GSA DATA REPOSITORY ITEM XXXX: U-PB AND ^{40}AR/^{39}AR RESULTS FOR GRANITES OF THE RONGBUK VALLEY, SOUTHERN TIBET

GEOCHRONOLOGIC METHODS

U-Pb analyses were performed at MIT on mineral separates containing no microscopically visible inclusions. Zircons were air-abraded and washed in warm 4*N* HNO_3 for 30 min. before HF + HNO_3 dissolution in Teflon bombs at 220 °C for 48 h. Monazite and xenotime were washed in acetone and warm H_2O prior to 11-12*N* HCl dissolution in Teflon capsules over two 30-48 h. steps at 180 °C. After similar preparation, the titanite was dissolved in a mixture of 6*N* HCl and HF at 180 °C. All samples were spiked with a mixed ^{205}Pb-^{233}U-^{235}U tracer solution. Pb and U were separated from the resulting solutions by using anion-exchange chemistry. Total procedural blanks were 2.0-3.5 pg for Pb and <1 pg for U. Pb was loaded on single Re filaments with silica gel and phosphoric acid. Lead isotopes were measured with a VG Sector-54 thermal ionization mass spectrometer either by (1) peak jumping to all peaks using the Daly detector in ion-counting mode, or (2) measuring ^{204}Pb on the Daly detector, measuring ^{205}Pb on both the Daly and Faraday detectors to permit gain calibration, and measuring all other peaks using only Faraday detectors in dynamic mode. Uranium was loaded with phosphoric acid and colloidal graphite on Re filaments and measured as metal ions in the static mode utilizing three Faraday collectors. The ^{235}U ion-beam intensity averaged 2.5 x 10^{-13}A.

$^{40}Ar/^{39}Ar$ analyses were performed at MIT by incremental heating of mineral separates in a resistance furnace. Descriptions of analytical procedures may be found elsewhere (Hodges et al., 1994). Fish Canyon sanidine (27.95 Ma; Renne et al., 1994) was used as the primary flux monitor. The irradiation parameter J was $3.58 \times 10^{-3} \pm 3.52 \times 10^{-5}$ (2σ).

REFERENCES

Hodges, K.V., Hames, W.E., Olszewski, W.J., Burchfiel, B.C., Royden, L.H., and Chen, Z., 1994, Thermobarometric and $^{40}Ar/^{39}Ar$ geochronologic constraints on Eohimalayan metamorphism in the Dinggyê area, southern Tibet: Contributions to Mineralogy and Petrology, v. 117, p. 151-163.

Renne, P.R., Deino, A.L., Walter, R.C., Turrin, B.D., Swisher, C.C., Becker, T.A., Curtis, G.H., Sharp, W.D., and Jaouni, A.-R., 1994, Intercalibration of astronomical and radioisotopic time: Geology, v. 22, p. 783-786.

TABLE 1. U-Pb DATA FOR RONGBUK SAMPLES R102 AND R113

Fraction†	Mass§ (μg)	U (ppm)	Th (ppm)#	Pb* (ppm)	Th/U	^{208}Pb mol%
R102 Calc-silicate Gneiss						
T1(4)	198.80	194	43	3	0.23	10.7
R113 Mylonitic Leucogranite						
Z1(1)	5.00	7788	188	18	0.03	1.4
Z2(3)	5.00	1694	33	17	0.02	3.6
M18(1)	5.00	8634	110425	126	13.12	72.7
M20(1)	5.00	14310	304147	290	21.80	86.1
M21(2)	5.00	10519	524190	111	51.12	64.6
M22(2)	10.00	1938	17369	19	9.20	72.7
M23(2)	10.00	3441	24544	28	7.32	68.2
M24(3)	10.00	2799	6705	15	2.46	42.3
X1(1)	0.30	74265	30425	195	0.42	6.6
X2(1)	1.70	26224	1793	63	0.07	2.5
X3(1)	1.20	42792	2242	104	0.05	2.8
X4(1)	0.20	50043	1979	123	0.04	3.4
X6(1)	5.00	3174	829	9	0.27	5.1

Note: Asterisk designates radiogenic component.

†Fractions are designated by mineral (T - titanite; M - monazite; Z - zircon; X - xenotime) and number of grains (in parentheses).

§Fraction weights, estimated by using a video monitor with a gridded screen, are known to within 20%.

#Th concentrations and Th/U ratios are calculated from ^{208}Pb* and ^{208}Pb/^{206}Pb ratios, respectively.

TABLE 1. U-Pb DATA FOR RONGBUK SAMPLES R102 AND R113 (continued)

Fraction†	Pb_{com} (pg)††	$^{206}Pb/^{204}Pb$§§	$^{208}Pb/^{206}Pb$	$^{206}Pb/^{238}U$##	$^{207}Pb/^{235}U$##	$^{207}Pb/^{206}Pb$##
R102 Calc-silicate Gneiss						
T1(4)	482.2	32	0.125	0.00266(0.75)	0.01709(13.50)	0.04661(12.94)
R113 Mylonitic Leucogranite						
Z1(1)	4.0	1655	0.015	0.00258(0.52)	0.01661(0.56)	0.04666(0.18)
Z2(3)	1.6	3540	0.039	0.01051(0.10)	0.07961(0.12)	0.05494(0.07)
M18(1)	42.4	289	2.789	0.00413 (0.30)	0.02643 (0.57)	0.04638(0.46)
M20(1)	58.8	253	6.455	0.00300(0.26)	0.01770 (0.35)	0.04285(0.23)
M21(2)	106.3	126	1.907	0.00338 (0.27)	0.02147(0.55)	0.04609(0.46)
M22(2)	17.2	217	2.782	0.00274(0.93)	0.01654(1.76)	0.04370(1.42)
M23(2)	18.6	342	2.244	0.00272(0.53)	0.01663(0.71)	0.04431(0.44)
M24(3)	38.9	141	0.766	0.00265(0.62)	0.01647(1.46)	0.04502(1.27)
X1(1)	6.3	613	0.074	0.00260(0.89)	0.01656(1.04)	0.04622(0.52)
X2(1)	4.6	1633	0.026	0.00259(0.46)	0.01657(0.48)	0.04642(0.14)
X3(1)	6.3	1374	0.031	0.00257(0.43)	0.01650(0.48)	0.04661(0.21)
X4(1)	4.2	416	0.037	0.00256(2.02)	0.01657(2.25)	0.04695(0.94)
X6(1)	7.3	378	0.056	0.00258(1.25)	0.01645(1.32)	0.04625(0.42)

Note: †Fractions are designated by mineral (T - titanite; M - monazite; Z - zircon; X - xenotime) and number of grains (in parentheses).

††Total common Pb.

§§Measured ratio corrected for fractionation.

##Isotopic ratios corrected for fractionation, spike, blank, and initial common Pb; U blank = 1 pg ± 50%; Pb blank = 3.5 pg ± 50%. For R102 titanite, the initial common Pb was estimated from the Stacey and Kramers (1975) model Pb concentration for the interpreted age; for R113 minerals, initial common Pb was determined from analyses of HF-leached R113 K-feldspar: $^{206}Pb/^{204}Pb = 18.729$, $^{207}Pb/^{204}Pb = 15.7092$, $^{208}Pb/^{204}Pb = 38.818$ (uncertainties better than 0.01% 2σ).

TABLE 1. U-PB DATA FOR RONGBUK SAMPLES R102 AND R113 (continued)

Fraction[†]	correlation coefficient	^{206}Pb-^{238}U age (Ma)[†††]	^{207}Pb-^{235}U age (Ma)[†††]	^{207}Pb-^{206}Pb age (Ma)[†††]
R102 Calc-silicate Gneiss				
T1(4)	0.752	17.12 ± 0.13	17.21 ± 2.32	29.20 ± 310.26
R113 Mylonitic Leucogranite				
Z1(1)	0.944	16.62 ± 0.09	16.72 ± 0.09	31.7 ± 4.4
Z2(3)	0.808	67.40 ± 0.07	77.78 ± 0.09	409.7 ± 1.6
M18(1)	0.584	26.58 ± 0.08	26.48 ± 0.15	17.6 ± 11.1
M20(1)	0.751	19.29 ± 0.05	17.82 ± 0.06	-176.4 ± 5.8
M21(2)	0.548	21.75 ± 0.06	21.57 ± 0.12	2.5 ± 11.0
M22(2)	0.595	17.67 ± 0.16	16.65 ± 0.29	-127.6 ± 35.0
M23(2)	0.784	17.52 ± 0.09	16.74 ± 0.12	-93.3 ± 10.8
M24(3)	0.502	17.08 ± 0.11	16.58 ± 0.24	-54.5 ± 31.0
X1(1)	0.869	16.73 ± 0.15	16.68 ± 0.17	9.1 ± 12.4
X2(1)	0.960	16.66 ± 0.08	16.68 ± 0.08	19.5 ± 3.3
X3(1)	0.901	16.53 ± 0.07	16.62 ± 0.08	29.3 ± 5.0
X4(1)	0.908	16.48 ± 0.33	16.68 ± 0.38	46.6 ± 22.5
X6(1)	0.947	16.61 ± 0.21	16.57 ± 0.22	10.8 ± 10.2

Note: [†]Fractions are designated by mineral (T - titanite; M - monazite; Z - zircon; X - xenotime) and number of grains (in parentheses).

[†††]Age uncertainties in million years at 2σ.

TABLE 2. $^{40}Ar/^{39}Ar$ DATA FOR MICAS FROM THE RONGBUK PLUTON (SAMPLE Δ33b)

$T^{\dagger}$(K)	$^{36}Ar/^{40}Ar^{\S}$	$^{39}Ar/^{40}Ar^{\S}$	$^{39}Ar_K^{\#}$(x 10^{14} mol)	$^{39}Ar_{cum}^{\dagger\dagger}$(%)	$^{40}Ar^{*\S\S}$(%)	$Age^{\#\#}$(Ma)
Muscovite						
900	0.00296(0.00022)	0.04580(0.00027)	2.02	0.5	12.6	17.67 ± 9.24(9.24)
950	0.00251(0.00036)	0.05492(0.00045)	2.39	1.0	25.7	30.01 ± 12.45(12.45)
975	0.00282(0.00045)	0.07879(0.00053)	3.03	1.7	16.7	13.63 ± 10.83(10.83)
1000	0.00264(0.00050)	0.08401(0.00037)	4.05	2.6	22.1	16.91 ± 11.24(11.24)
1025	0.00257(0.00013)	0.08413(0.00023)	10.80	5.1	24.0	18.37 ± 2.85(2.85)
1050	0.00175(0.00008)	0.18370(0.00024)	45.42	15.6	48.3	16.95 ± 0.86(0.84)
1075	0.00102(0.00009)	0.27720(0.00045)	65.53	30.6	69.7	16.19 ± 0.64(0.62)
1100	0.00052(0.00014)	0.32840(0.00063)	56.81	43.7	84.5	16.58 ± 0.84(0.82)
1125	0.00050(0.00012)	0.33150(0.00065)	44.46	53.9	85.0	16.52 ± 0.72(0.70)
1150	0.00056(0.00010)	0.31720(0.00067)	35.52	62.0	83.2	16.90 ± 0.64(0.62)
1175	0.00079(0.00027)	0.29110(0.00060)	25.68	67.9	76.7	16.97 ± 1.75(1.74)
1200	0.00131(0.00025)	0.26450(0.00062)	17.57	71.9	61.3	14.92 ± 1.78(1.77)
1250	0.00112(0.00030)	0.24860(0.00047)	20.47	76.6	66.8	17.31 ± 2.27(2.26)
1300	0.00099(0.00025)	0.27080(0.00051)	27.02	82.9	70.7	16.82 ± 1.77(1.77)
1350	0.00081(0.00016)	0.30340(0.00058)	30.10	89.8	76.1	16.15 ± 0.99(0.97)
1550	0.00028(0.00021)	0.35310(0.00083)	35.21	97.9	91.5	16.70 ± 1.16(1.15)
1925	0.00124(0.00063)	0.31320(0.00096)	9.38	100.0	63.4	13.06 ± 3.81(3.80)
Biotite						
900	0.00267(0.00013)	0.08413(0.00032)	15.27	5.4	21.1	16.16 ± 2.86(2.86)
950	0.00109(0.00017)	0.25780(0.00043)	26.59	14.7	67.8	16.94 ± 1.28(1.27)
975	0.00051(0.00014)	0.33280(0.00072)	52.41	33.1	84.9	16.43 ± 0.83(0.82)
1000	0.00079(0.00029)	0.29460(0.02290)	3.07	34.2	76.6	16.75 ± 2.33(2.32)
1025	0.00019(0.00016)	0.37100(0.00083)	35.95	46.8	94.2	16.36 ± 0.81(0.80)
1050	0.00014(0.00178)	0.60840(0.36000)	9.19	50.0	95.6	10.15 ± 8.36(8.36)
1075	0.00063(0.00094)	0.32300(0.00163)	6.16	52.2	81.4	16.23 ± 5.49(5.49)
1100	0.00072(0.00127)	0.33200(0.00162)	5.38	54.1	78.5	15.25 ± 7.23(7.23)
1125	0.00030(0.00087)	0.33050(0.00111)	6.75	56.5	91.2	17.77 ± 4.96(4.96)
1150	0.00048(0.00059)	0.34370(0.00081)	14.87	61.7	85.6	16.04 ± 3.24(3.24)
1175	0.00021(0.00028)	0.34350(0.00071)	23.84	70.0	93.7	17.57 ± 1.54(1.53)
1200	0.00022(0.00025)	0.34440(0.00077)	25.36	78.9	93.5	17.48 ± 1.39(1.38)
1250	0.00040(0.00015)	0.35400(0.00074)	42.81	94.0	88.0	16.02 ± 0.81(0.80)
1300	0.00038(0.00060)	0.36390(0.00120)	11.71	98.1	88.6	15.68 ± 3.13(3.13)
1350	0.00024(0.00152)	0.28650(0.00169)	2.81	99.1	92.7	20.81 ± 10.03(10.03)
1550	0.00102(0.00198)	0.26600(0.00192)	2.64	100.0	69.7	16.89 ± 14.07(14.07)

Note: Asterisk designates radiogenic component.
†Temperature of release increment, monitored by thermocouple (± 5 K).
§Numbers in parentheses indicate 2σ absolute errors.
$^{\#}$Number of moles of K-derived ^{39}Ar calculated from measured signal size and instrumental sensitivity as calibrated against air aliquots of known volumes.
††Cumulative percentage of K-derived ^{39}Ar after each increment.
§§Percentage of radiogenic ^{40}Ar.
$^{\#\#}$Ages calculated assuming initial $^{40}Ar/^{36}Ar$ = 295.5, shown with 2σ absolute errors. Numbers in parentheses indicate 2σ absolute errors assuming no error in the irradiation parameter *J*.