

Appendix 1. Sample Localities

Sample Number	Latitude & Longitude	Outcrop Description
LS-8	32°37'00"N 85°42'25"W	Pavement outcrops along Ropes Creek
NO-2	32°36'10"N 85°37'17"W	Quarry
AUB-2 & 87AUB2A	32°37'00"N 85°31'07"W	Schist from pavement outcrops
87FG-1	32°39'16"N 85°32'01"W	Pavement exposure adjacent to road
WA-59	32°41'37"N 85°31'28"W	Road crop along dirt road near intersection with County road.
LSW-1	2°46'53"N 85°39'38"W	Road cut along SW side of US 280
AU-68A, PMB-3, & PMA-A1	32°32'50"N 85°29'24"W	Outcrops along cascades in branch of Chewacla Creek
MM-2A	32°31'12"N 85°15'25"W	Outcrop along cascades at Meadows Mill
RS-1	32°28'16"N 85°00'00"W	Pavement outcrop at Rocky Shoals, Chattahooche River
DM-2	32°42'16"N 85°01'00"W	Outcrop directly below Davis Mill
BFD-1	32°39'36"N 85°05'17"W	Outcrop along west side of easternmost spillway
BH-251	32°40'00"N 85°11'48"W	Outcrops below powerlines and north of small creek
BL-13	32°05'02"N 85°11'34"W	Outcrop in ditch along dirt road
TH-5C	32°00'33"N 85°10'59"W	Exposures along water falls at Moffits Mill
OE-79A	32°09'47"N 85°15'28"W	Road crop along road near intersection with County road, north side
AU-160 & AU-210	32°04'24"N 85°24'54"W	Road cut along north side of road, across from pond
PM-12	32°02'49"N 85°28'35"W	Northernmost quarry wall, schist layer
LC-1	32°29'24"N 84°58'26"W	Outcrop in creek on Columbus College campus
FLQ-2	32°36'00"N 84°54'30"W	Outcrop along north side of road in quarry

Appendix II. $^{40}\text{Ar}/^{39}\text{Ar}$ Analytical Techniques

Mineral separations were made in facilities at the U.S. Geological Survey, Reston, Virginia, and the Department of Geology at Auburn University using standard ultrasonic cleaning and heavy liquid and magnetic separation techniques. Separates of better than 99 percent purity for muscovite, biotite, and potassium feldspar and no less than 99.9 percent purity for hornblende were used for our analyses. The samples, together with aliquats of the monitor mineral MMhb-1, were encapsulated in tin foil and sealed under vacuum in fused silica vials. The relative geometry of the samples and monitors was measured and recorded. The sample vials were sealed into an aluminum irradiation can and irradiated at the U.S. Geological Survey TRIGA reactor (Dalrymple et al, 1981) in Denver, Colorado. After irradiation the samples and monitors were placed in the side arm assembly of a low blank double vacuum furnace, similar in design to that described by Staudacher and others (1978). After melting the tin packaging at 350°C, samples were either fused or heated in a stepwise manner to extract their argon. The gas was cleaned using SAES St707, ST101, and titanium metal getters before analysis in a VG 1200b rare gas mass spectrometer for their argon isotopic composition. (Use of tradenames is for descriptive purposes only and does not imply any endorsement by the U.S. Geological Survey.) This data was then reduced using the computer program ArAr* (Haugerud and Kunk, 1989). Corrections for the production of interfering isotopes were those of Dalrymple and others (1981). Decay constants are those recommended by Steiger and Jaeger (1977). The age used for MMhb-1 is 519.4 +/- 2.5 Ma (Alexander et al., 1978; Dalrymple et al., 1981); the authors have chosen not to use the value suggested by Samsom and Alexander (1987) primarily because of the small uncertainty stated. Plateau ages calculated by ArAr* (Haugerud and Kunk, 1989) follow the definition suggested by Fleck and others (1977). The method of calculation of ages and errors as well as plateau ages and errors is discussed in Haugerud and Kunk (1989). Tabulated results of the $^{40}\text{Ar}/^{39}\text{Ar}$ analyses follow.

References

Alexander, E.C., Jr., Mickelson, G.M., and Lamphyre, M.A., 1978, MMhb-1: A new $^{40}\text{Ar}/^{39}\text{Ar}$ dating standard: *Journal of Geophysical Research*, v. 94, p. 17917-17935.

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Fleck, R.J., Sutter, J.F., and Elliot, D.H., 1977, Interpretation of discordant $^{40}\text{Ar}/^{39}\text{Ar}$ age spectra of Mesozoic tholeiites from Antarctica: *Geochemica et Cosmochemica Acta*, v. 41, p. 15-32.

Haugerud, R.A., and Kunk, M.J., 1989, ArAr* A computer program for reduction of $^{40}\text{Ar}/^{39}\text{Ar}$ data: U.S. Geological Survey open file report 99-261, 68 p.

Samsom, S.D., and Alexander, E.C., Jr., 1987, Calibration of the interlaboratory $^{40}\text{Ar}/^{39}\text{Ar}$ dating standard, MMhb-1: *Chemical Geology, Isotope Geoscience section*, v. 66, p. 27-34.

Staudacher, Th., Jessberger, E.K., Dorflinger, D., Kiko, J., 1978, A refined ultrahigh-vacuum furnace for rare gas analysis: *Journal of Physical Earth Science Instruments*, v. 11, p. 781-784.

Steiger, R.H., and Jaeger, E., 1977, Subcommittee on geochronology: Convention on the use of decay constants in geo- and cosmochronology: *Earth and Planetary Sciences Letters*, v. 36, p. 359-362.

REPOSITORY DATA: 40Ar/39Ar STELTENPOHL AND KUNK

PM3-3 MUSCOVITE #103

J = 0.009375 ± 0.50%

SAMPLE WT = 0.1001 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
650	1.268E-11	5.483E-13	3.439E-15	3.706E-15	2.124E-15	250.03 ±	40.95
750	3.253E-11	1.505E-12	3.500E-15	2.295E-15	1.071E-15	314.01 ±	3.03
850	4.365E-11	2.183E-12	***	2.647E-15	1.470E-15	291.90 ±	9.15
950	1.861E-10	9.590E-12	***	1.937E-14	***	291.55 ±	4.21
1000	6.197E-11	4.121E-12	***	9.103E-15	***	300.09 ±	4.79
1050	3.985E-11	2.000E-12	***	5.193E-15	***	295.54 ±	5.70
1100	9.300E-11	4.786E-12	***	2.222E-15	***	295.97 ±	3.80
1200	4.679E-11	2.431E-12	***	1.620E-14	***	299.32 ±	2.74
1350	7.610E-12	3.799E-13	1.153E-15	3.332E-13	5.603E-15	270.04 ±	17.03
1450	1.033E-11	5.174E-13	1.295E-15	3.217E-13	5.302E-15	201.55 ±	14.17
TOTAL GAS	5.545E-10	2.007E-11	9.581E-15	7.157E-13	1.247E-14	294.57	
		K/Ca = 382.0					
				assuming 40Ar/36Ar initial = 295.5		304.64	

NO PLATEAU

AU3-2 MUSCOVITE #105RD61

J = 0.009575 ± 0.50%

SAMPLE WT = 0.1008 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
650	2.425E-12	1.004E-13	4.923E-15	6.832E-16	1.964E-15	292.43 ±	4.29
750	9.803E-12	4.791E-13	1.139E-15	***	2.936E-15	301.61 ±	1.79
850	7.796E-11	4.014E-12	1.776E-15	***	9.603E-15	297.33 ±	1.43
950	1.887E-10	1.009E-11	***	7.092E-15	3.594E-15	295.50 ±	1.42
1000	2.537E-11	1.339E-12	***	***	9.050E-16	297.85 ±	1.41
1050	1.708E-11	8.988E-13	***	1.107E-15	1.038E-15	295.62 ±	1.50
1100	2.910E-11	1.537E-12	***	3.576E-16	1.198E-15	297.16 ±	1.41
1200	1.087E-11	5.787E-13	***	1.755E-15	3.391E-16	295.91 ±	1.47
1350	9.810E-13	4.624E-14	***	2.937E-15	3.589E-16	300.37 ±	7.79
TOTAL GAS	3.623E-10	1.908E-11	7.662E-15	1.418E-14	2.194E-14	295.40	
		K/Ca =					
	1021.0301184	3D.D					

70.6% of gas on plateau, steps 650 through 950 PLATEAU AGE = 295.34 ± 1.53

Note: all gas quantities are in moles. No blank correction.

* Ages calculated assuming initial 40Ar/36Ar = 295.5 ± 3

** 1-sigma precision estimates are for intra-irradiation package reproducibility.

*** below detection limit

v 10/19/89 50

TH-5C MUSCOVITE

J = 0.007678 + 0.50%							SAMPLE WT = 0.1015 g	
TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE± in Ma	**	
550	1.548E-12	3.898E-14	4.976E-15	1.012E-15	3.637E-15	160.77 +	8.50	
650	3.470E-12	1.423E-13	1.076E-15	1.074E-15	1.267E-15	278.70 +	5.10	
750	1.167E-11	4.910E-13	***	1.207E-15	1.309E-15	293.21 +	1.55	
850	4.925E-11	2.143E-12	***	3.151E-15	3.605E-15	287.41 +	1.37	
950	1.482E-10	6.615E-12	***	5.778E-15	4.462E-15	283.95 +	1.38	
1000	3.179E-11	1.409E-12	***	1.070E-15	9.831E-16	285.85 +	1.37	
1050	2.627E-11	1.156E-12	***	5.857E-15	8.829E-16	285.22 +	1.39	
1100	3.540E-11	1.571E-12	***	1.443E-15	1.041E-15	285.63 +	1.33	
1200	1.040E-10	4.630E-12	***	5.139E-15	1.547E-15	286.00 +	1.36	
1300	1.539E-11	7.156E-13	***	3.753E-15	7.416E-16	272.07 +	1.29	
1450	2.772E-12	1.197E-13	***	***	4.555E-16	284.11 +	2.96	
TOTAL	4.298E-10	1.904E-11	6.052E-15	2.461E-14	1.993E-14	284.71		
GAS	K/Ca = 531.1							

NO PLATEAU

v 10/19/89 60

FLQ-2 MUSCOVITE #37

J = 0.007579 + 0.50%							SAMPLE WT = 0.0999 g	
TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE± in Ma	**	
550	2.167E-12	7.424E-14	4.919E-15	***	3.788E-15	183.33 +	7.58	
650	2.833E-12	1.153E-13	4.694E-16	1.051E-15	9.529E-15	279.75 +	2.95	
750	1.265E-11	5.370E-13	***	1.961E-15	1.089E-15	289.41 +	1.41	
850	4.745E-11	2.208E-12	***	6.531E-15	2.941E-15	267.63 +	1.25	
950	1.658E-10	7.305E-12	***	6.002E-15	4.377E-15	284.22 +	1.37	
1000	4.006E-11	1.751E-12	***	2.164E-15	1.206E-15	286.11 +	1.37	
1050	2.816E-11	1.237E-12	***	1.510E-15	7.923E-16	284.95 +	1.45	
1100	5.228E-11	2.303E-12	***	2.157E-15	***	285.05 +	1.36	
1200	3.462E-10	1.524E-11	***	2.055E-14	3.970E-15	285.73 +	1.38	
1450	1.338E-11	5.790E-13	***	4.861E-15	***	288.91 +	1.44	
1650	3.941E-12	1.595E-13	***	***	9.813E-16	288.53 +	2.43	
TOTAL	7.149E-10	3.151E-11	5.388E-15	4.691E-14	2.133E-14	283.94		
GAS	K/Ca = 440.5							

65.2% of gas on plateau, steps 1000 through 1200 PLATEAU AGE = 285.52 +/- 1.48

BFD-1 MUSCOVITE #184RD61

J = 0.009502 ± 0.50%							SAMPLE WT = 0.1003 g	
TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE± in Ma	**	
650	5.540E-12	3.821E-13	2.613E-15	1.315E-15	1.234E-15	271.25 +	1.54	
750	1.412E-11	7.335E-13	6.578E-16	6.701E-15	5.191E-15	292.59 +	1.42	
850	4.171E-11	2.380E-12	***	***	***	294.89 +	1.41	
950	1.598E-10	8.931E-12	***	6.218E-15	***	282.51 +	1.34	
1000	2.384E-11	1.684E-12	***	***	4.283E-15	283.18 +	1.32	
1050	2.452E-11	1.368E-12	***	***	4.668E-15	283.77 +	1.34	
1100	3.752E-11	2.891E-12	***	***	***	282.86 +	1.36	
1200	7.426E-11	4.133E-12	***	***	***	283.38 +	1.37	
TOTAL	3.863E-10	2.148E-11	3.281E-15	9.637E-15	6.678E-15	283.22		
GAS	K/Ca =							
1163.23134204 3I.D								

84.4% of gas on plateau, steps 950 through 1200 PLATEAU AGE = 283.07 ± 1.46

PM-12 MUSCOVITE #102RD61

J = 0.009435 ± 0.01%

SAMPLE WT = 0.1004 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
650	4.493E-12	3.173E-13	4.002E-15	2.580E-15	1.925E-15	197.13 +	.94
750	1.528E-11	8.103E-13	4.566E-15	3.346E-15	5.802E-15	302.99 +	.59
850	3.625E-11	2.825E-12	***	1.879E-15	1.368E-15	292.05 +	.54
950	1.742E-12	9.525E-12	***	4.525E-15	***	286.32 +	.39
1000	2.920E-11	1.593E-12	***	***	5.246E-15	286.32 +	.36
1050	2.132E-11	1.159E-12	***	***	5.130E-15	286.79 +	.54
1100	3.979E-11	2.172E-12	***	***	***	286.25 +	.95
1200	7.063E-11	3.805E-12	***	***	3.259E-15	287.42 +	.58
1350	2.802E-12	1.469E-13	***	***	***	289.00 +	4.24
1450	1.400E-12	6.949E-14	***	***	4.369E-15	287.24 +	3.79
TOTAL	3.980E-12	2.163E-11	4.985E-15	9.745E-15	1.134E-14	286.57	
GAS	K/Ca =						
	1024.14600299 31.D						

85.4% of gas on plateau, steps 950 through 1450 PLATEAU AGE = 286.55 ± .56

AU-160 MUSCOVITE #48RD72

J = 0.009914 ± 0.50%

SAMPLE WT = 0.1011 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
900	8.006E-12	4.167E-13	1.250E-15	1.370E-15	3.563E-15	276.14 +	.54
950	9.959E-12	5.217E-13	7.090E-16	2.115E-15	2.986E-15	287.07 +	.28
1000	3.049E-11	1.744E-12	4.597E-16	***	2.481E-15	281.96 +	.30
1025	4.454E-11	2.545E-12	1.244E-15	***	5.001E-15	279.71 +	.11
1050	2.093E-11	1.210E-12	7.060E-16	***	1.824E-15	278.62 +	.37
1100	2.224E-11	1.297E-12	***	***	1.588E-15	277.75 +	.18
1150	1.471E-11	8.441E-13	***	6.134E-16	1.867E-15	277.55 +	.22
1200	2.688E-11	1.573E-12	***	***	1.450E-15	278.16 +	.14
1450	4.129E-11	2.415E-12	***	5.132E-15	***	280.09 +	.55
1450	1.618E-11	9.153E-13	***	***	1.986E-15	281.55 +	.30
TOTAL	2.352E-10	1.348E-11	4.737E-15	9.230E-15	2.399E-14	279.77	
GAS							

NO PLATEAU

Points ABC deleted;

7 points regressed out of 10 includes 80.1 % of 39Ar

Mean X = .577E-01 Mean Y = .894E-04 Slope = -.461E-01 + .559E-02

36/40 = .275E-02 + .323E-03 39/40 = .597E-01 + .249E-03

Fit parameters: SUMS = 13.07 MSWD = 2.614

40Ar/36Ar = 363.86 ± 42.72 F = 16.757 ± .07 AGE = 277.26 ± 1.67 Ma

AU-210 BIOTITE #1012D61

J = 0.009917 ± 0.25% SAMPLE WT = 0.0502 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
1550	1.129E-10	5.117E-12	1.311E-13	***	1.548E-14	342.87 ±	.99

PMA-A1 BIOTITE #972D61

J = 0.009917 ± 0.50% SAMPLE WT = 0.0509 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
1450	5.662E-11	9.320E-13	2.491E-14	1.910E-13	1.500E-15	344.36 ±	3.42

87FC-1 BIOTITE #982D61

J = 0.009917 ± 0.25% SAMPLE WT = 0.0503 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
1550	4.837E-11	2.667E-12	***	1.919E-15	***	293.15 ±	.97

FLQ-2 BIOTITE #992D61

J = 0.009917 ± 0.25% SAMPLE WT = 0.0508 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
1550	1.046E-10	6.822E-12	1.027E-14	***	1.396E-14	276.19 ±	.69

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TH-5C BIOTITE #88

J = 0.007620 ± 0.50% SAMPLE WT = 0.0513 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
1450	1.033E-10	4.674E-12	2.369E-15	1.625E-14	6.118E-15	276.11 +	1.32
1450	5.498E-09	2.486E-10	1.755E-13	8.982E-13	3.402E-13	276.15 +	1.29
TOTAL	5.601E-09	2.533E-10	1.779E-13	9.145E-13	3.463E-13	276.15	
GAS	K/Ca = 144.0						

100.0% of gas on plateau, steps 1450 through 1450 PLATEAU AGE = 276.15 +/- 1.43
 100.0% of gas released in steps 1450 through 1450 average age = 276.15 +/- 1.43

Note: all gas quantities are in moles. No blank correction.

* Ages calculated assuming initial 40Ar/36Ar = 295.5 ± 0

** 1-sigma precision estimates are for intra-irradiation package reproducibility.

*** below detection limit

87AUB2A BIOTITE #100RD1

 $J = 0.009917 \pm 0.50\%$

SAMPLE WT = 0.0503 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
1450	1.324E-11	6.980E-13	3.017E-15	1.171E-14	1.298E-15	302.59 \pm	1.43

RU-210 MICROCLINE #80

J = 0.007767 ± 0.50%

SAMPLE WT = 0.1022 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**	
650	2.406E-11	5.961E-13	1.518E-15	1.699E-15	4.334E-15	463.93	+	2.10
750	8.433E-12	4.403E-13	***	1.322E-15	1.528E-16	243.93	+	1.19
850	3.841E-11	1.980E-12	***	1.061E-14	***	252.53	+	1.19
950	3.785E-11	1.398E-12	***	8.925E-15	4.993E-16	253.76	+	1.23
1000	3.016E-11	1.490E-12	***	3.944E-15	***	262.95	+	1.25
1050	3.311E-11	1.592E-12	***	3.916E-15	4.203E-16	269.17	+	1.29
1100	3.646E-11	1.633E-12	***	4.818E-15	9.118E-16	273.54	+	1.31
1150	3.987E-11	1.771E-12	***	6.446E-15	1.222E-15	283.25	+	1.36
1200	7.149E-12	3.018E-13	***	1.449E-15	2.600E-16	301.68	+	1.42
1250	1.424E-11	5.302E-13	***	1.647E-15	4.285E-16	312.18	+	1.45
1300	3.182E-11	1.255E-12	***	2.972E-15	1.006E-15	321.63	+	1.52
1350	7.461E-12	2.370E-13	***	3.440E-16	2.871E-16	323.36	+	1.61
TOTAL GAS	3.090E-10 K/Ca = 166.8	1.337E-11	1.518E-15	4.809E-14	1.009E-14	285.27		

NO PLATEAU

87FC1 MICROCLINE #78

J = 0.007721 ± 0.50%

SAMPLE WT = 0.1012 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**	
750	4.642E-11	2.535E-12	***	2.939E-15	1.083E-15	237.02	+	1.14
850	2.606E-12	1.405E-13	***	5.854E-16	***	233.65	+	5.09
950	7.473E-12	3.976E-13	***	2.208E-15	***	244.41	+	1.17
1000	2.509E-11	1.305E-12	***	5.152E-15	***	243.11	+	1.61
1050	2.171E-11	1.106E-12	***	2.223E-15	5.713E-16	252.86	+	1.21
1100	2.424E-11	1.217E-12	***	2.032E-15	6.115E-16	256.37	+	1.26
1150	2.258E-11	1.116E-12	***	5.585E-15	***	253.55	+	1.54
1200	2.957E-11	1.443E-12	***	9.668E-15	1.864E-15	269.38	+	1.25
1250	1.116E-11	5.487E-16	7.355E-15	1.922E-15	6.702E-16	9101.67	+	791.20
1300	1.495E-11	7.298E-13	***	5.108E-16	6.930E-16	261.45	+	1.23
1350	1.350E-11	6.528E-13	***	***	5.131E-16	264.50	+	1.24
1450	8.706E-12	4.125E-13	***	***	5.618E-16	267.52	+	1.28
TOTAL GAS	2.280E-10 K/Ca = 444.9	1.105E-11	7.355E-15	3.312E-14	8.307E-15	263.92		

NO PLATEAU

Note: all gas quantities are in moles. No blank correction.

* Ages calculated assuming initial 40Ar/36Ar = 295.5 ± 8

** 1-sigma precision estimates are for intra-irradiation package reproducibility.

*** below detection limit

PMA-A1 POTASSIUM FELDSPAR #71RD65

J = 0.007774 ± 0.50%

SAMPLE WT = 0.0799 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
750	9.714E-12	3.987E-13	***	1.439E-15	4.860E-16	303.68 +	1.46
850	7.923E-12	3.389E-13	***	2.458E-15	***	264.20 +	1.27
950	6.134E-12	3.554E-13	***	2.352E-15	***	294.16 +	1.42
1000	3.590E-11	1.394E-12	***	3.507E-15	1.073E-15	325.43 +	1.54
1050	4.514E-11	1.402E-12	***	2.060E-15	2.277E-15	373.18 +	1.73
1100	4.942E-11	1.493E-12	***	2.644E-15	2.809E-15	405.91 +	1.90
1150	1.481E-11	3.750E-13	***	1.622E-15	3.404E-16	408.27 +	2.13
1250	4.799E-12	1.300E-13	***	4.854E-15	1.090E-16	452.44 +	2.06
1350	8.225E-12	2.063E-13	***	3.947E-16	1.825E-16	484.32 +	2.16
1450	7.416E-12	1.246E-13	***	***	***	679.44 +	3.26
TOTAL GAS	1.915E-10 K/Ca = 220.5	6.348E-12	4.274E-16	1.798E-14	7.790E-15	375.89	

NO PLATEAU

v 10/19/89 60

NO-2 POTASSIUM FELDSPAR #66

J = 0.007722 ± 0.50%

SAMPLE WT = 0.1006 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
650	1.396E-11	7.370E-13	2.001E-15	1.130E-15	2.729E-15	232.87 +	1.18
750	3.983E-11	2.007E-12	***	2.537E-15	1.375E-15	254.76 +	1.21
850	4.448E-11	2.239E-12	***	2.810E-15	1.461E-15	255.08 +	1.23
950	3.188E-11	1.609E-12	***	3.572E-15	1.033E-15	254.59 +	1.22
1000	2.372E-11	1.203E-12	***	2.518E-15	7.991E-16	253.32 +	1.33
1050	2.154E-11	1.092E-12	***	2.253E-15	6.757E-16	253.46 +	1.25
1100	2.748E-11	1.394E-12	***	3.177E-15	9.464E-16	253.23 +	1.22
1150	3.778E-11	1.918E-12	***	4.808E-15	1.342E-15	252.95 +	1.22
1200	5.391E-11	2.716E-12	***	9.246E-15	1.601E-15	255.17 +	1.34
1250	1.974E-11	9.750E-13	***	3.110E-15	***	260.25 +	1.39
1275	5.987E-11	2.932E-12	***	5.234E-15	1.305E-15	262.51 +	1.25
1300	3.896E-11	1.906E-12	***	1.911E-15	***	262.55 +	1.41
1350	6.047E-11	2.965E-12	***	6.061E-15	***	262.52 +	1.43
1450	2.463E-11	1.202E-12	***	8.998E-16	6.992E-16	262.93 +	1.27
1650	7.885E-12	3.725E-13	***	1.066E-15	5.938E-16	267.45 +	1.63
TOTAL GAS	5.061E-10 K/Ca = 306.5	2.527E-11	2.001E-15	5.033E-14	1.716E-14	257.03	

NO PLATEAU

Note: all gas quantities are in moles. No blank correction.

* Ages calculated assuming initial 40Ar/36Ar = 295.5 ± 0

** 1-sigma precision estimates are for intra-irradiation package reproducibility.

*** below detection limit

v 10/19/89 60

FLQ-2 POTASSIUM FELDSPAR #69

J = 0.007696 + 0.50%

SAMPLE WT - 0.1014 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
650	6.746E-12	2.151E-13	4.584E-15	5.760E-15	6.182E-15	292.52 +	2.32
750	2.550E-11	1.380E-12	8.546E-16	4.725E-14	3.615E-15	230.37 +	1.14
850	4.864E-11	2.607E-12	***	7.244E-14	2.194E-15	239.02 +	1.15
950	4.516E-11	2.400E-12	***	7.845E-14	1.559E-15	241.63 +	1.16
1000	1.972E-11	1.039E-12	***	3.238E-14	7.490E-16	243.49 +	1.24
1050	1.735E-11	9.053E-13	***	2.452E-14	5.966E-16	245.81 +	1.22
1100	2.002E-11	1.041E-12	***	2.402E-14	8.997E-16	245.90 +	1.21
1150	2.692E-11	1.387E-12	***	3.278E-14	1.407E-15	247.55 +	1.19
1200	3.347E-11	1.693E-12	***	6.058E-14	2.701E-15	249.77 +	1.19
1250	4.386E-11	2.155E-12	1.149E-15	1.295E-13	5.217E-15	253.91 +	1.19
1300	8.916E-11	4.389E-12	***	1.628E-13	6.484E-15	256.80 +	1.25
1350	5.983E-11	2.923E-12	***	5.569E-14	2.272E-15	261.15 +	1.29
1450	2.059E-12	9.214E-14	***	1.440E-14	5.069E-16	266.89 +	3.04
TOTAL	4.384E-10	2.223E-11	7.290E-15	7.406E-13	3.438E-14	249.45	
GAS	K/Ca = 17.4						

NO PLATEAU

98.6% of gas released in steps 750 through 1350 average age = 248.02 +/- 1.30

BH-251

J = 0.009350 ± 0.50% SAMPLE WT = 0.5454 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE+ in Ma	**	
950	7.549E-12	1.640E-13	7.503E-15	8.987E-13	2.239E-15	597.49	+	2.91
1025	3.150E-11	1.136E-12	5.410E-14	7.318E-12	2.346E-15	407.56	+	1.98
1050	6.362E-11	2.143E-12	9.798E-14	1.356E-11	3.365E-15	434.82	+	2.11
1075	6.249E-11	1.904E-12	8.564E-14	1.203E-11	3.228E-15	476.27	+	2.19
1100	4.524E-11	1.383E-12	6.133E-14	8.712E-12	2.171E-15	475.54	+	2.20
1125	1.779E-11	5.845E-13	2.577E-14	3.661E-12	2.238E-15	436.80	+	2.03
1150	1.389E-11	4.562E-13	2.047E-14	2.894E-12	1.660E-15	429.32	+	2.07
1175	1.804E-11	5.937E-13	2.564E-14	3.660E-12	1.831E-15	456.85	+	2.38
1215	4.038E-11	1.176E-12	5.041E-14	7.224E-12	1.049E-15	498.84	+	2.52
1250	4.300E-11	1.293E-12	5.568E-14	7.890E-12	2.477E-15	481.26	+	2.43
1300	4.076E-12	1.166E-13	5.716E-15	7.126E-13	1.685E-15	455.01	+	3.59
TOTAL GAS	3.484E-10	1.096E-11	4.903E-13	6.856E-11	2.479E-14	450.63		

K/Ca = .1

NO PLATEAU

OE-79 HORNBLENDE

TEMP C	% TOT 39Ar	AGE YIELD	APP K/Ca	APP K/Cl	F	AGE (Ma)	intra- sample	precision intra- package	inter- package	
950	1.9	93.0	.07	13	94.456	779.68	+	1.97	4.28	5.71
1025	13.9	97.6	.06	14	33.861	414.87	+	.37	1.90	2.65
1050	13.2	98.6	.06	15	29.204	363.15	+	1.12	2.00	2.57
1075	8.1	98.9	.06	14	29.480	363.78	+	.54	1.75	2.41
1100	5.6	98.9	.06	14	28.793	358.52	+	1.17	2.01	2.52
1150	17.0	98.7	.06	14	29.643	368.12	+	2.58	3.95	4.29
1175	14.1	97.3	.06	14	30.774	380.76	+	.55	1.81	2.49
1200	16.3	96.2	.06	14	29.331	364.81	+	1.04	1.96	2.56
1350	5.0	97.0	.07	14	27.941	347.97	+	2.06	2.60	3.04
1350	5.0	97.0	.07	14	27.861	347.97	+	2.06	2.60	3.04

total gas K/Ca = .1

FLQ-2 HORNBLENDE #128, 130RD63

J = 0.007643 ± 0.50% SAMPLE WT = 0.8059 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE+ in Ma	**	
1025	5.083E-12	2.116E-13	7.211E-15	8.757E-13	2.840E-16	299.45	+	1.42
1050	4.647E-12	1.977E-13	6.871E-15	8.651E-13	8.113E-17	296.67	+	1.42
1075	8.220E-11	3.495E-12	1.253E-13	1.442E-11	1.779E-15	296.51	+	1.43
1150	7.426E-12	3.150E-13	1.133E-14	1.306E-12	1.673E-16	296.97	+	1.40
1175	1.189E-11	5.055E-13	1.831E-14	2.129E-12	***	298.42	+	3.56
1250	6.145E-12	2.442E-13	9.322E-15	1.016E-12	1.206E-15	300.39	+	1.64
TOTAL GAS	1.174E-10	4.969E-12	1.783E-13	2.061E-11	3.518E-15	297.03		

K/Ca = .1

90.6% of gas on plateau, steps 1050 through 1175 PLATEAU AGE = 296.80 ± 1.53

Note: all gas quantities are in moles. No blank correction.

* Ages calculated assuming initial 40Ar/36Ar = 293.5 ± 0

** 1-sigma precision estimates are for intra-irradiation package reproducibility.

*** below detection limit

WA-59 HORNBLLENDE #125,127RD65

J = 0.00751E + 0.50% SAMPLE WT = 0.8028 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
1050	1.349E-11	4.230E-13	5.926E-15	1.552E-11	5.173E-15	347.27 +	1.61
1075	1.580E-11	5.564E-13	6.012E-15	2.059E-11	3.456E-15	323.08 +	1.55
1100	9.973E-12	3.430E-13	4.103E-15	1.257E-11	3.013E-15	327.16 +	1.53
1150	8.635E-12	2.911E-13	4.190E-15	1.067E-11	3.614E-15	321.70 +	1.72
1200	1.120E-11	3.373E-13	4.878E-15	1.420E-11	3.645E-15	323.43 +	1.62
1250	7.899E-12	2.748E-13	3.443E-15	1.000E-11	2.516E-15	322.25 +	1.75
1350	1.598E-12	4.340E-14	7.479E-16	1.566E-12	1.483E-15	330.06 +	6.36
TOTAL	6.059E-11	2.319E-12	2.930E-14	8.511E-11	2.290E-14	323.24	
GAS	K/Ca = .0						

NO PLATEAU

BL-13 HORNBLLENDE

J = 0.009105 + 0.50% SAMPLE WT = 0.4678 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
850	4.288E-12	3.135E-14	6.846E-15	2.875E-13	1.255E-14	297.02 +	13.80
950	1.449E-12	5.140E-14	9.388E-16	5.577E-13	1.834E-15	270.35 +	9.25
1025	3.578E-12	1.630E-13	1.237E-15	1.796E-12	1.468E-15	292.27 +	1.97
1050	7.870E-12	3.856E-13	2.185E-15	4.115E-12	1.535E-15	291.29 +	2.08
1075	1.219E-11	6.123E-13	3.192E-15	6.531E-12	1.215E-15	292.43 +	1.66
1100	1.137E-11	5.720E-13	2.734E-15	6.110E-12	1.103E-15	292.29 +	1.46
1125	4.739E-12	2.304E-13	1.170E-15	2.459E-12	8.847E-16	294.05 +	1.66
1150	6.659E-12	3.306E-13	1.791E-15	3.503E-12	1.002E-15	291.47 +	1.71
1200	4.197E-11	2.139E-12	9.874E-15	2.255E-11	1.924E-15	292.84 +	1.64
1250	1.744E-11	8.728E-13	4.512E-15	9.245E-12	1.764E-15	293.23 +	1.41
1300	3.167E-12	1.421E-13	1.146E-15	1.495E-12	1.529E-15	289.78 +	2.23
1350	6.388E-13	1.371E-14	5.452E-16	1.435E-13	1.298E-15	286.72 +	14.12
TOTAL	1.154E-10	5.544E-12	3.617E-14	5.871E-11	2.811E-14	292.37	
GAS	K/Ca = .8						
	assuming 40Ar/36Ar initial = 295.5					292.15	

95.7% of gas on plateau, steps 1025 through 1250 PLATEAU AGE = 292.80 + 1.51
 63.1% of gas on plateau, steps 1150 through 1350 PLATEAU AGE = 292.88 + 1.51

RS-1 HORNBLLENDE

J = 0.00751E + 0.50% SAMPLE WT = 0.7286 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
1020	5.955E-12	2.512E-13	1.921E-14	7.925E-13	2.444E-16	292.27 +	1.36
1040	1.549E-11	6.567E-13	5.733E-14	2.465E-12	2.549E-15	292.05 +	1.37
1060	1.006E-11	4.277E-13	3.681E-14	1.589E-12	***	292.41 +	1.38
1080	4.728E-11	2.004E-12	1.684E-13	7.282E-12	4.183E-16	293.58 +	1.39
1200	1.449E-11	6.135E-13	5.337E-14	2.310E-12	2.271E-16	293.23 +	1.38
1350	3.968E-12	1.515E-13	1.377E-14	6.044E-13	1.284E-15	295.44 +	1.95
TOTAL	9.723E-11	4.104E-12	3.488E-13	1.504E-11	2.565E-15	293.28	
GAS	K/Ca = .1						

96.5% of gas on plateau, steps 1020 through 1200 PLATEAU AGE = 292.73 + 1.51
 67.5% of gas on plateau, steps 1080 through 1350 PLATEAU AGE = 293.43 + 1.51

MM-2A HORNBLLENDE

J = 0.009100 ± 0.50% SAMPLE WT = 0.4349 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE+ in Ma	**	
750	1.861E-12	5.575E-14	9.253E-16	6.371E-14	1.223E-15	395.09	+	1.97
850	1.844E-12	5.328E-14	1.173E-15	9.644E-14	1.620E-15	378.03	+	2.08
950	4.493E-12	1.684E-13	3.079E-15	7.156E-13	1.611E-15	354.43	+	1.55
1000	9.404E-12	3.988E-13	7.049E-15	1.970E-12	1.387E-15	336.71	+	1.46
1025	2.131E-11	9.231E-13	1.752E-14	4.381E-12	2.157E-15	334.54	+	1.71
1050	4.155E-11	1.826E-12	3.396E-14	8.411E-12	2.332E-15	335.13	+	1.41
1075	4.944E-11	2.276E-12	4.095E-14	1.020E-11	1.535E-15	322.67	+	2.23
1100	3.315E-11	1.817E-12	3.346E-14	7.971E-12	1.633E-15	311.71	+	0.00
1125	2.599E-11	1.248E-12	2.361E-14	5.420E-12	1.775E-15	308.47	+	0.00
1150	2.220E-11	1.013E-12	1.967E-14	4.300E-12	1.695E-15	321.25	+	0.00
1175	2.401E-11	1.032E-12	2.136E-14	4.556E-12	1.811E-15	324.90	+	0.00
1200	2.452E-11	1.123E-12	2.173E-14	4.836E-12	1.723E-15	321.94	+	0.00
1225	8.695E-12	3.897E-13	7.514E-15	1.711E-12	1.017E-15	322.90	+	0.00
1250	1.207E-12	4.054E-14	1.171E-15	1.846E-13	1.161E-15	319.75	+	0.00
TOTAL GAS	4.128E-10	1.846E-11	3.580E-13	8.237E-11	3.769E-14	325.00		

K/Ca = .1

NO PLATEAU

DM-2 HORNBLLENDE

J = 0.009100 ± 0.50% SAMPLE WT = 0.7989 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE+ in Ma	**	
850	6.896E-12	8.838E-14	8.359E-15	3.363E-13	1.647E-14	342.13	+	3.19
950	2.511E-12	7.798E-14	2.325E-15	4.975E-13	3.931E-15	263.79	+	6.92
1000	3.098E-12	1.115E-13	3.170E-15	7.391E-13	3.388E-15	285.03	+	7.07
1025	6.023E-12	2.678E-13	6.689E-15	1.792E-12	3.081E-15	288.99	+	2.78
1050	1.286E-11	6.258E-13	1.429E-14	4.358E-12	3.129E-15	288.63	+	1.38
1075	2.720E-11	1.370E-12	2.908E-14	9.705E-12	3.736E-15	288.43	+	1.37
1100	9.140E-11	4.683E-12	9.375E-14	3.298E-11	5.139E-15	290.39	+	1.43
1125	2.926E-11	1.464E-12	3.105E-14	1.053E-11	3.487E-15	291.71	+	1.45
1150	7.494E-12	3.495E-13	7.808E-15	2.470E-12	2.313E-15	294.52	+	2.00
1175	1.631E-11	8.031E-13	1.714E-14	5.695E-12	2.983E-15	290.64	+	1.65
1225	5.561E-11	2.833E-12	5.725E-14	1.994E-11	3.208E-15	291.80	+	1.59
1275	3.755E-11	1.898E-12	3.823E-14	1.303E-11	3.271E-15	291.47	+	1.45
1350	2.609E-12	1.047E-13	2.784E-15	7.206E-13	1.821E-15	298.57	+	4.92
TOTAL GAS	2.988E-10	1.468E-11	3.119E-13	1.028E-10	5.596E-14	290.96		

K/Ca = .1

82.7% of gas on plateau, steps 1100 through 1350 PLATEAU AGE = 291.23 ± 1.50

LWS-1 HORNBLLENDE #57,58,59

J = 0.007714 ± 0.50% SAMPLE WT = 1.0002 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE+ in Ma	**	
1050	1.592E-11	5.512E-13	4.508E-14	2.756E-11	2.505E-15	347.44	+	1.76
1075	1.614E-11	5.704E-13	3.377E-14	2.939E-11	1.762E-15	345.31	+	2.12
1175	1.048E-11	3.675E-13	3.017E-14	1.812E-11	1.835E-15	341.69	+	1.93
1225	9.477E-12	3.367E-13	2.436E-14	1.671E-11	1.084E-15	343.53	+	1.69
TOTAL GAS	5.201E-11	1.826E-12	1.334E-13	9.178E-11	7.186E-15	345.06		

K/Ca = 0.0

61.4% of gas on plateau, steps 1050 through 1075 PLATEAU AGE = 347.06 +/- 1.76

LS-8 HORNBLÉNDE

J = 0.009249 ± 0.50% SAMPLE WT = 0.4009 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE+ in Ma	**
750	2.379E-13	4.346E-15	***	2.130E-14	5.967E-16	228.32	+ 180.87
1050	1.369E-12	6.012E-14	1.224E-15	1.299E-12	4.327E-16	315.32	+ 11.10
1100	2.816E-11	1.319E-12	2.620E-14	2.929E-11	1.612E-15	320.13	+ 1.50
1150	7.002E-12	3.236E-13	6.369E-15	7.175E-12	6.932E-16	320.30	+ 1.71
1200	5.516E-12	2.548E-13	5.195E-15	5.689E-12	6.341E-16	319.06	+ 2.34
1250	1.270E-11	5.859E-13	1.145E-14	1.303E-11	1.764E-15	317.29	+ 1.75
1300	3.229E-13	1.130E-14	4.472E-16	2.531E-13	3.547E-16	296.20	+ 25.81
1350	1.728E-13	3.320E-15	2.842E-16	7.468E-14	3.940E-16	263.35	+ 88.10
1450	4.321E-13	1.097E-14	***	2.425E-13	6.969E-16	314.95	+ 37.93
TOTAL GAS	5.592E-11	2.573E-12	5.153E-14	5.700E-11	7.172E-15	318.94	

K/Ca = .0

75.2% of gas on plateau, steps 750 through 1200 PLATEAU AGE = 320.12 ± 1.64

RU-63A HORNBLÉNDE

J = 0.009122 ± 0.50% SAMPLE WT = 0.7172 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE+ in Ma	**
850	1.197E-11	7.182E-14	2.092E-14	2.118E-13	9.709E-15	1386.25	+ 9.11
950	4.437E-12	8.293E-14	4.503E-15	4.977E-13	2.119E-15	631.63	+ 3.09
1025	5.096E-11	2.222E-12	1.041E-13	1.153E-11	3.859E-15	335.63	+ 1.80
1050	4.154E-11	1.809E-12	8.237E-14	9.109E-12	2.803E-15	336.92	+ 1.57
1075	3.623E-11	1.590E-12	7.120E-14	8.096E-12	2.158E-15	335.27	+ 1.69
1100	2.481E-11	1.110E-12	4.889E-14	5.717E-12	1.385E-15	329.80	+ 1.59
1125	1.497E-11	6.626E-13	2.875E-14	3.503E-12	2.614E-15	322.14	+ 1.60
1150	1.400E-11	5.945E-13	2.574E-14	3.149E-12	1.963E-15	337.76	+ 1.64
1190	3.088E-11	1.183E-12	5.084E-14	6.237E-12	2.026E-15	378.62	+ 1.74
1230	1.584E-11	6.099E-13	2.633E-14	3.188E-12	1.778E-15	372.00	+ 1.75
1300	1.090E-11	4.563E-13	1.946E-14	2.384E-12	1.634E-15	341.32	+ 1.68
1360	1.475E-12	5.000E-14	2.594E-15	2.618E-13	1.278E-15	329.21	+ 7.16
TOTAL GAS	2.580E-10	1.044E-11	4.857E-13	5.389E-11	3.333E-14	354.01	

K/Ca = .1

53.8% of gas on plateau, steps 1025 through 1075 PLATEAU AGE = 336.55 ± 1.72

LC-1 HORNBLÉNDE #93,94,95RD61

J = 0.00951E ± 0.50% SAMPLE WT = 0.9984 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE+ in Ma	**
950	1.668E-11	8.205E-13	2.330E-14	4.383E-12	3.822E-15	296.56	+ 1.54
1025	1.324E-10	7.179E-12	1.929E-13	3.420E-11	5.720E-15	287.77	+ 1.41
1050	1.183E-10	6.466E-12	1.746E-13	3.077E-11	3.078E-15	283.22	+ 1.35
1075	8.152E-11	4.441E-12	1.210E-13	2.096E-11	2.075E-15	283.44	+ 1.36
1100	3.067E-11	1.652E-12	4.555E-14	7.907E-12	1.538E-15	287.51	+ 1.33
1135	2.239E-11	1.199E-12	3.322E-14	5.981E-12	1.325E-15	290.31	+ 1.36
1170	6.431E-11	3.473E-12	9.530E-14	1.721E-11	2.262E-15	287.99	+ 1.41
1200	1.026E-11	5.269E-13	1.495E-14	2.716E-12	1.775E-15	292.34	+ 1.52
1235	4.198E-12	2.034E-13	6.165E-15	1.067E-12	1.424E-15	293.66	+ 1.73
1270	1.960E-12	7.795E-14	2.661E-15	3.907E-13	1.696E-15	295.77	+ 3.36
TOTAL GAS	4.833E-10	2.605E-11	7.098E-13	1.256E-10	2.651E-14	283.96	

K/Ca = .1

75.5% of gas on plateau, steps 1025 through 1100 PLATEAU AGE = 288.49 ± 1.49

APPENDIX III. Pine Mountain belt thermobarometry

Because petrographic observations are rare and no quantitative thermobarometry has been reported for Pine Mountain belt units in the study area, some initial data follow. The strategy for the mineral chemical analyses and the calibrations, equilibria, and error estimates for the thermobarometric calculations are the same as those described by Steltenpohl and Bartley (1987), Goldberg and Steltenpohl (1990), and Steltenpohl (in press). The mineral chemical data are tabulated below.

Steltenpohl (in press) describes the results of calcite-dolomite geothermometry of 8 Chewacla Marble specimens based on XRD analyses. These values range between 470 and 502°C (Fig. 6). Two additional Chewacla Marble samples analyzed using an electronmicroprobe yield temperatures of 490 and 525°C (OP-50C and OP-50D, respectively). Estimated rim P-T conditions for two aluminosilicate absent Manchester Schist specimens are 534°C and 6.2 Kb (OP-14) and 561°C and 8.0 Kb (OP-40), which overlap with estimates for the Inner Piedmont metapelites reported by Goldberg and Steltenpohl (1990). In contrast to the retrogressive amphibolite-facies development of the Inner Piedmont samples, the Pine Mountain cover samples (OP-14 and OP-40) have prograde core-to-rim zonation patterns in garnet (in data repository). Corresponding core-rim T-P estimates for OP-14 are 502°C and 5 Kb to 534°C and 6.2 Kb, respectively.

Some felsic basement gneisses in Alabama rarely contain garnet + hornblende coronas surrounding biotite and quartz, which Stieve and Size (1988) report are characteristic of Grenville basement gneiss farther northeast in the Georgia portion of the Pine Mountain window. Two basement gneiss specimens that do not have coronas (NX-2 and OP-49) resulted in the highest P-T estimates determined in this study (634°C and 10.1 Kb and 820 and 11.1 Kb, respectively). These felsic gneisses are variably migmatized with patchy areas of leucosomal and melanocratic material surrounded by relatively unaltered paleosome. The leucosomes contain garnet and biotite as mafic phases in contact with plagioclase + phengite + quartz + kyanite which were analyzed for the P-T calculations. Fractured garnets, within which biotite, phengite, and quartz has crystallized, document a complex multistage crystallization history within the leucosomes. One of the specimens (NX-2) has different core versus rim compositions that result in a net retrograde P-T path (see Fig. 6a), although spot analyses do not reveal a smooth continuous chemical zonation within garnet. The calculated rim T-P estimate (634°C and 10.1 Kb) is consistent with the petrogenetic grid (i.e., phengite Si⁴⁺ content is 3.26, within the kyanite stability field and granite melting field); the core estimate is 678°C and 11.0 Kb. Although the P-T estimates from the basement-cover units are preliminary, they are compatible with earlier workers' interpretation that: (1) an early high-grade (granulite-facies?) metamorphic event affected the basement complex during the Grenville orogeny; (2) the basement gneisses later were at least

partly exposed to surface conditions during Cambro-Ordovician (?) deposition of the cover units; and (3) the high-grade assemblages within the basement were retrograded to amphibolite-facies assemblages during prograde metamorphism of the cover following the Cambro-Ordovician.

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REPOSITORY DATA: Electronmicroprobe analyses STELTENPOHL AND KUNK

Samples NX-2 and OP-40 analyzed by Tom Chako, using probe at University of Chicago. Remaining samples analyzed by M.G. Steltenpohl, using probe at University of North Carolina. Abbreviations are: gt=garnet, c=core, r=rim, pc=plagioclase, wm=white mica, bt=biotite.

NX-2

	gt(r)	gt(r)	gt(r)	gt(r)	gt(c)	gt(c)	gt(c)
SiO2	37.12	37.48	37.01	37.02	37.7	37.65	37.33
TiO2	0	0	0	0	0	0	0
Al2O3	21.07	21.37	21.32	21.18	20.94	21.01	21.29
FeO*	30.04	28.85	31.16	19.15	28.76	28.86	28.9
MnO	5.98	7.31	5.49	6.18	6.53	6.73	7.28
MgO	1.11	1.2	1.3	1.46	1.13	1.36	1.11
CaO	4.17	4.35	3.9	4.16	4.06	4.52	4.28
Na2O	0	0	0	0	0	0	0
K2O	0	0	0	0	0	0	0
total	99.49	100.56	100.18	89.15	99.12	100.13	100.19

NX-2

	pc	pc	pc	pc	pc	pc	pc
SiO2	66.85	67.84	67.51	68.21	67.28	65.72	66.02
TiO2	0	0	0	0	0	0	0
Al2O3	21.6	20.58	21.25	21.05	21.14	22.22	21.67
FeO*	0	0	0	0	0	0	0
MnO	0	0	0	0	0	0	0
MgO	0	0	0	0	0	0	0
CaO	2.18	1.26	1.39	1.57	1.86	2.83	2.66
Na2O	9.91	10.97	11.35	10.67	10.6	9.84	9.85
K2O	0.35	0.22	0.21	0	0	0	0
total	100.89	100.87	101.71	101.5	100.88	100.61	100.2

NX-2

	wm	wm	wm	wm	wm	wm
SiO2	47.16	47.04	47.1	46.38	46.53	46.79
TiO2	0	0	0	0	0	0
Al2O3	29.5	29.3	29.61	29.78	28.71	29.99
FeO*	4.45	4.61	4.11	4.41	4.7	4.48
MnO	0	0	0	0	0	0
MgO	1.53	1.66	1.46	1.51	1.4	1.38
CaO	0	0	0	0	0	0
Na2O	0	0	0	0	0	0
K2O	10.14	10.22	9.57	9.83	9.5	9.52
total	92.78	92.83	91.85	91.91	90.84	92.16

NX-2

	gt(r)	gt(r)	gt(r)	gt(r)	gt(c)	gt(c)	gt(c)
SiO2	37.12	37.48	37.01	37.02	37.7	37.65	37.33
TiO2	0	0	0	0	0	0	0
Al2O3	21.07	21.37	21.32	21.18	20.94	21.01	21.29
FeO*	30.04	28.85	31.16	19.15	28.76	28.86	28.9
MnO	5.98	7.31	5.49	6.18	6.53	6.73	7.28
MgO	1.11	1.2	1.3	1.46	1.13	1.36	1.11
CaO	4.17	4.35	3.9	4.16	4.06	4.52	4.28
Na2O	0	0	0	0	0	0	0
K2O	0	0	0	0	0	0	0
total	99.49	100.56	100.18	89.15	99.12	100.13	100.19

NX-2

	pc	pc	pc	pc	pc	pc	pc
SiO2	66.85	67.84	67.51	68.21	67.28	65.72	66.02
TiO2	0	0	0	0	0	0	0
Al2O3	21.6	20.58	21.25	21.05	21.14	22.22	21.67
FeO*	0	0	0	0	0	0	0
MnO	0	0	0	0	0	0	0
MgO	0	0	0	0	0	0	0
CaO	2.18	1.26	1.39	1.57	1.86	2.83	2.66
Na2O	9.91	10.97	11.35	10.67	10.6	9.84	9.85
K2O	0.35	0.22	0.21	0	0	0	0
total	100.89	100.87	101.71	101.5	100.88	100.61	100.2

NX-2

	wm	wm	wm	wm	wm	wm
SiO2	47.16	47.04	47.1	46.38	46.53	46.79
TiO2	0	0	0	0	0	0
Al2O3	29.5	29.3	29.61	29.78	28.71	29.99
FeO*	4.45	4.61	4.11	4.41	4.7	4.48
MnO	0	0	0	0	0	0
MgO	1.53	1.66	1.46	1.51	1.4	1.38
CaO	0	0	0	0	0	0
Na2O	0	0	0	0	0	0
K2O	10.14	10.22	9.57	9.83	9.5	9.52
total	92.78	92.83	91.85	91.91	90.84	92.16

NX-2

	bt	bt	bt
SiO2	34.78	34.9	35.11
TiO2	0	0	0
Al2O3	18.79	17.97	18.23
FeO*	23.47	25.9	25.27
MnO	0	0	0
MgO	5.72	6.14	6.24
CaO	0	0	0
Na2O	0	0	0
K2O	9.21	8.25	8.98
total	91.97	93.16	93.83

OP-40

	pc(r)	pc(r)	pc(r)	wm(r)	wm(r)	bt(r)	bt(r)
SiO2	61.21	62.12	58.16	45.06	46.37	36.52	36.6
TiO2	0.03	0.02	0	0.72	0.65	2.13	2.12
Al2O3	25.29	27.28	26.05	36.24	34.83	20.07	18.57
FeO*	0.05	0.03	0.03	1.09	1.61	18.64	19.73
MnO	0	0	0	0.03	0.04	0.08	0.09
MgO	0	0	0	0.79	0.9	10.86	10.33
CaO	5.71	5.89	6.02	0	0	0	0.03
Na2O	8.55	8.48	8.31	0.83	0.59	0.25	0.12
K2O	0.15	0.15	0.15	10.16	9.61	8.86	9.48
total	100.99	103.97	98.72	94.92	94.6	97.41	97.07

OP-40

	bt(r)	bt(r)
SiO2	36.74	46.6
TiO2	2.39	0.74
Al2O3	19.41	33.65
FeO*	19.61	1.11
MnO	0.12	0
MgO	10.37	0.82
CaO	0	0
Na2O	0.14	0.75
K2O	8.67	11.99
total	97.45	95.66

OP-40

	gt(r)	gt(r)	gt(r)	gt(c)	gt(c)	gt(c)
SiO2	38.03	37.87	38.75	39.08	38.68	38.34
TiO2	0.13	0.03	0.06	0	0	0
Al2O3	21.68	21.82	21.46	21.61	21.51	22
FeO*	32.26	33.11	33.35	32.17	32.67	32.62
MnO	3.43	3.7	3.34	4.79	4.85	4.84
MgO	2.51	2.74	2.44	3.32	3.25	3.25
CaO	4.42	3.56	3.78	2.12	2.07	2.15
Na2O	0	0	0	0	0	0
K2O	0	0	0.02	0.03	0.02	0
total	102.46	102.83	103.2	103.12	103.05	103.2

OP-49

	gt(r)	pc(r)	wm(r)	wm(r)	wm(r)	wm(r)	wm(r)
SiO2	36.81	62.81	45.93	45.63	45.9	45.72	45.77
TiO2	0	0	0.74	0.72	0.48	0.74	0.54
Al2O3	20.81	23.95	34.8	34.77	34.95	34.38	33.94
FeO*	36.6	0	1.83	1.65	1.36	1.75	1.83
MnO	1.98	0	0	0	0	0	0
MgO	2.23	0	0.43	0.34	0.61	0.63	0.63
CaO	1.76	5.18	0	0	0	0	0
Na2O	0	8.58	0	0	0	0	0
K2O	0	0.31	9.15	9.34	9.51	9.62	9.47
total	100.19	100.83	92.88	92.45	92.81	92.84	92.18

OP-49

	wm(r)	wm(r)	bt(r)	bt(r)	bt(r)	bt(r)	bt(r)
SiO2	45.91	46.41	34.31	34.6	33.97	34.09	34.65
TiO2	0.94	0.83	3.45	3.42	3.4	3.5	3.1
Al2O3	34.76	34.75	17.37	17.54	17.78	18.02	18.23
FeO*	1.74	2.09	25.84	25.38	25.14	26.64	25.47
MnO	0	0	0	0	0	0	0
MgO	0.44	0.54	4.1	4.6	4.62	4.29	4.77
CaO	0	0	0	0	0	0	0
Na2O	0	0	0	0	0	0	0
K2O	9.14	9.2	9.11	9.28	9.05	9.05	9
total	92.93	93.82	94.18	94.82	93.96	95.59	95.22

OP-14

	gt(r)	gt(r)	gt(r)	gt(c)	gt(c)	pc	pc
SiO2	39.49	37.1	38.06	41.04	38.55	64.29	62.79
TiO2	0.04	0.08	0.11	0	0.05	0.1	0.04
Al2O3	21.11	21.44	22.78	21.86	22.09	23.86	24.03
FeO*	33.48	33.03	32.55	32.38	33.32	0.13	0.09
MnO	5.45	5.06	5.5	5.84	5.67	0	0
MgO	2.21	2.17	1.8	2.55	2.58	0	0
CaO	1.53	1.54	2.18	0.91	1	4.68	4.5
Na2O	0	0	0	0	0	9.5	9.5
K2O	0	0.02	0	0	0	0.16	0.18
total	103.31	100.44	102.98	104.58	103.26	102.72	101.13

OP-14

	gt(r)	gt(r)	gt(c)	gt(c)	pc	pc	pc
SiO2	35.67	36.21	37.63	37.27	63.73	64.34	63.05
TiO2	0.07	0.02	0.03	0.02	0.16	0.06	0
Al2O3	20.79	20.73	22.06	21.23	23.07	23.13	22.09
FeO*	31.66	33.41	32.69	32.98	0.16	0.15	0.18
MnO	5.7	5.03	5.72	5.71	0	0	0
MgO	1.73	2.09	2.25	2.62	0	0	0
CaO	1.9	2	1.21	1.16	4.05	4.07	4.01
Na2O	0	0	0	0	9.3	9.44	9.45
K2O	0	0	0	0	0.11	0.05	0.14
total	97.52	99.49	101.59	100.99	100.58	101.24	98.92

OP-14

	wm	wm	bt	bt
SiO2	45.28	45.49	34.65	34.99
TiO2	0.76	0.76	2.9	2.77
Al2O3	34.18	34.37	19.51	18.74
FeO*	1.1	1.27	19.43	21.14
MnO	0	0.05	0	0.14
MgO	0.61	0.67	8.09	7.84
CaO	0	0	0	0
Na2O	0.65	0.83	0.22	0.19
K2O	9.48	8.97	8.46	8.65
total	92.06	92.41	93.26	94.46

OP-50C

	<u>Wt. %</u>
<u>FeO*</u>	<u>0.04</u>
<u>MgO</u>	<u>22.05</u>
<u>CaO</u>	<u>28.98</u>
<u>total</u>	<u>51.07</u>

OP-50D

	<u>Wt. %</u>
<u>FeO*</u>	<u>0.04</u>
<u>MgO</u>	<u>21.36</u>
<u>CaO</u>	<u>27.14</u>
<u>total</u>	<u>48.54</u>



