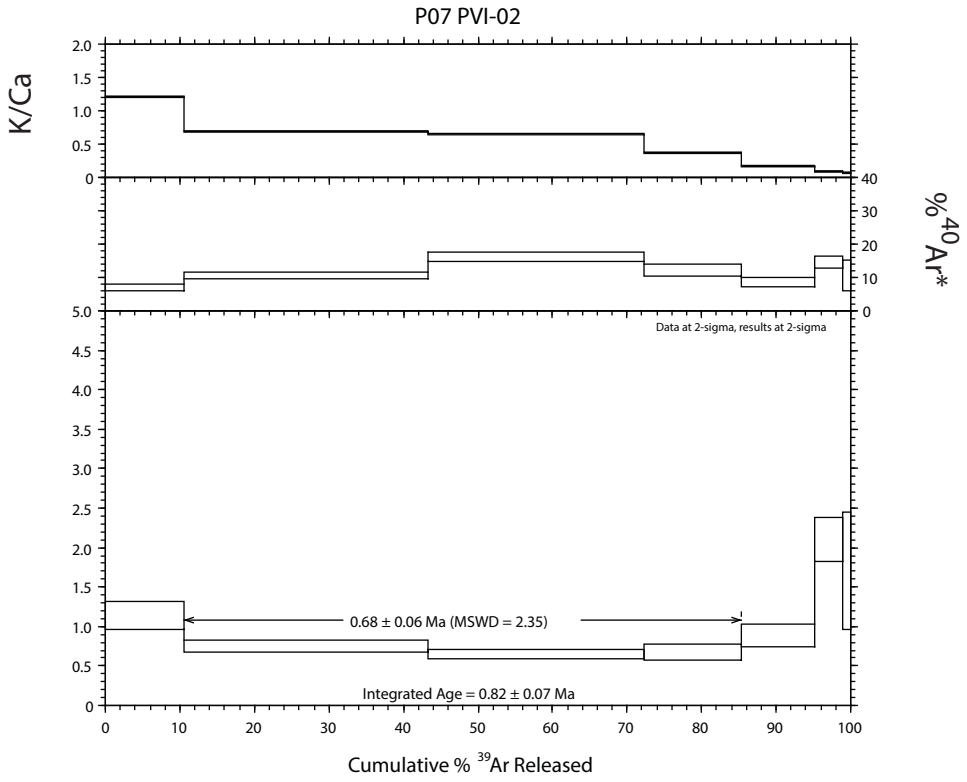
Table DR2. Ar/Ar geochronology data

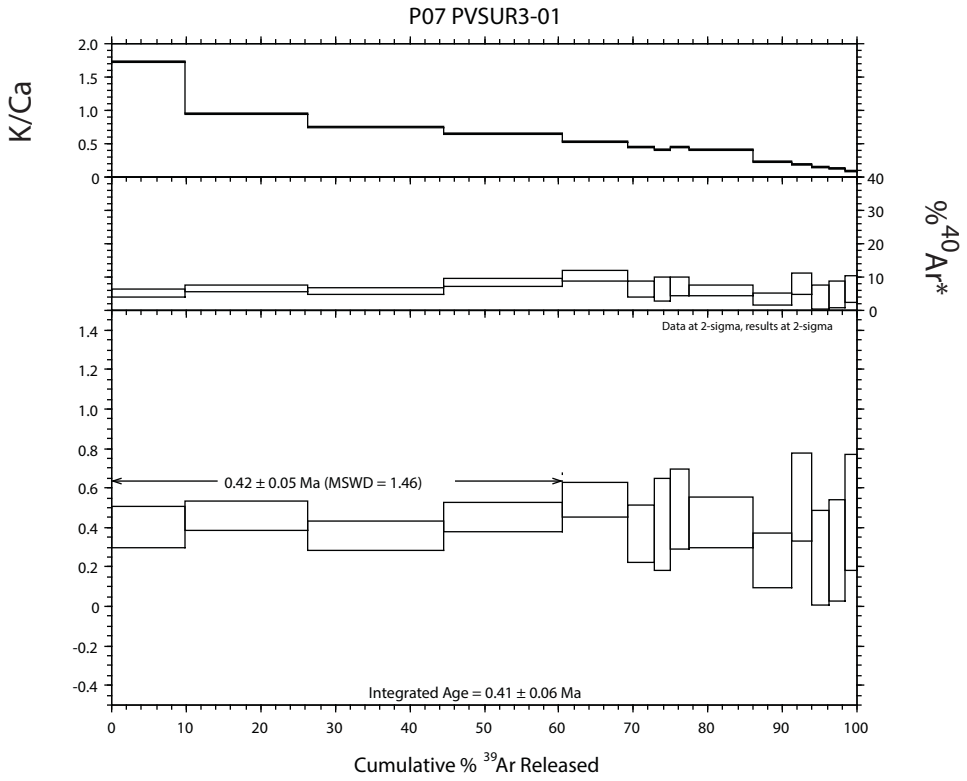
Watts	Relative Isotopic Abundances (x 10^{-14} A)										Derived Results						
	^{40}Ar	±1σ	^{39}Ar	±1σ	^{38}Ar	±1σ	^{37}Ar	±1σ	^{36}Ar	±1σ	^{39}Ar Mol ∞ 10^{-14}	^{39}Ar % of total	Ca/K	±1σ	$\%^{40}Ar^{*}$	Age (Ma)	±1σ
0.4	42244.57	59.78	27768.23	46.04	427.16	2.13	14566.51	45.97	136.900	0.740	0.61	11.43	1.03	0.00	5.75	0.65	0.07
0.8	11690.90	35.61	31026.90	37.04	438.99	2.33	20758.55	49.74	34.860	0.530	0.69	12.77	1.31	0.00	24.18	0.68	0.04
1	7835.98	32.62	20747.35	25.03	301.75	1.93	19479.06	56.91	25.340	0.470	0.46	8.54	1.84	0.01	22.16	0.62	0.06
1.2	5706.13	33.06	15716.96	19.04	229.13	1.93	18933.46	61.00	20.040	0.520	0.35	6.47	2.36	0.01	20.25	0.55	0.08
1.5	4651.30	31.81	16263.96	14.04	237.71	1.44	23935.18	58.99	17.970	0.460	0.36	6.69	2.88	0.01	23.82	0.51	0.07
2	14747.29	38.00	39022.73	75.06	594.98	3.02	93792.24	159.59	66.490	0.690	0.86	16.06	4.71	0.01	14.10	0.40	0.05
2.5	23626.94	43.50	44718.68	68.06	698.83	3.12	181553.20	299.54	116.970	0.770	0.99	18.40	7.96	0.02	11.35	0.45	0.05
3	6345.53	33.54	11656.70	16.04	177.86	2.13	54040.44	77.41	34.070	0.600	0.26	4.80	9.09	0.02	5.31	0.22	0.12
3.5	3840.52	31.47	7113.63	8.85	114.47	1.02	39148.34	63.26	21.440	0.500	0.16	2.93	10.79	0.02	11.94	0.48	0.17
4	3882.95	32.65	7127.34	14.04	113.55	1.35	45721.80	67.49	24.180	0.510	0.16	2.93	12.57	0.03	4.96	0.20	0.17
5	6482.78	32.25	11146.26	11.04	177.10	1.35	88240.68	114.06	44.420	0.600	0.25	4.59	15.52	0.03	0.55	0.02	0.14
P07 PVI-02, whole rock, J = .004066 ± 0.000001																	
0.2	82531.95	124.08	36051.69	55.05	659.72	2.92	15246.32	54.45	261.490	1.200	0.80	10.60	0.83	0.00	6.73	1.13	0.09
0.6	109580.20	124.11	111751.40	130.10	1677.58	3.32	82052.69	94.39	349.250	1.300	2.47	32.85	1.44	0.00	10.39	0.75	0.04
1	53959.61	66.12	98251.08	110.09	1354.21	3.72	78320.01	125.12	171.190	0.830	2.18	28.88	1.56	0.00	16.09	0.64	0.03
1.5	33411.20	60.13	44712.18	55.05	648.54	2.53	61267.79	83.38	113.880	0.860	0.99	13.14	2.69	0.01	12.12	0.66	0.05
2	47099.95	61.03	33493.59	42.04	558.18	2.33	101701.60	117.57	170.570	0.910	0.74	9.84	5.95	0.01	8.45	0.87	0.07
2.5	24982.85	52.83	12626.44	15.04	232.99	1.84	78857.05	133.20	91.990	0.700	0.28	3.71	12.24	0.03	14.45	2.10	0.14
3	7413.91	35.06	3348.00	6.18	63.43	1.03	24772.19	59.58	28.650	0.550	0.07	0.98	14.50	0.04	10.44	1.70	0.38

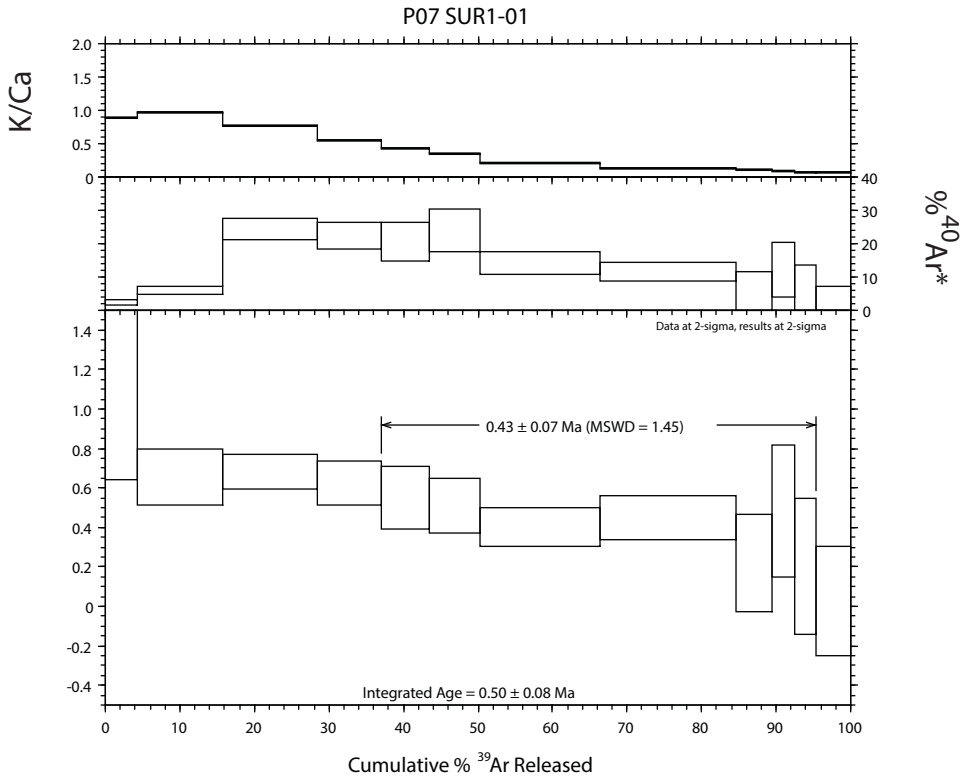
Figure DR1

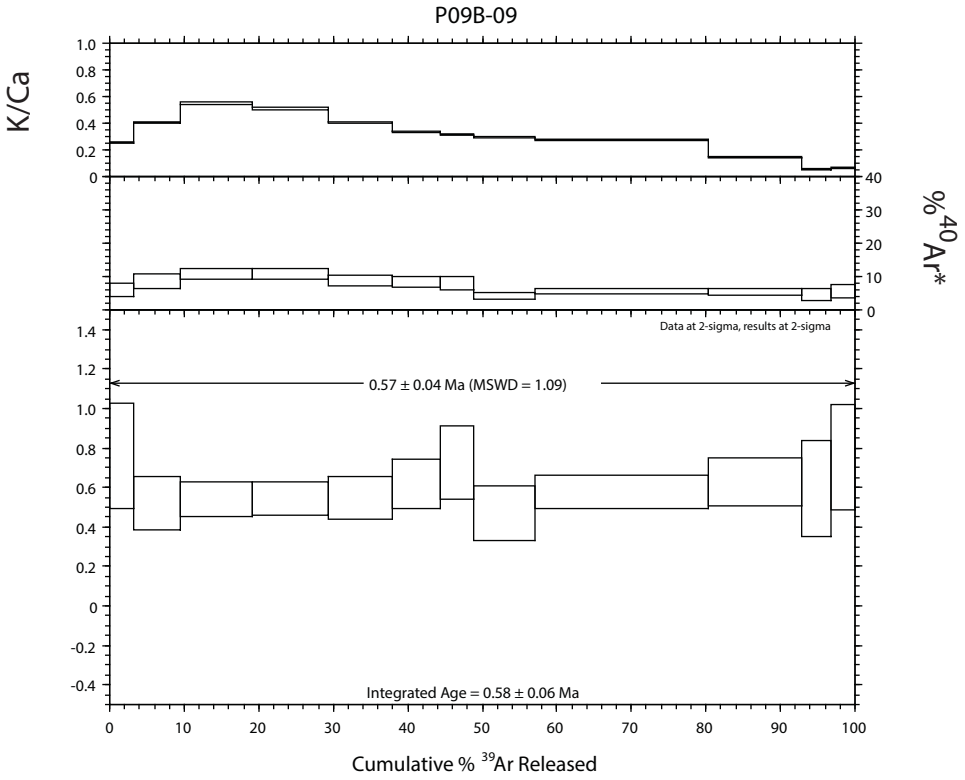

% 40Ar*
K/Ca
Apparent Age (Ma)
11.69 ± 0.01 Ma
PV11B-01
Integrated Age = 11.85 Ma
Cumulative %39Ar Released


PV11B-01
B
C
D
E
F
G
H
I
Age = 11.678 ± 0.018 Ma
40Ar/36Ar Int. = 300.0 ± 1.3
MSWD = 1.6, P = 0.06
36Ar/40Ar
39Ar/40Ar


P07 PVI-02
K/Ca
% 40 Ar*
Data at 2-sigma, results at 2-sigma
0.68 ± 0.06 Ma (MSWD = 2.35)
Integrated Age = 0.82 ± 0.07 Ma
Cumulative % 39 Ar Released


P07 PVSUR3-01
K/Ca
% 40 Ar*
Data at 2-sigma, results at 2-sigma
0.42 ± 0.05 Ma (MSWD = 1.46)
Integrated Age = 0.41 ± 0.06 Ma
Cumulative % 39Ar Released


P07 SUR1-01
K/Ca
% 40 Ar*
Data at 2-sigma, results at 2-sigma
0.43 ± 0.07 Ma (MSWD = 1.45)
Integrated Age = 0.50 ± 0.08 Ma
Cumulative % 39 Ar Released


P09B-09
K/Ca
% 40 Ar*
Data at 2-sigma, results at 2-sigma
0.57 ± 0.04 Ma (MSWD = 1.09)
Integrated Age = 0.58 ± 0.06 Ma
Cumulative % 39Ar Released

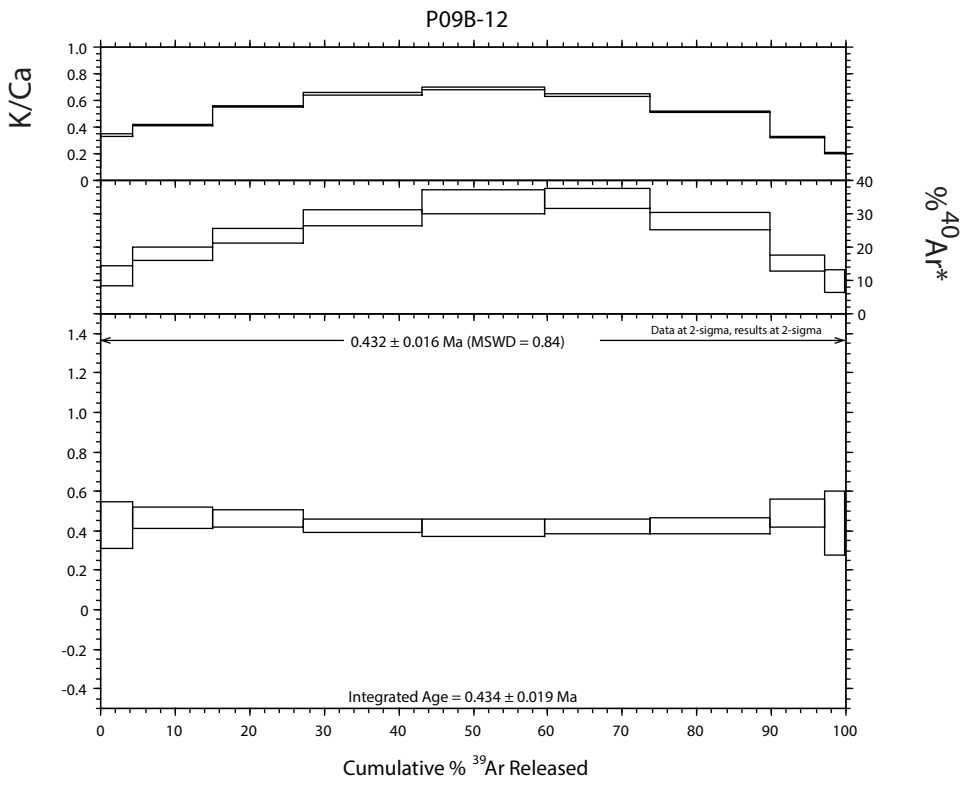
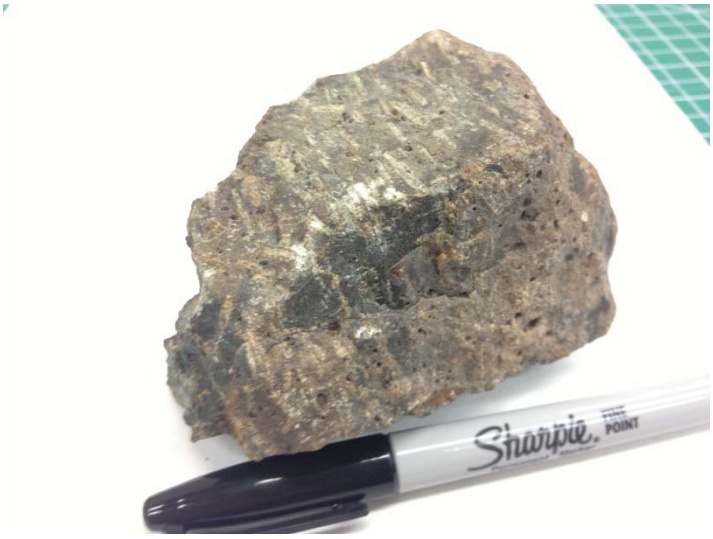
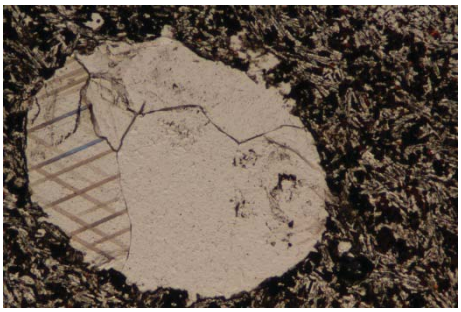

P09B-12
K/Ca
% 40 Ar*
0.432 ± 0.016 Ma (MSWD = 0.84)
Data at 2-sigma, results at 2-sigma
Integrated Age = 0.434 ± 0.019 Ma
Cumulative % 39Ar Released

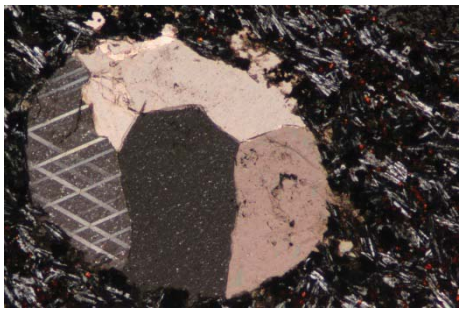
Figure DR2



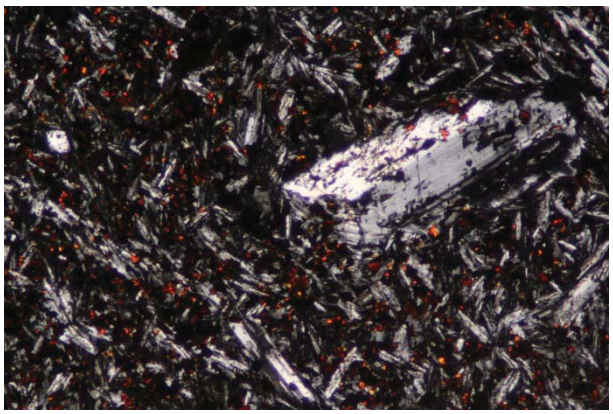
Above: photos of Sample PV11B-01 from Unit Nfl

Figure DR3





Above: parallel (left) and crossed (right) nicols microscope photo. Show calcite-filled vesicles.



Above: plagioclase and olivine (iddingsite, altered) groundmass, and plagioclase phenocrysts (parallel nicol picture)