ANALYTICAL PROCEDURES

The procedures described below were conducted several laboratories located at different institutions. The U/Pb, $^{40}Ar/^{39}Ar$ K-feldspar, and U-Th/He (on Gand Ob apatite samples) analyses were conducted at UCLA by Bernard Guest, Patrick Lam and Marty Grove. (U-Th)/ He analyses on apatites from the Nusha, Lahijan, Dizan, and Chalus Road localities were conducted at Caltech and the University of Kansas by Daniel Stockli. (U-Th)/ He analyses on Nusha and Lahijan zircons were conducted at the California Institute of Technology by Bernard Guest.

U-Pb zircon geochronology

Uranium and lead isotope ratios were determined on a Cameca ims-1270 ion-microprobe at UCLA. Ion-microprobe analysis is a technique capable of measuring micron-scale domains on the surface of a sample. The typical dimension of an ion-microprobe spot is ~25 μm diameter by ~2 μm deep. Zircons were prepared and analyzed according to the following procedures, unless otherwise noted. The lengths of mounted grains range between 100 and 180 μm. We selected individual zircons of varying lengths from each phase (granitic and dioritic) of the Nusha pluton.

A ~25 μm-diameter primary O^- ion beam operating between 4-18 nA was accelerated onto the sample under vacuum conditions. The collimated secondary ion beam induced a mass resolving power of 6000, sufficient to discern molecular ion interferences at mass 204 (e.g., $^{176}Hf^{28}Si^+$), which is important for making accurate common Pb corrections (see Quidelleur, et al. (1997)). In addition, oxygen was released onto the sample surface to a pressure of ~$3x10^{-5}$ Torr to enhance the secondary ionization of Pb^+.

Pb-U relative sensitivity factor (RSF) and ages were determined by comparison with standard zircon AS-3 (1099.1 Ma by isotope dilution-thermal ionization mass spectrometry; Paces and Miller, 1993). Secondary ionization affects the density and energy distributions of Pb^+ and U^+, thus, the RSF between these two species must be determined. A plot of $^{254}UO^+/^{238}U$ vs. $^{206}Pb^+/^{238}U$ for AS-3 generates the calibration curve and allows the determination of the RSF by dividing the measured $^{206}Pb^+/^{238}U^+$ on AS-3 at a reference $^{254}UO^+/^{238}U$ by its known daughter to parent ratio. Isotopic ratios measured on an unknown sample under identical conditions are calculated using the RSF e.g. (Williams et al., 1984). Fig. DR1 in the data repository shows a typical calibration curve, which was determined on May 22, 2001. Quidelleur et al. (1997) describe supplementary operating conditions.

The analyses were corrected for common Pb contamination. Time-series measurements show that most common Pb is surface contamination. Measured isotopic ratios for younger grains are corrected for common Pb using measured ^{208}Pb (corrected for ^{232}Th derived ^{208}Pb) to estimate common ^{206}Pb and ^{207}Pb assuming a southern Californian anthropogenic $^{206}Pb/^{208}Pb = 0.475$ and $^{207}Pb/^{208}Pb = 0.411$ (Senudo-Wilhelmy and Flegal, 1994). Because of their age the radiogenic Pb signal in the Nusha zircons swamp the common Pb signal and are therefore less sensitive to common Pb contamination; therefore, the common Pb correction scheme assumed zero-age common Pb isotope ratios of $^{206}Pb/^{204}Pb = 18.7$ and $^{207}Pb/^{204}Pb = 15.6$ (Stacey and Kramers, 1975) to estimate common ^{206}Pb and ^{207}Pb from measured ^{204}Pb. Table 1.1.1a in the data repository contains the results of all U-Pb isotopic measurements. The uncertainties in table 1.1.1a are understated by the ZIPS data reduction program. To deal with this problem we turn the calibration errors completely off in ZIPS and quadratically add a random error that reflects the scatter of the standard data about the calibration (± 2.5% in this case). If the standards are scattered by ± 2.5%, then the unknowns should also scatter about the mean by at least this amount. Performing this operation increased the errors of individual analyses to more realistic values and yielded MSWD values within the acceptable range for the size of the data sets (~0.4 for ~97 Ma Nusha pluton).

There was some discussion during the review process on what approach to use to calculate a U-Pb age from the individual analyses. With calculating U-Pb concordia ages being one suggestion. We submit that this has no greater benefit than just relying upon the $^{206}Pb/^{238}U$ ages. This is because, intrinsically, the $^{206}Pb/^{238}U$ ages are the most reliable since they are least affected by common Pb. We have therefore decided to stay with the $^{206}Pb/^{238}U$ ages and the recalculated uncertainties. Table 1.1.1b contains the Nusha U/Pb age determinations and recalculated uncertainties for the separate granite and diorite phases of the pluton.

$^{40}Ar/^{39}Ar$ K-feldspar thermochronology

McDougall and Harrison (1999) provide an overview of the $^{40}Ar/^{39}Ar$ methods employed. Purified K-feldspar concentrates were wrapped in Cu foil and irradiated at the University of Michigan Ford Reactor. Fish Canyon sanidine (27.8 ± 0.3 Ma) was used to monitor neutron flux density. Incremental heating was performed at University of

California Los Angeles using a Ta crucible in a resistively-heated, double-walled vacuum furnace with ±5°C temperature control. Argon isotopes were measured on a VG 1200S automated mass spectrometer (Harrison et al., 1997a). Duplicate low-temperature, isothermal heating steps were performed to evaluate the consistency of low-temperature Arrhenius data and to generate data necessary to correct $^{40}Ar^{*}/^{39}Ar_{K}$ for Cl-correlated excess ^{40}Ar released by breakdown of fluid inclusions (Harrison et al., 1994). The interpretation of K-feldspar $^{40}Ar/^{39}Ar$ age spectra incorporated multiple diffusion domain (MDD) calculations assuming monotonic cooling (Harrison et al., 1997b; Lovera et al., 1989; Quidelleur et al., 1997). Results of the argon isotopic analyses calculated using conventional decay constants and isotopic abundances, corrected for atmospheric and nucleogenic interferences, are presented in Tables 1.2.1 and 1.2.2.

(U-Th)/He apatite and zircon thermochronology

The basis for (U-Th)/He dating is the α-decay of ^{235}U, ^{238}U, and ^{232}Th (see (Hurley, 1954).

Helium ages were calculated based on He, U, and Th measurements on individual grains as well as small aliquots of several grains per packet. The analytical procedures of House et al. (2000) for apatites and Takahiro et al. (2003) for zircons were followed. The dimensions of the apatite and zircon grains in each sample were measured to determine the alpha-ejection correction (F_T) after (Farley et al., 1996). Analytical uncertainties on age determinations are generally <6% (±2σ). Uncertainties of the He measurements using lasing ~1%, and ICP-MS ~1% (House et al., 2000). Reproducibility of ages from individual samples is determined by multiple experiments.

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Figure DR1.1.1

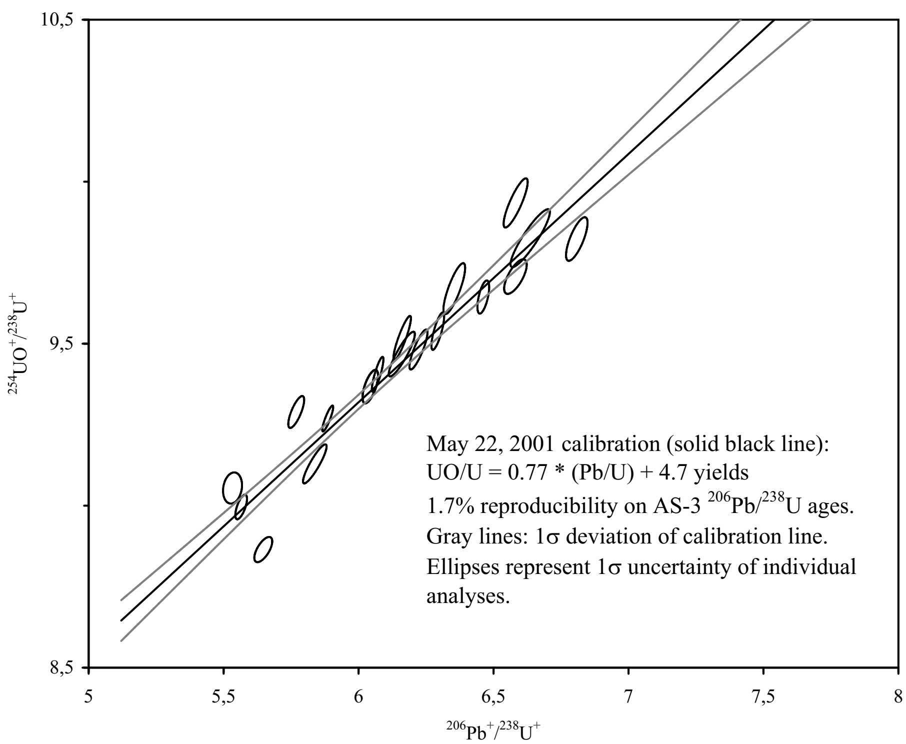
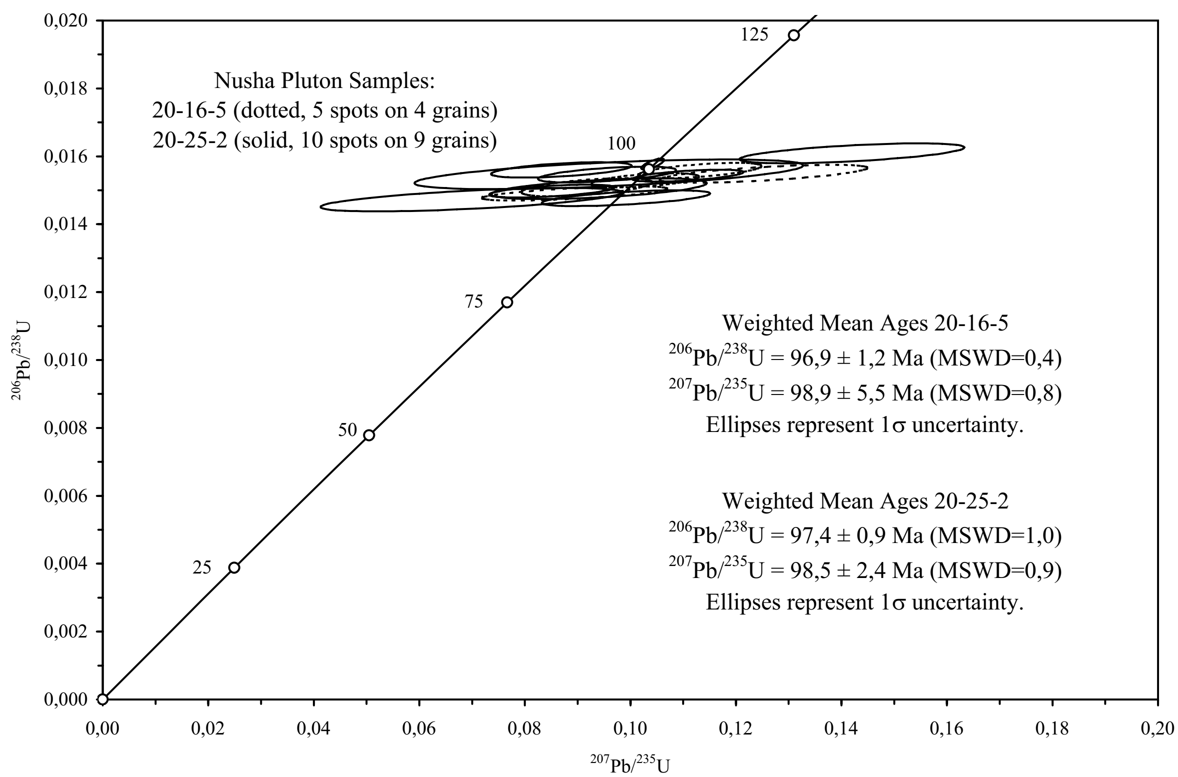


Figure DR1.1.2



Nusha K-feldspar (20-24-1)

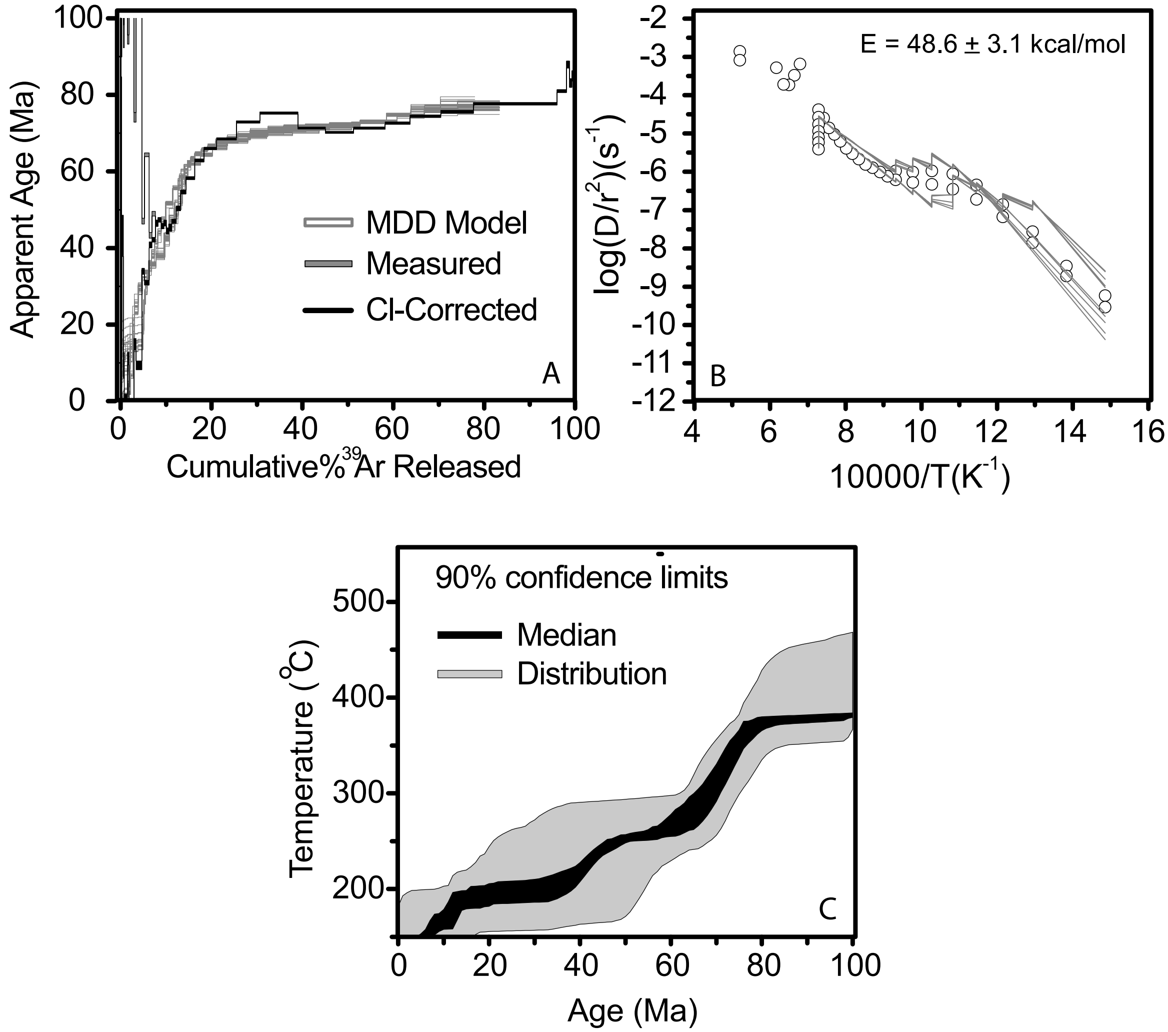


Figure DR1.2.1

Lahijan K-feldspar (Lj004)

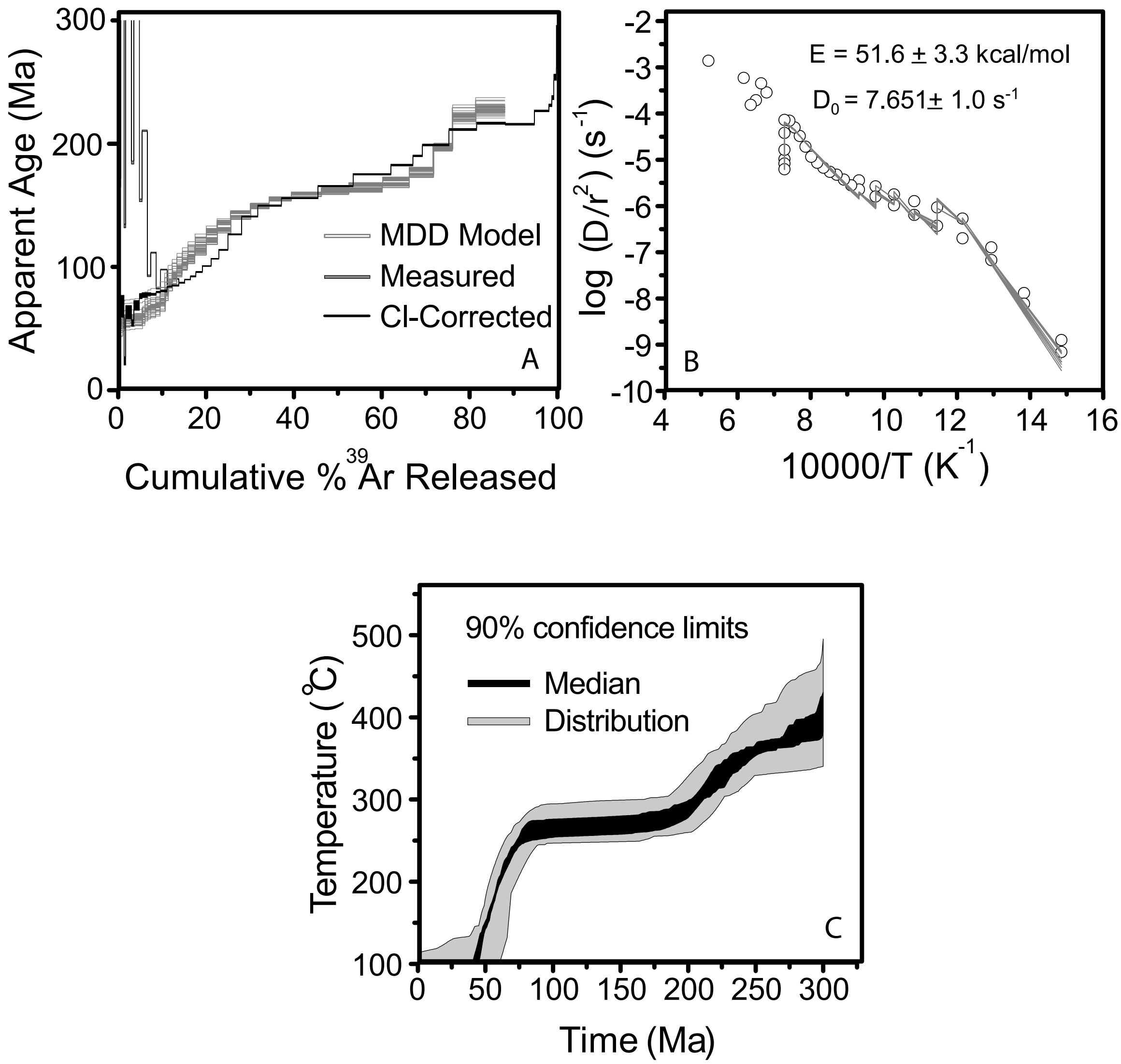


Figure DR1.2.2

Table 1.1.1a Ion microprobe U-Pb zircon age results from the Nusha pluton (analyzed 05/22/2001).

Sample Analysis ID	UO/U [1]	U [2] (ppm)	Th/U	^{206}Pb* [3] (%)	^{206}Pb*/^{238}U [3] (±σ)	^{207}Pb*/^{235}U [4] (±σ)	^{207}Pb*/^{206}Pb* [3, 4] (±σ)	Apparent Ages Ma (±σ) ^{206}Pb/^{238}U [3]	^{207}Pb/^{235}U [4]
20-25-2									
20252-5-1-1	9,03	211	0,69	96,2	0,01538 ± 0,00023	0,09432 ± 0,01320	0,04447 ± 0,00586	98,4 ± 1,5	91,5 ± 12,3
20252-5-2-1	9,28	223	0,50	96,1	0,01535 ± 0,00018	0,10960 ± 0,01070	0,05179 ± 0,00470	98,2 ± 1,1	105,6 ± 9,8
20252-6-3-1	9,10	83	0,46	95,7	0,01599 ± 0,00030	0,14050 ± 0,02160	0,06372 ± 0,00907	102,3 ± 1,9	133,5 ± 19,2
20252-6-4-1	9,28	149	0,75	96,3	0,01552 ± 0,00023	0,08571 ± 0,01350	0,04005 ± 0,00598	99,3 ± 1,5	83,5 ± 12,6
20252-6-5-1	9,39	1309	0,95	99,6	0,01576 ± 0,00016	0,10410 ± 0,00214	0,04789 ± 0,00070	100,8 ± 1,0	100,6 ± 2,0
20252-6-9-1	9,44	124	0,48	96,0	0,01468 ± 0,00024	0,09789 ± 0,01610	0,04835 ± 0,00750	94,0 ± 1,5	94,8 ± 14,9
20252-6-6-1	9,23	59	0,55	91,2	0,01527 ± 0,00045	0,09287 ± 0,03720	0,04410 ± 0,01690	97,7 ± 2,9	90,2 ± 34,6
20252-6-6-2	9,38	80	0,48	93,8	0,01459 ± 0,00036	0,06786 ± 0,02900	0,03372 ± 0,01390	93,4 ± 2,3	66,7 ± 27,5
20252-6-10-1	9,13	196	0,84	96,6	0,01491 ± 0,00019	0,08403 ± 0,01200	0,04088 ± 0,00552	95,4 ± 1,2	81,9 ± 11,2
20252-6-8-1	9,66	106	0,51	95,0	0,01494 ± 0,00031	0,09244 ± 0,02060	0,04487 ± 0,00950	95,6 ± 2,0	89,8 ± 19,1
20-16-5									
20165-8-6-1	9,44	85	0,52	96,3	0,01541 ± 0,00027	0,12400 ± 0,01990	0,05838 ± 0,00869	98,6 ± 1,7	118,7 ± 18,0
20165-8-7-1	9,45	170	0,49	96,8	0,01502 ± 0,00027	0,09073 ± 0,01250	0,04380 ± 0,00563	96,1 ± 1,7	88,2 ± 11,6
20165-8-7-2	9,44	149	0,62	97,9	0,01525 ± 0,00021	0,10210 ± 0,01030	0,04857 ± 0,00457	97,6 ± 1,4	98,7 ± 9,5
20165-9-20-1	9,46	130	0,64	95,7	0,01482 ± 0,00022	0,08808 ± 0,01780	0,04311 ± 0,00828	94,8 ± 1,4	85,7 ± 16,6
20165-8-8-1	9,46	155	0,49	97,5	0,01553 ± 0,00023	0,11230 ± 0,01180	0,05246 ± 0,00507	99,3 ± 1,5	108,1 ± 10,8

[1] Pb/U relative sensitivity calculated from measured UO/U on basis of comparison with AS-3 standard zircon (1099 Ma; Paces and Miller, 1993).
Calibration: UO/U = 0.82*(Pb/U) + 4.4 yields 1.6% reproducibility on AS-3 ^{206}Pb/^{238}U ages.

[2] Estimated by reference to AS-3 zircon (330 ppm U) after normalization by measured $^{94}Zr_2O$.

[3] Calculated using measured ^{204}Pb to estimate common ^{206}Pb assuming ^{206}Pb/^{204}Pb = 18.7 (Stacey and Kramers, 1975).

[4] Calculated using measured ^{204}Pb to estimate common ^{207}Pb assuming ^{207}Pb/^{204}Pb = 15.6 (Stacey and Kramers, 1975).

Table DR1.1.1b Ion microprobe U-Pb zircon age results from the Nusha pluton (analyzed 05/22/2001).

Sample 20-16-5 (Rapakivi Granite)

$^{206}Pb/^{238}U$ Age (Ma)	$^{206}Pb/^{238}U$ ± 1 s.e. (Ma)	Radiogenic ^{206}Pb (%)	$^{207}Pb/^{235}U$ ± 1 s.e. (Ma)	Radiogenic ^{207}Pb (%)	$^{207}Pb/^{206}Pb$ Age (Ma)	$^{207}Pb/^{206}Pb$ ± 1 s.e. (Ma)	U (ppm)	Th (ppm)	Th/U	Name
94,5	2,7	95,7	17	53,5	-	-	221	162	0,7	20165_9-20-1
95,8	2,9	96,7	12	60,8	-	-	288	163	0,6	20165_8-7-1
97,3	2,7	97,9	10	72,7	-	-	253	181	0,7	20165_8-7-2
98,3	2,9	96,3	18	64,3	-	-	144	87	0,6	20165_8-6-1
99,0	2,8	97,5	11	70,7	-	-	263	148	0,6	20165_8-8-1
WM	*96,9*		*98,9*							
±1 SE	*1,2*		*5,5*							
MSWD	*0,4*		*0,8*							

Sample 20-25-2 (Diorite)

$^{206}Pb/^{238}U$ Age (Ma)	$^{206}Pb/^{238}U$ ± 1 s.e. (Ma)	Radiogenic ^{206}Pb (%)	$^{207}Pb/^{235}U$ ± 1 s.e. (Ma)	Radiogenic ^{207}Pb (%)	$^{207}Pb/^{206}Pb$ Age (Ma)	$^{207}Pb/^{206}Pb$ ± 1 s.e. (Ma)	U (ppm)	Th (ppm)	Th/U	Name
93,2	3,2	93,8	28	37,7	-	-	135	75	0,6	20252_6-6-2
93,7	2,7	96,0	15	57,9	-	-	210	115	0,5	20252_6-9-1
95,0	2,9	95,0	19	50,5	-	-	179	106	0,6	20252_6-8-1
95,5	2,6	96,6	11	58,4	-	-	332	321	1,0	20252_6-10-1
97,7	3,8	91,2	35	35,3	-	-	100	63	0,6	20252_6-6-1
98,1	2,7	96,1	10	60,5	-	-	378	217	0,6	20252_5-2-1
98,7	2,8	96,2	13	57,3	-	-	358	283	0,8	20252_5-1-1
99,2	2,9	96,3	13	55,6	-	-	252	219	0,9	20252_6-4-1
100,6	2,7	99,6	3	93,5	-	-	2219	2436	1,1	20252_6-5-1
102,4	3,2	95,7	19	62,8	-	-	141	75	0,5	20252_6-3-1
WM	*97,4*		*98,5*							
±1 SE	*0,9*		*2,4*							
MSWD	*1,0*		*0,9*							

Table DR1.2.1 Nusha K-feldspar (20-24-1) Ar results (analyzed 01/21/2003)

Step	T (°C)	Time (min.)	$^{40}Ar/^{39}Ar$[1] $x10^{-1}$	$^{38}Ar/^{39}Ar$[1] $x10^{-2}$	$^{36}Ar/^{39}Ar$[1] $x10^{-4}$	$^{39}Ar_K$[2] (mol) $x10^{-15}$	$^{39}Ar_K$ (%)	$^{40}Ar^*$[3] (%)	$^{40}Ar^*/^{39}Ar_K$[4] ± 1σ $x10^{-1}$	Cl/K[5] ± 1σ $x10^{-3}$	Apparent Age[6] ± 1σ (Ma)	Corrected Age[7] ± 1σ (Ma)
1	400	15	1236.75	194.56	2177.29	2.29	0.1	47.9	593.1 ± 14.89	524.2 ± 4.02	599.0 ± 12.80	-105.3 ± 21.27
2	400	22	481.94	34.70	1363.68	0.72	0.1	16.2	78.7 ± 21.72	85.6 ± 2.45	91.9 ± 24.72	-29.5 ± 26.71
3	450	15	723.00	137.67	597.23	3.33	0.2	75.5	546.2 ± 6.77	374.8 ± 2.81	558.3 ± 5.95	74.8 ± 9.95
4	450	22	174.92	25.56	309.96	1.73	0.3	47.2	83.0 ± 6.10	65.8 ± 1.39	96.8 ± 6.93	7.1 ± 7.57
5	500	15	493.25	110.77	234.28	9.63	0.6	85.9	423.7 ± 2.68	302.2 ± 1.51	447.2 ± 2.50	43.2 ± 5.38
6	500	22	110.16	24.28	95.29	4.63	0.8	73.9	81.7 ± 2.64	63.4 ± 0.68	95.3 ± 3.00	9.3 ± 3.37
7	550	15	284.77	73.24	114.96	19.47	1.5	87.9	250.5 ± 1.40	198.9 ± 0.65	277.6 ± 1.44	-1.4 ± 3.17
8	550	22	96.33	23.59	50.95	9.39	1.8	83.9	81.0 ± 1.05	61.7 ± 0.55	94.5 ± 1.20	11.1 ± 1.63
9	600	15	177.48	46.45	81.33	30.28	2.9	86.3	153.1 ± 0.70	124.8 ± 0.39	174.7 ± 0.76	-1.7 ± 1.84
10	600	22	80.57	17.84	57.87	14.05	3.4	78.3	63.2 ± 1.10	45.7 ± 0.35	74.1 ± 1.26	14.9 ± 1.47
11	650	15	114.66	27.92	65.04	34.96	4.7	82.9	95.1 ± 0.55	73.6 ± 0.28	110.5 ± 0.62	9.4 ± 1.15
12	650	22	46.20	6.89	20.77	16.66	5.3	85.9	39.8 ± 0.66	15.6 ± 0.17	47.0 ± 0.77	33.9 ± 0.79
13	700	15	64.07	11.71	30.73	28.77	6.3	85.3	54.7 ± 0.44	28.9 ± 0.19	64.3 ± 0.51	30.9 ± 0.63
14	700	22	42.18	4.40	17.83	16.69	6.9	86.6	36.6 ± 0.66	8.7 ± 0.20	43.3 ± 0.77	40.8 ± 0.77
15	750	15	46.15	5.41	14.93	21.42	7.7	89.6	41.4 ± 0.52	11.5 ± 0.16	49.0 ± 0.61	42.1 ± 0.62
16	750	22	43.80	3.80	14.26	15.52	8.2	89.5	39.3 ± 0.68	7.1 ± 0.14	46.5 ± 0.80	46.5 ± 0.80
17	800	15	46.75	5.48	21.62	19.87	8.9	85.5	40.1 ± 0.49	11.7 ± 0.16	47.4 ± 0.57	47.4 ± 0.57
18	800	22	43.64	3.88	15.83	15.72	9.5	88.4	38.7 ± 0.59	7.3 ± 0.17	45.7 ± 0.68	45.7 ± 0.68
19	825	19	44.15	4.90	15.22	15.59	10.1	88.9	39.3 ± 0.66	10.1 ± 0.15	46.5 ± 0.77	46.5 ± 0.77
20	850	15	44.57	4.99	22.73	15.25	10.6	84.0	37.6 ± 0.69	10.3 ± 0.16	44.4 ± 0.81	44.4 ± 0.81
21	875	15	46.52	5.35	26.68	18.60	11.3	82.2	38.3 ± 0.78	11.3 ± 0.19	45.3 ± 0.91	45.3 ± 0.91
22	900	19	48.50	6.35	28.59	26.76	12.2	81.8	39.7 ± 0.49	14.0 ± 0.16	47.0 ± 0.57	47.0 ± 0.57
23	925	15	53.11	7.93	34.39	26.63	13.2	80.2	42.6 ± 0.54	18.4 ± 0.15	50.4 ± 0.63	50.4 ± 0.63
24	950	15	56.49	9.55	33.40	33.92	14.4	81.9	46.3 ± 0.44	22.9 ± 0.17	54.6 ± 0.52	54.6 ± 0.52
25	975	19	59.75	10.75	33.90	53.28	16.3	82.7	49.4 ± 0.30	26.2 ± 0.10	58.3 ± 0.35	58.3 ± 0.35
26	1000	15	63.27	11.76	32.26	57.21	18.4	84.4	53.4 ± 0.34	29.0 ± 0.14	62.9 ± 0.40	62.9 ± 0.40
27	1025	15	65.11	12.40	29.47	77.09	21.1	86.1	56.1 ± 0.27	30.8 ± 0.18	66.0 ± 0.31	66.0 ± 0.31
28	1050	19	66.07	12.69	25.33	121.86	25.5	88.2	58.3 ± 0.24	31.6 ± 0.11	68.5 ± 0.27	68.5 ± 0.27
29	1075	15	69.31	13.65	23.22	144.59	30.7	89.6	62.1 ± 0.25	34.3 ± 0.12	72.9 ± 0.29	72.9 ± 0.29
30	1100	18	70.16	13.37	19.38	233.16	39.0	91.4	64.1 ± 0.25	33.5 ± 0.09	75.2 ± 0.29	75.2 ± 0.29
31	1100	25	65.90	11.64	16.50	169.17	45.1	92.1	60.7 ± 0.22	28.8 ± 0.09	71.3 ± 0.26	71.3 ± 0.26
32	1100	45	65.16	11.08	17.22	172.32	51.2	91.7	59.8 ± 0.22	27.2 ± 0.06	70.2 ± 0.25	70.2 ± 0.25
33	1100	90	66.84	10.97	19.64	194.63	58.2	90.8	60.7 ± 0.24	26.9 ± 0.11	71.3 ± 0.28	71.3 ± 0.28
34	1100	120	69.24	11.01	23.86	152.88	63.7	89.4	61.9 ± 0.26	27.0 ± 0.09	72.6 ± 0.30	72.6 ± 0.30
35	1100	240	72.41	11.01	29.33	189.30	70.5	87.6	63.4 ± 0.28	26.9 ± 0.10	74.4 ± 0.33	74.4 ± 0.33
36	1100	480	77.44	10.84	43.02	200.39	77.6	83.2	64.4 ± 0.33	26.4 ± 0.10	75.6 ± 0.38	75.6 ± 0.38
37	1200	18	70.70	9.68	14.04	514.05	96.1	93.7	66.3 ± 0.26	23.3 ± 0.12	77.7 ± 0.30	77.7 ± 0.30
38	1233	15	77.66	11.25	27.70	57.77	98.1	89.0	69.2 ± 0.31	27.6 ± 0.11	81.0 ± 0.35	81.0 ± 0.35

Table DR1.2.1 continued Nusha K-feldspar (20-24-1) Ar results (analyzed 01/21/2003)

Step	T (°C)	Time (min.)	$^{40}Ar/^{39}Ar$[1] x10^{-1}	$^{38}Ar/^{39}Ar$[1] x10^{-2}	$^{36}Ar/^{39}Ar$[1] x10^{-4}	$^{39}Ar_K$[2] (mol) x10^{-15}	$^{39}Ar_K$ (%)	$^{40}Ar^*$[3] (%)	$^{40}Ar^*/^{39}Ar_K$[4] ± 1σ x10^{-1}	Cl/K[5] ± 1σ x10^{-3}	Apparent Age[6] ± 1σ (Ma)	Corrected Age[7] ± 1σ (Ma)
39	1266	15	95.77	19.92	68.51	17.57	98.7	78.5	75.2 ± 0.81	51.4 ± 0.32	87.9 ± 0.92	87.9 ± 0.92
40	1300	19	99.71	21.05	96.21	14.50	99.3	71.1	71.0 ± 0.98	54.4 ± 0.33	83.1 ± 1.12	83.1 ± 1.12
41	1350	15	107.13	14.36	115.65	14.08	99.8	67.7	72.7 ± 1.15	35.8 ± 0.38	85.0 ± 1.31	85.0 ± 1.31
42	1650	15	1451.93	23.30	4566.74	6.25	100.0	7.0	102.2 ± 15.01	37.4 ± 0.85	118.4 ± 16.84	118.4 ± 16.84

[1] Corrected for backgrounds (mean values in (mol): m/e40 = 4x10^{-16}; m/e39 = 1x10^{-16}; m/e38 = 1.8x10^{-17}; m/e37 = 1.8x10^{-17}; m/e36 = 1.6x10^{-17}), mass discrimination (measured $^{40}Ar/^{36}Ar_{ATM}$ = 293.5±0.5), abundance sensitivity (5 ppm), and radioactive decay (Irradiated: 05/03/2002; Analyzed: 01/06/2003).

[2] Normalized to 100% delivery to mass spectrometer.

[3] Includes static line blank.

[4] Corrected for atmospheric argon and nucleogenic interferences ($^{40}Ar/^{39}Ar_K$ = 0.0306;$^{36}Ar/^{37}Ar_{Ca}$ = 0.000271;$^{39}Ar/^{37}Ar_{Ca}$ = 0.000772).

[5] Corrected for atmospheric argon and and nucleogenic interferences and production ratios ($^{38}Ar/^{39}Ar_K$ = 0.012; Cl/K = 0.277 $^{38}Ar_{Cl}/^{39}Ar_K$; $^{36}Cl/^{38}Cl$ = 316).

[6] Assumes trapped argon is atmospheric. J-factor = 0.00664 (assumes Fish Canyon sanidine = 27.8 Ma).

[7] Corrected for Cl-correlated excess ^{40}Ar ($^{40}Ar_E$; Harrison et al., 1994) using $^{40}Ar_E$ = 1.06±0.01x10^{-5}; Cl/K offset = 7.06x10^{-3}.

[8] All uncertainties reflect analytical errors only.

Table DR1.2.2 Lj004 Lahijan K-feldspar Ar results (analyzed 01/21/2003)

Step	T (°C)	Time (min.)	$^{40}Ar/^{39}Ar$[1] x10^{-1}	$^{38}Ar/^{39}Ar$[1] x10^{-2}	$^{36}Ar/^{39}Ar$[1] x10^{-4}	$^{39}Ar_K$[2] (mol) x10^{-15}	$^{39}Ar_K$ (%)	$^{40}Ar^*$[3] (%)	$^{40}Ar^*/^{39}Ar_K$[4] ± 1σ x10^{-1}	Cl/K[5] ± 1σ x10^{-3}	Apparent Age[6] ± 1σ (Ma)	Corrected Age[7] ± 1σ (Ma)
1	400	15	2365.64	90.37	948.27	2.62	0.12	88.10	2085.12 ± 17.33	241.98 ± 2.25	1567.74 ± 8.71	-1239.69 ± 85.52
2	400	22	366.08	14.94	542.11	0.91	0.16	55.65	205.58 ± 12.16	35.17 ± 1.08	230.85 ± 12.82	-260.48 ± 24.45
3	450	15	1753.25	52.81	210.09	5.65	0.42	96.39	1690.86 ± 11.09	141.80 ± 1.34	1357.94 ± 6.26	38.11 ± 25.44
4	450	22	183.39	6.54	120.91	2.90	0.55	79.89	147.36 ± 3.28	14.09 ± 0.56	168.41 ± 3.58	-16.29 ± 8.72
5	500	15	853.30	25.26	79.68	17.10	1.34	97.17	829.45 ± 3.65	66.16 ± 0.43	791.52 ± 2.82	68.05 ± 8.95
6	500	22	128.97	4.39	44.64	8.24	1.71	89.28	115.47 ± 1.35	8.52 ± 0.21	133.28 ± 1.50	23.70 ± 3.33
7	550	15	521.09	15.43	41.85	28.38	3.01	97.54	508.42 ± 2.07	39.13 ± 0.27	524.75 ± 1.85	63.36 ± 5.40
8	550	22	170.22	4.98	25.60	11.37	3.53	95.22	162.34 ± 1.17	10.27 ± 0.16	184.69 ± 1.26	54.54 ± 2.65
9	600	15	357.56	10.35	28.88	28.06	4.81	97.48	348.72 ± 1.31	25.12 ± 0.23	375.74 ± 1.27	68.79 ± 3.97
10	600	22	140.24	3.52	19.13	13.49	5.43	95.60	134.28 ± 0.97	6.27 ± 0.13	154.08 ± 1.06	76.39 ± 2.09
11	650	15	191.23	5.10	15.40	26.43	6.64	97.40	186.37 ± 0.59	10.66 ± 0.13	210.48 ± 0.63	77.10 ± 2.03
12	650	22	83.34	1.78	12.08	16.87	7.41	95.14	79.46 ± 0.62	1.47 ± 0.09	92.76 ± 0.71	78.01 ± 1.16
13	700	15	99.21	2.29	9.41	27.57	8.67	96.78	96.13 ± 0.35	2.90 ± 0.06	111.63 ± 0.39	77.90 ± 0.84
14	700	22	73.92	1.46	10.54	20.86	9.63	95.19	70.50 ± 0.50	0.58 ± 0.07	82.54 ± 0.57	79.71 ± 0.66
15	750	15	86.61	1.85	7.98	32.11	11.10	96.82	83.94 ± 0.34	1.67 ± 0.07	97.85 ± 0.39	80.44 ± 0.84
16	750	22	75.96	1.43	7.74	25.13	12.25	96.43	73.37 ± 0.45	0.52 ± 0.07	85.82 ± 0.51	83.87 ± 0.58
17	800	15	79.47	1.52	6.12	34.51	13.83	97.23	77.35 ± 0.30	0.77 ± 0.06	90.36 ± 0.35	84.99 ± 0.55
18	800	22	77.19	1.38	7.74	28.85	15.15	96.51	74.60 ± 0.35	0.37 ± 0.07	87.22 ± 0.39	87.22 ± 0.39
19	825	19	79.34	1.42	7.32	28.06	16.43	96.76	76.87 ± 0.33	0.50 ± 0.07	89.81 ± 0.38	89.81 ± 0.38
20	850	15	81.14	1.43	5.66	27.53	17.69	97.43	79.16 ± 0.42	0.55 ± 0.08	92.42 ± 0.48	92.42 ± 0.48
21	875	15	84.41	1.49	6.35	32.09	19.16	97.30	82.23 ± 0.36	0.70 ± 0.06	95.91 ± 0.41	95.91 ± 0.41
22	900	19	88.81	1.60	6.99	43.08	21.13	97.25	86.44 ± 0.28	0.99 ± 0.04	100.69 ± 0.32	100.69 ± 0.32
23	925	15	93.82	1.82	6.17	38.41	22.89	97.65	91.69 ± 0.33	1.61 ± 0.06	106.62 ± 0.37	106.62 ± 0.37
24	950	15	100.59	2.19	7.55	45.27	24.96	97.41	98.05 ± 0.35	2.62 ± 0.06	113.79 ± 0.39	113.79 ± 0.39
25	975	19	112.10	2.64	8.52	68.72	28.10	97.44	109.28 ± 0.35	3.87 ± 0.04	126.38 ± 0.40	126.38 ± 0.40
26	1000	15	125.18	3.01	8.43	80.01	31.76	97.72	122.38 ± 0.38	4.90 ± 0.09	140.95 ± 0.42	140.95 ± 0.42
27	1025	15	132.75	3.20	7.11	117.86	37.16	98.16	130.34 ± 0.48	5.42 ± 0.06	149.75 ± 0.53	149.75 ± 0.53
28	1050	18	138.25	3.30	7.01	182.17	45.49	98.24	135.88 ± 0.42	5.70 ± 0.07	155.84 ± 0.46	155.84 ± 0.46
29	1075	15	147.56	3.57	8.46	174.87	53.49	98.05	144.75 ± 0.46	6.44 ± 0.09	165.56 ± 0.50	165.56 ± 0.50
30	1100	19	156.16	3.60	7.67	187.98	62.09	98.31	153.59 ± 0.47	6.53 ± 0.07	175.20 ± 0.51	175.20 ± 0.51
31	1100	25	163.17	3.33	8.41	109.78	67.11	98.26	160.37 ± 0.67	5.78 ± 0.07	182.56 ± 0.72	182.56 ± 0.72

Table DR1.2.2 continued Lj004 Lahijan K-feldspar Ar results (analyzed 01/21/2003)

Step	T (°C)	Time (min.)	$^{40}Ar/^{39}Ar$[1] x10^{-1}	$^{38}Ar/^{39}Ar$[1] x10^{-2}	$^{36}Ar/^{39}Ar$[1] x10^{-4}	$^{39}Ar_K$[2] (mol) x10^{-15}	$^{39}Ar_K$ (%)	$^{40}Ar*$[3] (%)	$^{40}Ar*/^{39}Ar_K$[4] ± 1σ x10^{-1}	Cl/K[5] ± 1σ x10^{-3}	Apparent Age[6] ± 1σ (Ma)	Corrected Age[7] ± 1σ (Ma)
32	1100	45	171.80	3.35	13.97	47.49	69.29	97.38	167.36 ± 0.57	5.82 ± 0.06	190.11 ± 0.61	190.11 ± 0.61
33	1100	90	181.67	3.48	19.52	131.88	75.32	96.61	175.59 ± 0.64	6.13 ± 0.08	198.96 ± 0.68	198.96 ± 0.68
34	1100	240	199.14	3.86	39.17	137.70	81.62	93.99	187.26 ± 0.71	7.08 ± 0.07	211.43 ± 0.76	211.43 ± 0.76
35	1100	480	210.82	4.07	62.13	142.70	88.15	91.11	192.15 ± 0.75	7.55 ± 0.10	216.64 ± 0.80	216.64 ± 0.80
36	1200	19	193.76	4.11	7.14	144.02	94.74	98.71	191.34 ± 0.64	7.94 ± 0.07	215.78 ± 0.68	215.78 ± 0.68
37	1233	15	204.22	4.05	7.87	72.77	98.07	98.68	201.59 ± 0.63	7.79 ± 0.10	226.63 ± 0.67	226.63 ± 0.67
38	1266	15	216.28	4.59	34.35	14.81	98.74	95.07	205.82 ± 0.97	9.14 ± 0.14	231.10 ± 1.02	231.10 ± 1.02
39	1300	19	240.55	5.67	96.37	9.66	99.19	87.92	211.77 ± 1.57	11.81 ± 0.24	237.35 ± 1.65	237.35 ± 1.65
40	1350	15	388.27	8.27	542.40	12.94	99.78	58.61	227.69 ± 2.34	16.69 ± 0.26	254.00 ± 2.43	254.00 ± 2.43
41	1650	15	2005.39	21.85	5934.15	4.75	99.99	12.54	251.54 ± 16.90	26.25 ± 0.66	278.65 ± 17.35	278.65 ± 17.35

[1] Corrected for backgrounds (mean values in (mol): m/e40 = $4x10^{-16}$; m/e39 = $1x10^{-16}$; m/e38 = $1.8x10^{-17}$; m/e37 = $1.8x10^{-17}$; m/e36 = $1.6x10^{-17}$), mass discrimination (measured $^{40}Ar/^{36}Ar_{ATM}$ = 296.5±0.5), abundance sensitivity (5 ppm), and radioactive decay (Irradiated: 05/03/2002; Analyzed: 01/22/2003).

[2] Normalized to 100% delivery to mass spectrometer.

[3] Includes static line blank.

[4] Corrected for atmospheric argon and nucleogenic interferences ($^{40}Ar/^{39}Ar_K$ = 0.0306; $^{36}Ar/^{37}Ar_{Ca}$ = 0.000271; $^{39}Ar/^{37}Ar_{Ca}$ = 0.000772).

[5] Corrected for atmospheric argon and and nucleogenic interferences and production ratios ($^{38}Ar/^{39}Ar_K$ = 0.012; Cl/K = 0.277 $^{38}Ar_{Cl}/^{39}Ar_K$; $^{36}Cl/^{38}Cl$ = 316).

[6] Assumes trapped argon is atmospheric. J-factor = 0.00664 (assumes Fish Canyon sanidine = 27.8 Ma).

[7] Corrected for Cl-correlated excess ^{40}Ar ($^{40}Ar_E$; Harrison et al., 1994) using $^{40}Ar_E$ = 1.52±0.01x10^{-5}; Cl/K offset = 3.4x10^{-4}.

[8] All uncertainties reflect analytical errors only.

Table DR1.3.1a: Nusha apatite (U-Th)/He data

Sample	corr age*	error**	raw age	Uppm	Th ppm	Th/U	He(nmol/g)	mass(mg)	FT	radius (µm)	length (µm)	Elevation (km)	Rock type
Sample 20-16-1													
20-16-1a	6.9	0.3	4.6	31.7	77.4	2.4	1.245	4.93	0.67	40.0	191.4	3.36	Nusha granite
20-16-1b	6.6	0.3	4.6	29.2	65.7	2.3	1.117	7.01	0.70	44.8	211.4	3.36	Nusha granite
20-16-1	***6.7***	***0.3***	*4.6*	*30.4*	*71.6*	*2.3*	*1.181*	*5.97*	*0.68*	*42.4*	*201.4*	3.36	
Sample 20-16-4													
20-16-4a	7.4	0.4	5.2	22.2	67.8	3.1	1.072	7.20	0.70	46.7	205.7	3.08	Nusha granite
20-16-4b	5.9	0.3	4.3	17.3	50.3	2.9	0.674	8.14	0.72	49.5	200.0	3.08	Nusha granite
20-16-4	***6.6***	***0.3***	*4.7*	*19.7*	*59.1*	*3.0*	*0.873*	*7.67*	*0.71*	*48.1*	*202.8*	3.08	
Sample 20-16-6													
20-16-6a	5.2	0.3	3.5	20.2	66.0	3.3	0.677	4.71	0.67	40.0	177.1	2.86	Nusha granite
20-16-6b	4.4	0.2	2.9	22.0	45.5	2.1	0.513	4.20	0.66	38.1	177.1	2.86	Nusha granite
20-16-6	***4.8***	***0.2***	*3.2*	*21.1*	*55.7*	*2.7*	*0.595*	*4.45*	*0.66*	*39.0*	*177.1*	2.86	
Sample 20-16-6													
20-16-8a	4.7	0.2	3.3	25.9	52.8	2.0	0.690	7.25	0.70	46.7	211.4	2.67	Nusha granite
20-16-8b	5.7	0.3	4.2	30.7	68.8	2.2	1.061	5.67	0.73	48.6	214.3	2.67	Nusha granite
20-16-8	***5.2***	***0.3***	*3.7*	*28.3*	*60.8*	*2.1*	*0.876*	*6.46*	*0.71*	*47.6*	*212.8*	2.67	
Sample 20-16-6													
20-16-9a	4.1	0.2	2.7	17.5	67.6	3.9	0.484	4.28	0.65	38.1	182.8	2.53	Nusha granite
20-16-9b	6.6	0.3	4.6	12.8	39.8	3.1	0.555	7.50	0.70	45.7	222.8	2.53	Nusha granite
20-16-9	***5.3***	***0.3***	*3.6*	*15.1*	*53.7*	*3.5*	*0.520*	*5.89*	*0.67*	*41.9*	*202.8*	2.53	
Sample 20-21-1													
20-21-1a	2.6	0.1	1.9	7.5	26.3	3.5	0.142	6.13	0.73	48.6	222.8	2.63	Shemshack Fm
20-21-1b	5.1	0.3	3.6	5.9	8.6	1.5	0.153	4.84	0.70	42.9	240.0	2.63	Shemshack Fm
20-21-1	***3.8***	***0.2***	*2.7*	*6.7*	*17.5*	*2.5*	*0.147*	*5.49*	*0.72*	*45.7*	*231.4*	2.63	
Sample 20-23-1													
20-23-1a	4.1	0.2	2.9	62.2	86.2	1.4	1.309	7.72	0.71	44.8	234.3	2.23	Nusha granite
20-23-1b	4.0	0.2	2.7	17.8	46.0	2.6	0.426	5.52	0.68	41.0	200.0	2.23	Nusha granite
20-23-1	***4.1***	***0.2***	*2.8*	*40.0*	*66.1*	*2.0*	*0.867*	*6.62*	*0.69*	*42.9*	*217.1*	2.23	

* average age in bold
**error is 5% of age
All italicised values are averages

Table DR1.3.1a continued: Nusha apatite (U-Th)/He data

Sample	**corr age***	**error****	**raw age**	**Uppm**	**Th ppm**	**Th/U**	**He(nmol/g)**	**mass(mg)**	**FT**	**radius (µm)**	**length (µm)**	**Elevation (km)**	**Rock type**
Sample 20-24-1													
20-24-1a	4.7	0.2	3.1	20.1	46.9	2.3	0.526	4.50	0.66	36.2	200.0	2.33	Nusha granite
20-24-1b	3.5	0.2	2.3	16.5	54.7	3.3	0.373	3.24	0.66	40.0	188.6	2.33	Nusha granite
20-24-1	***4.1***	***0.2***	*2.7*	*18.3*	*50.8*	*2.8*	*0.450*	*3.87*	*0.66*	*38.1*	*194.3*	2.33	
Sample 20-25-2													
20-25-2a	3.0	0.2	2.1	20.6	62.4	3.0	0.404	6.53	0.70	46.7	185.7	1.44	Nusha granite
20-25-2b	2.5	0.1	1.8	50.2	114.3	2.3	0.748	4.93	0.71	48.6	197.1	1.44	Nusha granite
20-25-2	***2.8***	***0.1***	*1.9*	*35.4*	*88.3*	*2.7*	*0.576*	*5.73*	*0.71*	*47.6*	*191.4*	1.44	

* average age in bold
**error is 5% of age
All italicised values are averages

Table DR1.3.1b: Nusha zircon (U-Th)/He data

Sample	corr age*	error**	raw age	Uppm	Th ppm	U/Th	He(nmol/g)	mass(mg)	FT	radius (µm)	length (µm)	Elevation (km)	Rock type
Sample 20-16-1													
20-16-1a	24.8	1.0	19.0	286.7	153.0	1.9	33.40	6.46	0.77	44.2	178.1	3.36	granite
20-16-1b	26.4	0.9	18.6	250.8	82.5	3.0	27.41	3.13	0.70	33.0	155.1	3.36	granite
20-16-1c	30.7	1.2	24.0	253.6	94.2	2.7	36.01	7.86	0.78	46.17	198.1	3.36	granite
20-16-1e	30.0	1.5	22.7	114.7	62.9	1.8	16.02	5.96	0.76	41.3	187.9	3.36	granite
20-16-1f	22.4	1.1	17.0	161.1	54.2	3.0	16.13	5.37	0.76	45.9	136.9	3.36	granite
20-16-1g	42.0	2.1	29.6	161.6	109.1	1.5	30.18	2.98	0.70	33.9	139.7	3.36	granite
20-16-1h	34.7	1.7	26.6	83.8	56.9	1.5	14.08	6.93	0.77	43.2	200.0	3.36	granite
20-16-1i	56.4	2.8	44.1	170.8	95.9	1.8	46.53	8.51	0.78	45.9	216.7	3.36	granite
20-16-1	***33.4***	***1.5***	*25.2*	*185.4*	*88.6*	*2.1*	*27.5*	*5.9*	*0.8*	*41.7*	*176.6*	**3.4**	
Sample 20-16-4													
20-16-4a	35.3	1.3	26.4	488.0	263.7	1.9	79.13	4.82	0.75	41.1	153.6	3.08	granite
20-16-4b	34.3	1.4	28.7	107.1	38.2	2.8	18.17	20.02	0.84	62.6	274.2	3.08	granite
20-16-4c	38.2	1.5	30.9	220.1	141.2	1.6	42.65	12.51	0.81	54.1	230.0	3.08	granite
20-16-4d	41.1	1.5	30.0	281.8	144.8	1.9	51.61	4.57	0.73	35.5	194.9	3.08	granite
20-16-4	***37.2***	***1.5***	*29.0*	*274.3*	*147.0*	*2.0*	*47.9*	*10.5*	*0.8*	*48.3*	*213.2*	**3.08**	
Sample 20-16-6													
20-16-6a	21.9	0.9	17.4	765.0	286.3	2.7	78.60	8.72	0.79	50.1	186.6	2.86	granite
20-16-6b	31.5	1.2	24.4	229.7	84.9	2.7	33.23	7.43	0.77	44.5	201.4	2.86	granite
20-16-6c	24.6	1.0	20.4	251.3	203.6	1.2	33.30	17.74	0.83	64.5	229.2	2.86	granite
20-16-6	***26.0***	***1.0***	*20.7*	*415.3*	*191.6*	*2.2*	*48.4*	*11.3*	*0.8*	*53.1*	*205.7*	**2.86**	
Sample 20-23-1													
20-23-1a	26.9	1.0	20.5	305.0	101.6	3.0	36.69	6.67	0.76	40.2	222.4	2.23	granite
20-23-1b	23.4	0.9	17.3	501.2	248.5	2.0	52.81	4.88	0.74	38.1	181.0	2.23	granite
20-23-1c	23.6	0.9	17.2	428.8	202.0	2.1	44.52	4.25	0.73	36.0	176.8	2.23	granite
20-23-1d	11.5	0.5	10.2	220.1	44.7	4.9	12.85	62.24	0.89	103.0	315.3	2.23	granite
20-23-1	***21.3***	***0.8***	*16.3*	*363.8*	*149.2*	*3.0*	*36.7*	*19.5*	*0.8*	*54.3*	*223.9*	**2.23**	

* average age in bold
**error is 5% of age
All italicised values are averages

Table DR1.3.1b continued: Nusha zircon (U-Th)/He data

Sample	**corr age***	**error****	**raw age**	**Uppm**	**Th ppm**	**U/Th**	**He(nmol/g)**	**mass(mg)**	**FT**	**radius (µm)**	**length (µm)**	**Elevation (km)**	**Rock type**
Sample 20-25-2													
20-25-2a	18.8	0.9	16.3	86.9	95.0	0.9	9.67	38.75	0.87	79.3	330.9	1.44	granite
20-25-2b	12.1	0.6	9.8	98.8	49.4	2.0	5.90	11.39	0.81	58.2	180.5	1.44	granite
20-25-2d	13.0	0.6	11.4	203.9	122.9	1.7	14.37	40.75	0.88	102.1	210.2	1.44	granite
20-25-2e	9.4	0.5	8.2	227.2	74.9	3.03	10.92	43.98	0.88	87.5	309.0	1.44	granite
20-25-2f	9.7	0.5	8.2	98.2	48.0	2.05	4.88	22.84	0.85	70.5	246.8	1.44	granite
20-25-2	***12.6***	***0.6***	*10.8*	*143.0*	*78.0*	*1.9*	*9.1*	*31.5*	*0.9*	*79.5*	*255.5*	**1.4**	

* average age in bold
**error is 5% of age
All italicised values are averages

Table DR1.3.2a: Lahijan apatite (U-Th)/He data

Sample	**corr age***	**error****	raw age	**Uppm**	**Th ppm**	**Th/U**	**He (nmol/g)**	**mass (mg)**	**FT**	**radius (µm)**	**length (µm)**	**Elevation (km)**	**Rock type**
Sample LJ006													
LJ006a	10.3	0.5	7.0	6.6	14.6	2.2	0.381	3.65	0.68	42.9	188.6	0.21	Lahijan granite
LJ006b	16.4	0.8	10.8	5.2	13.8	2.7	0.495	2.81	0.66	41.4	154.3	0.21	Lahijan granite
LJ006	***13.3***	***0.7***	*8.9*	*5.9*	*14.2*	*2.4*	*0.438*	*3.23*	*0.67*	*42.1*	*171.4*	0.21	
Sample LJ007													
LJ007a	16.8	0.8	11.4	7.4	12.3	1.7	0.640	3.65	0.68	42.9	188.6	0.153	Lahijan granite
LJ007b	15.4	0.8	10.0	11.1	17.2	1.5	0.822	2.73	0.65	37.1	188.6	0.153	Lahijan granite
LJ007	***16.1***	***0.8***	*10.7*	*9.3*	*14.7*	*1.6*	*0.731*	*3.19*	*0.66*	*40.0*	*188.6*	0.153	
Sample LJ007													
LJ008a	21.1	1.1	13.5	20.2	28.0	1.4	1.968	2.37	0.64	37.1	162.8	0.043	Lahijan granite
LJ008b	13.3	0.7	8.3	10.6	25.8	2.4	0.757	2.21	0.62	35.7	162.8	0.043	Lahijan granite
LJ008	***17.2***	***0.9***	*10.9*	*15.4*	*26.9*	*1.9*	*1.363*	*2.29*	*0.63*	*36.4*	*162.8*	0.043	

* average age in bold
**error is 5% of age
All italicised values are averages

Table DR1.3.2b: Lahijan zircon (U-Th)/He data

Sample	corr age*	error**	raw age	Uppm	Th ppm	U/Th	He (nmol/g)	mass (mg)	FT	radius (µm)	length (µm)	Elevation (km)	Rock type
Sample LJ003													
LJ003(a)	94.925832	4.7	77.9	312.9	144.6	2.2	148.0	13.33	0.82	60.6	195.4	0.438	Lahijan granite
LJ003(b)	136.326724	6.8	101.8	479.9	178.0	2.7	291.4	5.20	0.74	37.8	195.5	0.438	Lahijan granite
LJ003(d)	125.589753	6.3	93.7	332.5	235.7	1.4	199.2	5.30	0.74	38.5	192.1	0.438	Lahijan granite
LJ003(e)	175.595594	8.8	132.5	304.6	149.4	2.0	247.8	5.99	0.75	39.0	211.9	0.438	Lahijan granite
LJ003	***133.1***	***6.7***	*101.5*	*357.5*	*176.9*	*2.1*	*221.6*	*7.46*	*0.76*	*44.0*	*198.7*	0.438	
Sample LJ006													
LJ006(d)	168.107473	*8.4*	134.6	275.3	90.1	3.1	219.8	10.76	0.80	49.4	236.7	0.21	Lahijan granite
LJ006(e)	72.769938	*3.6*	60.3	530.2	226.2	2.3	192.3	17.58	0.83	59.2	270.1	0.21	Lahijan granite
LJ006(f)	170.828461	*8.5*	139.0	125.7	72.2	1.7	109.2	12.09	0.81	56.6	202.8	0.21	Lahijan granite
LJ006(c)	189.215369	*9.5*	141.8	427.8	181.8	2.4	367.6	4.90	0.75	39.4	169.4	0.21	Lahijan granite
LJ006	***150.2***	***7.5***	*118.9*	*339.8*	*142.6*	*2.4*	*222.2*	*11.33*	*0.80*	*51.2*	*219.7*	0.21	
Sample LJ008													
LJ008(a)	162.341314	*8.1*	126.8	223.1	79.3	2.8	168.7	8.89	0.78	43.4	253.8	0.043	Lahijan granite
LJ008	***162.3***	***8.1***	*126.8*	*223.1*	*79.3*	*2.8*	*168.7*	*8.89*	*0.78*	*43.4*	*253.8*	0.043	

* average age in bold
**error is 5% of age
All italicised values are averages

Table DR1.3.3 :Dizan apatite (U-Th)/He data

Sample	corr age*	error**	raw age	Uppm	Th ppm	Th/U	He(nmol/g)	mass(mg)	FT	radius (µm)	length (µm)	Elevation (km)
Sample 20-35-1												
20-35-1a	4.1	0.2	2.7	9.4	33.5	3.5	0.255	3.39	0.66	40.0	197.1	3.25
20-35-1b	2.6	0.1	1.9	6.8	59.5	8.8	0.212	6.05	0.71	48.6	240.0	3.25
20-35-1	***3.4***	***0.2***	*2.3*	*8.1*	*46.5*	*6.2*	*0.234*	*4.72*	*0.69*	*44.3*	*218.6*	3.25
Sample 20-36-1												
20-36-1a	3.8	0.2	2.9	5.6	15.1	2.7	0.144	11.35	0.75	54.3	222.8	3.03
20-36-1b	5.5	0.3	4.0	7.3	31.9	4.3	0.322	8.69	0.72	51.4	200.0	3.03
20-36-1	***4.7***	***0.2***	*3.4*	*6.5*	*23.5*	*3.5*	*0.233*	*10.02*	*0.74*	*52.9*	*211.4*	3.03
Sample 20-36-3												
20-36-3a	6.0	0.3	4.7	7.7	25.7	3.4	0.348	20.56	0.78	62.9	320.0	2.58
20-36-3b	6.1	0.3	4.9	7.3	23.9	3.3	0.344	17.16	0.80	71.4	308.6	2.58
20-36-3	***6.1***	***0.3***	*4.8*	*7.5*	*24.8*	*3.3*	*0.346*	*18.86*	*0.79*	*67.1*	*314.3*	2.58
Sample 20-39-3												
20-39-3a	4.4	0.2	3.2	6.2	28.0	4.5	0.220	9.93	0.73	50.5	240.0	2.47
20-39-3b	4.0	0.2	2.9	4.1	20.5	5.0	0.141	10.16	0.73	51.4	240.0	2.47
20-39-3	***4.2***	***0.2***	*3.1*	*5.1*	*24.2*	*4.8*	*0.181*	*10.04*	*0.73*	*51.0*	*240.0*	2.47

* average age in bold
**error is 5% of age
All italicised values are averages

Table DR1.3.4: Chalus Road (U-Th)/He data

Sample	corr age*	error**	raw age	Uppm	Th ppm	Th/U	He(nmol/g)	mass(mg)	FT	radius (µm)	length (µm)	Elevation (km)
Sample KJ001												
KJ001a	*5,1*	*0,3*	3,8	13,5	82,5	6,1	0,675	7,56	0,74	54,3	240,0	2284
KJ001b	*6,5*	*0,3*	4,4	15,9	120,5	7,6	1,067	4,17	0,68	42,9	205,7	2284
KJ001	***5,8***	***0,3***	*4,1*	*14,7*	*101,5*	*6,8*	*0,871*	*5,86*	*0,71*	*48,6*	*222,8*	
Sample KJ003												
KJ003b	*4,8*	*0,2*	2,8	8,7	67,3	7,7	0,378	3,44	0,59	32,9	147,9	2534
KJ003	***4,8***	***0,2***	*2,8*	*8,7*	*67,3*	*7,7*	*0,378*	*3,44*	*0,59*	*32,9*	*147,9*	
Sample KJ005												
KJ005a	*3,1*	*0,2*	1,5	6,9	16,1	2,3	0,089	1,46	0,48	23,6	120,0	2369
KJ005b	*5,4*	*0,3*	2,5	2,2	13,6	6,1	0,075	1,21	0,47	23,6	96,4	2369
KJ005	***4,3***	***0,2***	*2,0*	*4,6*	*14,9*	*4,2*	*0,082*	*1,33*	*0,48*	*23,6*	*108,2*	
Sample KJ006												
KJ006a	*6,6*	*0,3*	4,1	6,6	40,0	6,1	0,359	4,55	0,63	37,9	145,7	2222
KJ006b	*6,5*	*0,3*	4,8	2,3	15,0	6,6	0,152	7,81	0,74	57,1	222,8	2222
KJ006	***6,5***	***0,3***	*4,5*	*4,4*	*27,5*	*6,3*	*0,256*	*6,18*	*0,69*	*47,5*	*184,3*	
Sample KJ007												
KJ007a	*4,0*	*0,2*	2,9	8,7	83,9	9,7	0,446	5,30	0,71	50,0	188,6	2166
KJ007b	*4,0*	*0,2*	2,8	15,9	103,6	6,5	0,617	4,82	0,70	47,1	201,4	2166
KJ007	***4,0***	***0,2***	*2,9*	*12,3*	*93,8*	*8,1*	*0,532*	*5,06*	*0,71*	*48,6*	*195,0*	
Sample KJ011												
KJ011a	*6,3*	*0,3*	4,4	6,5	38,5	5,9	0,375	2,61	0,70	24,3	201,4	1833
KJ011b	*7,4*	*0,4*	5,2	5,8	29,2	5,1	0,357	4,8	0,70	47,14	201,4	1833
KJ011	***6,9***	***0,3***	*4,8*	*6,1*	*33,8*	*5,5*	*0,366*	*3,71*	*0,70*	*35,7*	*201,4*	
Sample KJ012												
KJ012a	*4,4*	*0,2*	3,3	4,7	14,6	3,1	0,145	7,8	0,75	57,14	222,8	1831
KJ012b	*5,8*	*0,3*	4,3	4,1	13,9	3,4	0,173	7,8	0,75	57,14	222,8	1831
KJ012	***5,1***	***0,3***	*3,8*	*4,4*	*14,3*	*3,3*	*0,159*	*7,81*	*0,75*	*57,1*	*222,8*	

* average age in bold
**error is 5% of age
All italicised values are averages