Chapter 4. Partitioning of orogenesis across the boundary of Avalon with North America during the Alleghanian.

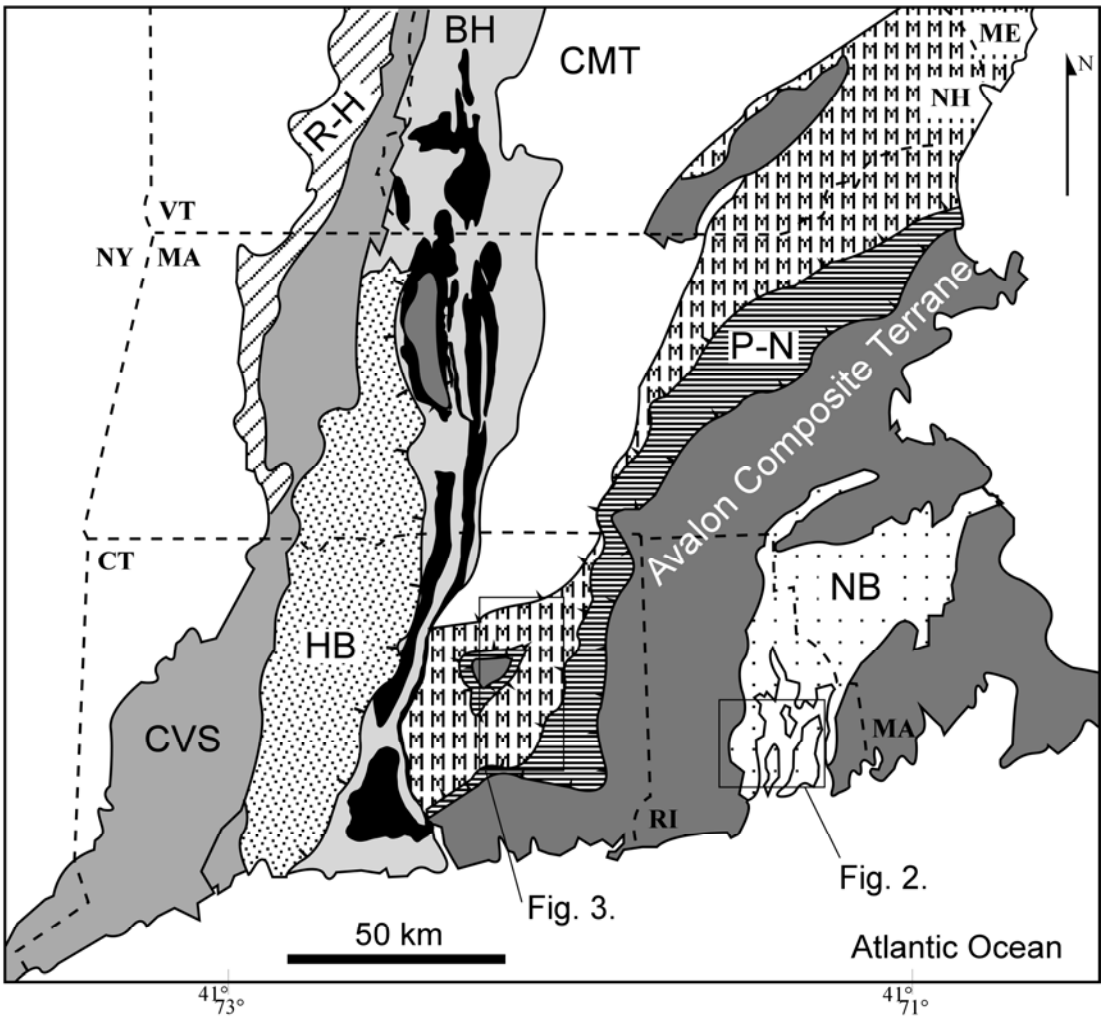


Figure 1. Regional tectonic map, with state borders, of the New England Appalachian Orogenic Belt illustrating the main lithotectonic terranes discussed in the text. *CVS* - Connecticut Valley Synclinorium, *R-H* - Rowe Hawley terrane, *HB* - Hartford Basin, *BH* – Bronson Hill Anticlinorium, *CMT* – Central Maine Terrane. The Merrimack Terrane has been hatched with the letter M. Boxes represent the approximate extent of field areas referred to in the text; Narragansett Basin (Fig.2) and eastern Connecticut (Fig. 3). VT- Vermont, MA- Massachusetts, CT- Connecticut, ME- Maine, NH- New Hampshire, RI- Rhode Island, NY_ New York.

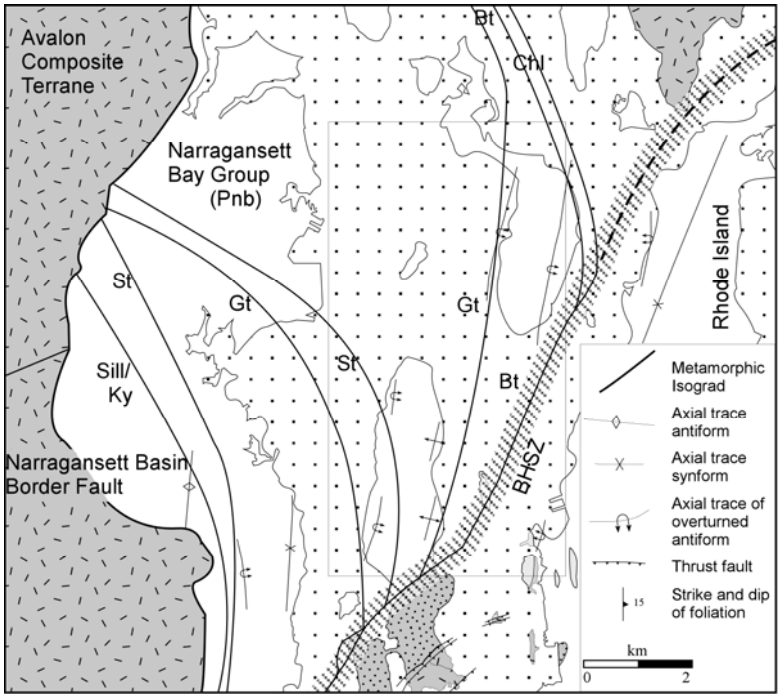


Figure 2a. Map of a portion of Rhode Island showing the fault-controlled boundaries between the Avalon Composite Terrane and the Rhode Island Formation metasediments (Pnb) of the Narragansett Basin. Isograds highlight the marked increase in metamorphic grade towards the southwest corner of the basin (modified after Hermes, O. D., Gromet, L. P. & Murray, D. P. 1994). The location of the area shown in Figure 3b is outlined with a box.

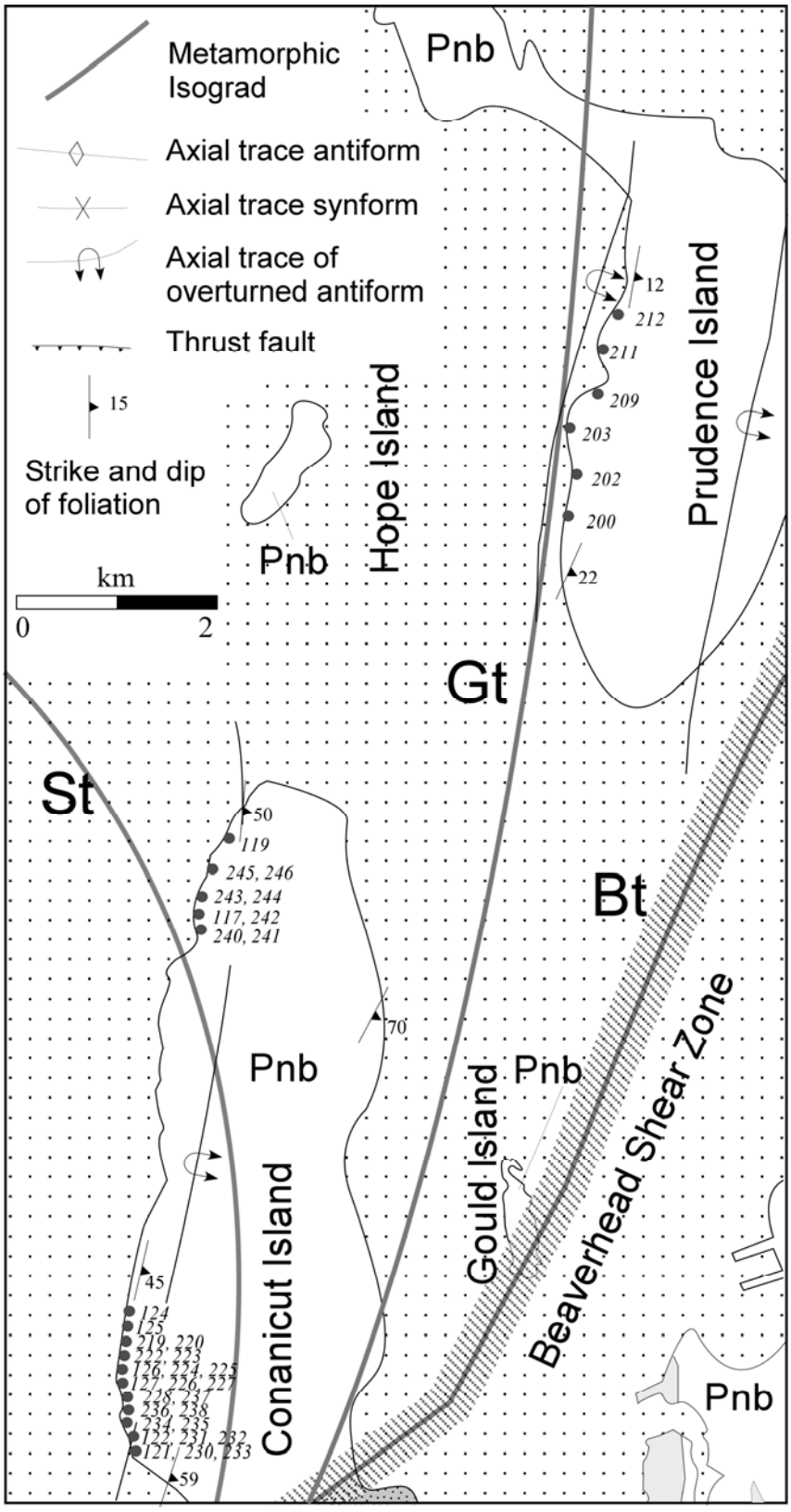


Figure 2b. Shows the approximate localities for oriented rock samples used in this study.

	Garnet		St	Plag	Bt
Sample	Core	Rim			
Conanicut					
R117	075				
R119	065				
R121	015				
R122	025				
R124			040		X
R125	020	055	030		X
R126	015	080	020		X
R127		065	050		
R219	073				X
R220	018		018		X
R222	068				
R223	023		033		X
R224	063				
R225	018		018		X
R226	013	078	028		X
R227	073				X
R228			013		X
R230	013				
R231	078				
R232	018				
R233	013				
R234	08	083			
R235	013	078			
R236	018				
R237	018				
R238	018	088	018		X
R240	063			073	
R241	068			068	
R242	073				
R243		078		078	
R244	063			073	
R245				063	
R246				068	
Prudence					
R200				083	
R202				093	
R203				058	
R209				063	
R211				063	
R212				058	

Table 1. Shows FIA measurements for samples from Conanicut and Prudence islands. All samples are taken from the Rhode Island Formation. FIA data separated as staurolite, plagioclase and garnet core and rim. All orientations are relative to true north. The presence of biotite porphyroblasts are noted with an X.

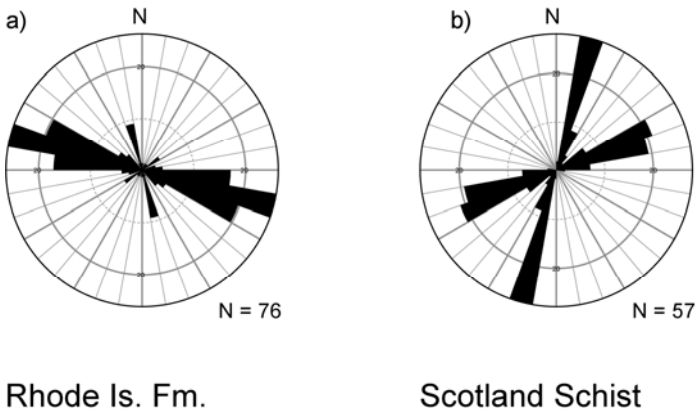


Figure 3. a) Equal area Rose plots of FIA trends measured for garnet staurolite and plagioclase porphyroblasts from the Rhode Island Formation of the Narragansett Basin. b) Equal area Rose plots of FIA trends measured for garnet and staurolite porphyroblasts from the Scotland Schist of the Merrimack Terrane, Connecticut.

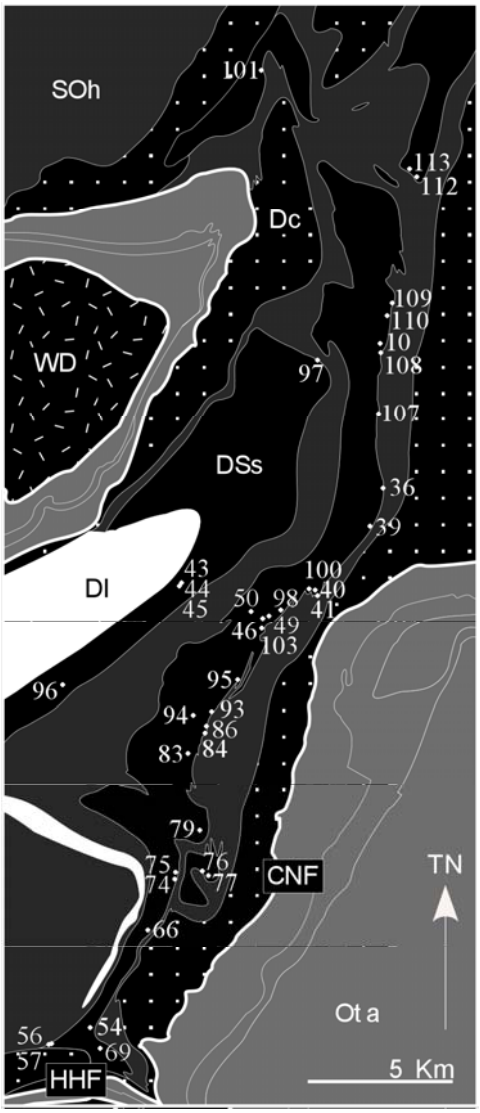


Figure 4. Geologic map showing the location of samples used for microstructural analysis within the Merrimack Terrane of eastern Connecticut. Samples were collected from the Devonian-Silurian Scotland Schist. Major terrane bounding faults are labelled; CNF – Clinton Newbury, HHF – Honey Hill. Geologic formations are labelled; \Dc – Devonian Canterbury Gneiss, SOh – Silurian-Ordovician Hebron Gneiss, Dl – Devonian Lebanon Gabbro, Ota, Ordovician Tatnic Hill Formation and DSs – Devonian-Silurian Scotland Schist. The Willimantic Dome is labelled WD.

	Garnet			St
Sample	Core	Median	Rim	
R10	120			100
R36	105		035	135
R39	100			
R40	090			100
R41	115			
R43	095		085	
R44	090		090	
R45	100			
R46	090			
R49	085		095	100
R50	160		110	
R54	125		160	
R56	110			
R57	130			
R66	095	055	165	
R69	0			
R74	105			
R75	090	050	170	
R76	115		165	110
R77	120		135	
R79	115	115	105	
R83	080		115	
R84	115		070	100
R86	100		115	105
R93	105		095	075
R94	110	040	150	
R95	105	105	105	100
R96	110		165	
R97	025			
R98	100		050	
R100	090			
R101	110			
R103	115	165	160	
R107				090
R108	100			110
R109	090			120
R110	090			
R112	105			
R113	100			

Table 2. Garnet and staurolite FIA trends measured from samples collected from Scotland Schist. Garnet multi-FIA sample FIAs are referred to as either ‘Core FIA’, ‘Median FIA’, or ‘Rim FIA’ based on their relative location inside the porphyroblasts. Single-FIA samples are presented in the ‘Core FIA’ column. Trends are presented relative to true north.

Monazite grains in porphyroblasts

Sample	Surrounding phase (fully enclosed?)	Shape	Relative to Inclusion trails
R40-0-mz1	grt (no)	elongated	perpendicular (rim)
R46-0-mz1a+b	grt(y)	blocky	sub parallel (rim)
R46-0-mz2	st(y)	elongated	parallel
R46-0-mz3	grt(y)	blocky	sub parallel
R50-70-mz1	st(y)	elongated	parallel
R50-70-mz2	st(y)	elongated	parallel
R50-70-mz3	st(y)	blocky	inclusion parallel
R50-70-mz4	grt (no)	blocky	perpendicular (rim)
R76-70-mz1	grt (y)	blocky	N/A (rim)
R76-70-mz2	grt(y)	sub rounded	parallel (rim)
R76-70-mz3	grt(y)	partially elongated	sub parallel
R96-10-mz1	grt (no)	rounded	N/A (rim)
R98-10-mz1	grt(y)	sub rounded	N/A (rim)
R98-10-mz2	grt (no)	blocky/rounded	N/A
R98-10-mz3	grt(y)	elongated	parallel (rim)
R109-0a-mz1	grt (y)	blocky	sub parallel
R109-0b-mz1	grt (y)	rounded	N/A (rim)
R109-0b-mz2	grt (no)	elongated	N/A (rim)

Monazite grains in matrix

Sample	Fabric	Shape	Relative to Fabric
R40-0-mz2	Sm	elongated	parallel
R40-0-mz3	Sm	partially elongated	parallel
R76-70-mz4	Sm-1	blocky	parallel
R76-70-mz5	Sm-1	rounded	N/A
R109-0a-mz2	Sshadow	sub rounded	parallel
R109-0a-mz3	Sm	elongated	parallel
R225-150-mz1	Sm	sub elongated	parallel
R225-150-mz2	Sshadow	sub rounded	parallel
R225-150-mz3	Sshadow	sub rounded	parallel
R225-150-mz4	Sm	elongate	parallel
R226-120-mz1	Sshadow	sub elongated	sub parallel

Table 3. Shown is a summary of the microstructural/textural setting of monazites analysed. Samples are separated according to whether the monazite is included within a porphyroblast or situated in the matrix.

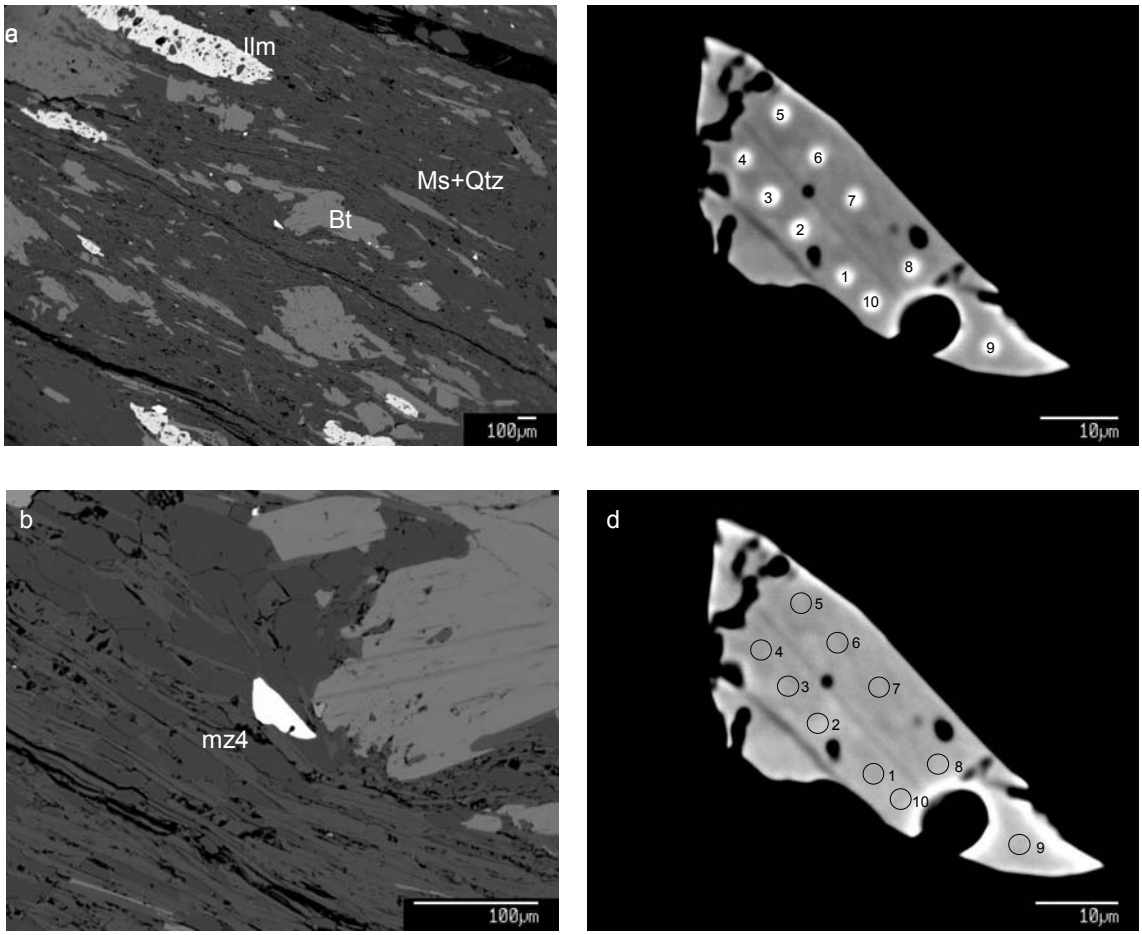


Figure 5. Backscatter electron images of sample R225-150 and monazite 4. a) and b) show the microstructural/textural setting of the monazite, c) shows the location of analyses and resultant beam damage, d) shows the grain prior to analysis.

Table4.

EPMA analytical conditions

Element - Peak	Standard	Crystal - Spectrometer	Back-ground -/+ (mm)	Count time (s) Peak/Bgd
SiKα	[1]PbSiO3	TAP-1	5/3	20/10
PKα	[3]CePO4	TAP-1	3/4	20/10
SKα[#]	[1]BaSO4	PETJ-3*	6/4	30/15
CaKα	[1]CaSiO3	PETJ-5	1.6/1.6	20/10
YLα	[3]YPO4	TAP-1	1.25/2	90/45
LaLα	[3]LaPO4	LIFH-3*	1.6/1.6	10/5
CeLα	[3]CePO4	LIFH-3*	3.2/3.2	10/5
PrLβ	[3]PrPO4	LIFH-3*	1/1	20/10
NdLβ	[3]NdPO4	LIFH-3*	1/1	10/5
SmLβ	[3]SmPO4	LIFH-3*	1/1	40/20
GdLβ	[3]GdPO4	LIFH-3*	1/1	40/20
DyLβ	[3]DyPO4	LIFH-3*	1/4	40/20
PbMα	[1]PbSiO3	PETJ-2*	4/6	180/90
ThMα	[2]ThO2	PETJ-5	2.5/3	90/45
UMβ	[1]U	PETJ-4	3.5/2.5	180/90

* - sealed Xe detectors, others are P-10 gas-flow detectors

[#] S not analysed for all monazites in this study

Standards: [1] - Astimex, [2] - Taylor, [3] - Pb-free synthetic (J. Pyle, RPI ,USA)

Table 4. Electron superprobe analytical setup conditions.

Sample	Domain	n	b.d.	Comp range (wt%)		Mean	95% CI	Comment
				Th	Y	(Ma)	(SE x t)	
R225-								*Manangotry: 551 ± 6 Ma (n=10)*
150-mz1	total	9	2	2.69-4.12	0.18-0.41	**264**	**8**	some variation in Th, U and Y
150-mz2	total	14	2	2.61-3.49	0.39-0.45	**261**	**7**	little compositional variation
150-mz3	total	10	2	2.67-3.81	0.24-0.46	**270**	**7**	lower Th positively correlated with U
150-mz4	total	10	2	2.49-3.20	0.30-0.41	**267**	**7**	minor compositional variation
R226-								*Manangotry: 547 ± 8 Ma (n=10)*
70-mz1	total	7	2	2.65-3.58	0.40-0.45	**298**	**8**	minor compositional variation
								Manangotry: 547 ± 7 Ma (n=10)

b.d. = beam diameter (μm)

Table 5. Summary of individual grain analyses for monazite from the Rhode Island Formation.

Sample	Domain	n	b.d.	Comp range (wt%)		Mean	95% CI	Comment
				Th	Y	(Ma)	(SE x t)	
R40-								*Manangotry: 549 ± 5 Ma (n=9)*
0-mz1	total	7	2	2.4-4.2	0.27-0.89	**325**	**13**	variation in Th (+U) and Y
0-mz2	total	8	2	3.37-4.21	0.29-0.31	**323**	**14**	relatively homogenuous in Th, U and Y
0-mz3	total	8	2	3.65-4.37	0.21-0.29	**324**	**10**	relatively homogenuous in Th, U and Y
R46-								*Manangotry: 551 ± 6 Ma (n=10)*
0-mz1a+b	total	8	2	2.04-3.62	0.47-1.48	**316**	**11**	two fragments compositionally similar
0-mz2	total	6	2	3.13-4.89	1.36-1.52	**317**	**25**	patchy variation in Th
0-mz3	total	7	2	4.18-6.67	1.26-1.49	**309**	**17**	minor variation in U and Y
R50-								*Manangotry: 552 ± 8 Ma (n=10)*
70-mz1	total	8	2	2.35-5.01	1.15-1.73	**307**	**12**	interpreted core has higher Th.
70-mz2	total	5	2	2.72-4.48	1.11-1.55	**303**	**16**	some compositional variation
70-mz3	total	8	2	4.44-8.34	0.09-0.62	**305**	**6**	significant compositional variation
70-mz4	total	6	2	2.95-5.35	0.48-0.88	**314**	**11**	large Th + Y + U variation
R76-								*Manangotry: 551 ± 6 Ma (n=10)*
70-mz1	total	6	2	2.72-6.20	0.64-1.37	**315**	**15**	significant variation in Th, U and Y
70-mz2	total	8	2	4.39-8.70	0.59-0.87	**316**	**14**	minimal variation in U and Y
70-mz3	total	8	2	3.59-9.91	0.44-0.83	**318**	**16**	Th correlates with U and Y
70-mz4	total	8	2	4.58-5.35	0.92-1.22	**307**	**7**	minor variation in Th, U and Y
70-mz5	zone 1	4		3.96-4.82	1.04-1.37	326	10	Th correlates with Y(R-squared = 0.95)
	zone 2	7		2.86-3.33	0.19-0.31	317	5	cannot separate (errors are too large)
	total	11	2			**320**	**10**	zones probably distinct growth events
R96-								*Manangotry: 547 ± 7 Ma (n=10)*
0-mz1	total	8	2	2.87-3.35	0.74-1.17	**315**	**19**	higher Y closest to core/rim boundary
R98-								*Manangotry: 547 ± 7 Ma (n=10)*
10-mz1	zone1			3.16-3.51	0.10-0.12			
	zone2a			1.90-1.97	1.39-1.58			*complex (intergrowth-type?) zoning*
	zone2b			4.10-4.43	1.39-1.58			no evident correlation between
	total	7	2	1.90-4.43	0.10-1.58	**308**	**25**	*Y (or Th or U) and age.*
10-mz2	zone 1	6		3.01-3.48	0.09-0.22			two fragments with differing Y and Th
	zone 2	2		2.50-2.79	1.06-1.50			no evident correlation between
	total	8	2			**290**	**13**	compositional variation and age
10-mz3	total	4	2	2.66-4.56	1.37-1.54(+0.26)	**305**	**20**	complex variation between Th and Y
R109-								*Manangotry: 553 ± 8 Ma (n=9)*
0a-mz1	total	4	2	4.79-5.55(+9.09)	1.35-1.40	**316**	**26**	3 relatively consistant analyses
0a-mz2	total	12	2	3.53-3.95(+4.54)	0.32-1.32	**311**	**11**	Y increases toward garnet porph
0a-mz3	total	10	2	3.41-4.02	0.44-0.89	**308**	**9**	homogenuous in Th, U, and Y
0b-mz1	core			2.19-2.36	0.93-0.99			monazite has two separable zones:
	rim			3.52-4.12	0.13-0.55			not enough data to calculate proper age
	total	5	2			**300**	**13**	or error for core
0b-mz2	total	6	2	2.65-7.58	0.61-1.34	**312**	**15**	some Th + Y + U variation

b.d. = beam diameter (μm)

Table 6. Summary of individual grain analyses for monazite from the Scotland Schist of the Merrimack Terrane, Connecticut.

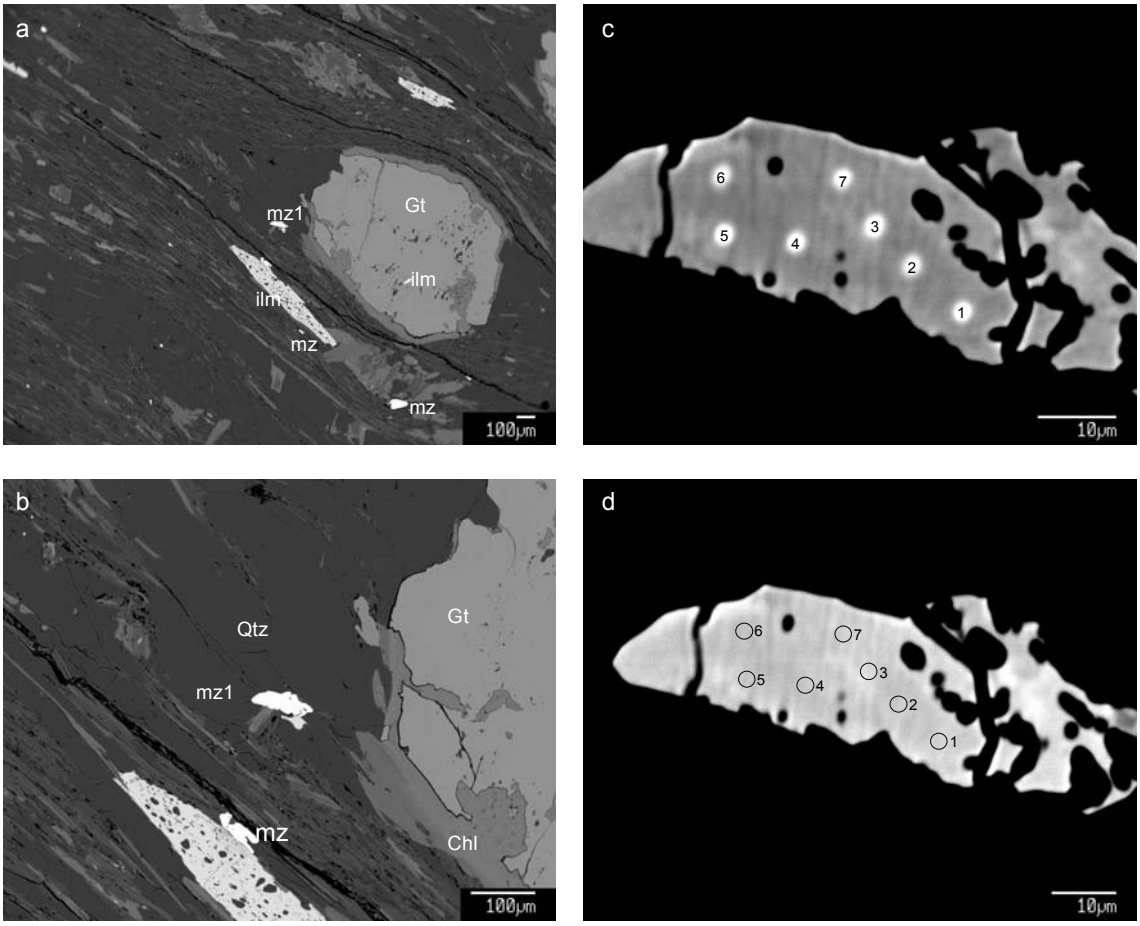


Figure 6. Backscatter electron images of sample R226-120 and monazite 1. a) and b) show the microstructural/textural setting of the monazite, c) shows the location of analyses and resultant beam damage, d) shows the grain prior to analysis.

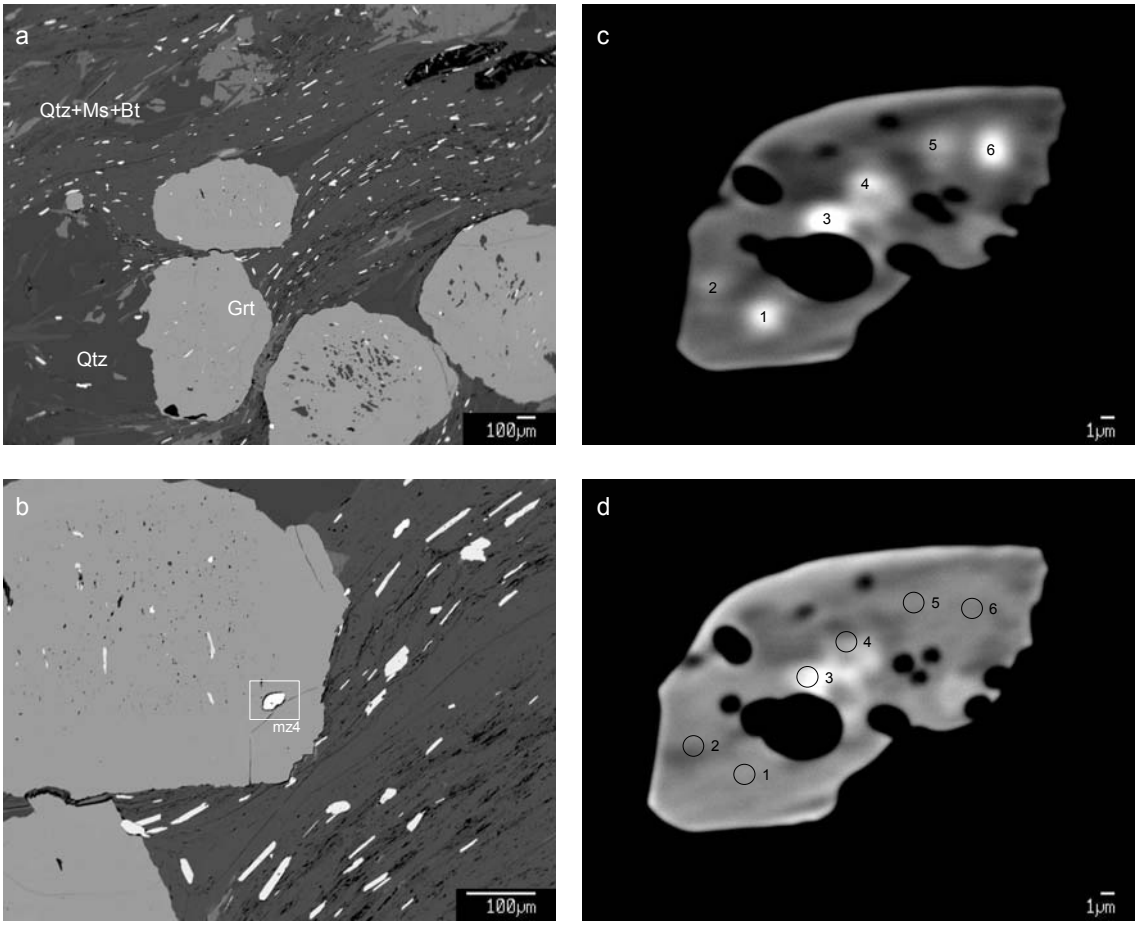


Figure 7. Backscatter electron images of sample R50-70 and monazite 4. a) and b) show the microstructural/textural setting of the monazite, c) shows the location of analyses and resultant beam damage, d) shows the grain prior to analysis.

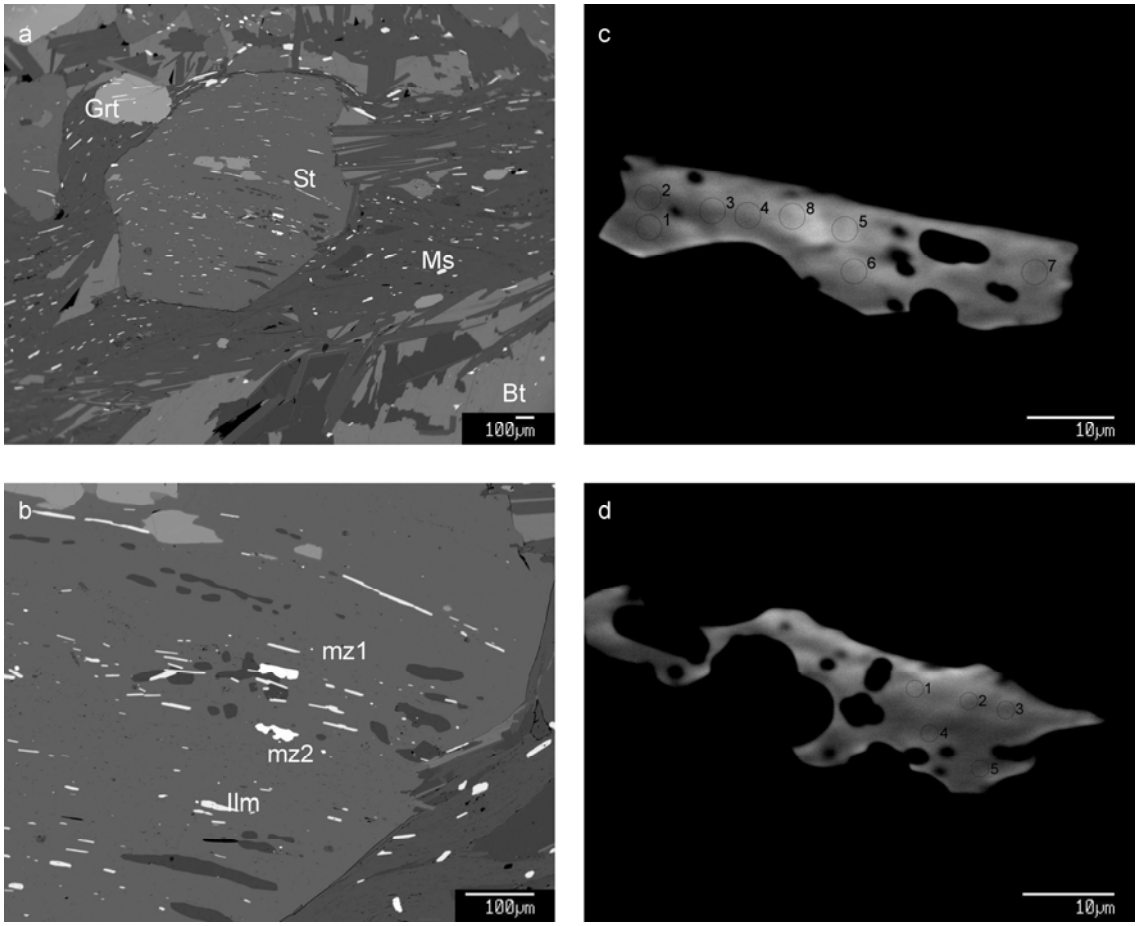


Figure 8. Backscatter electron images of sample R50-70 and monazites 1 and 2. a) and b) show the microstructural/textural setting of the monazite, c) shows mz1 prior to analysis and the location of analyses, d) shows mz2 prior to analysis and the location of analyses.

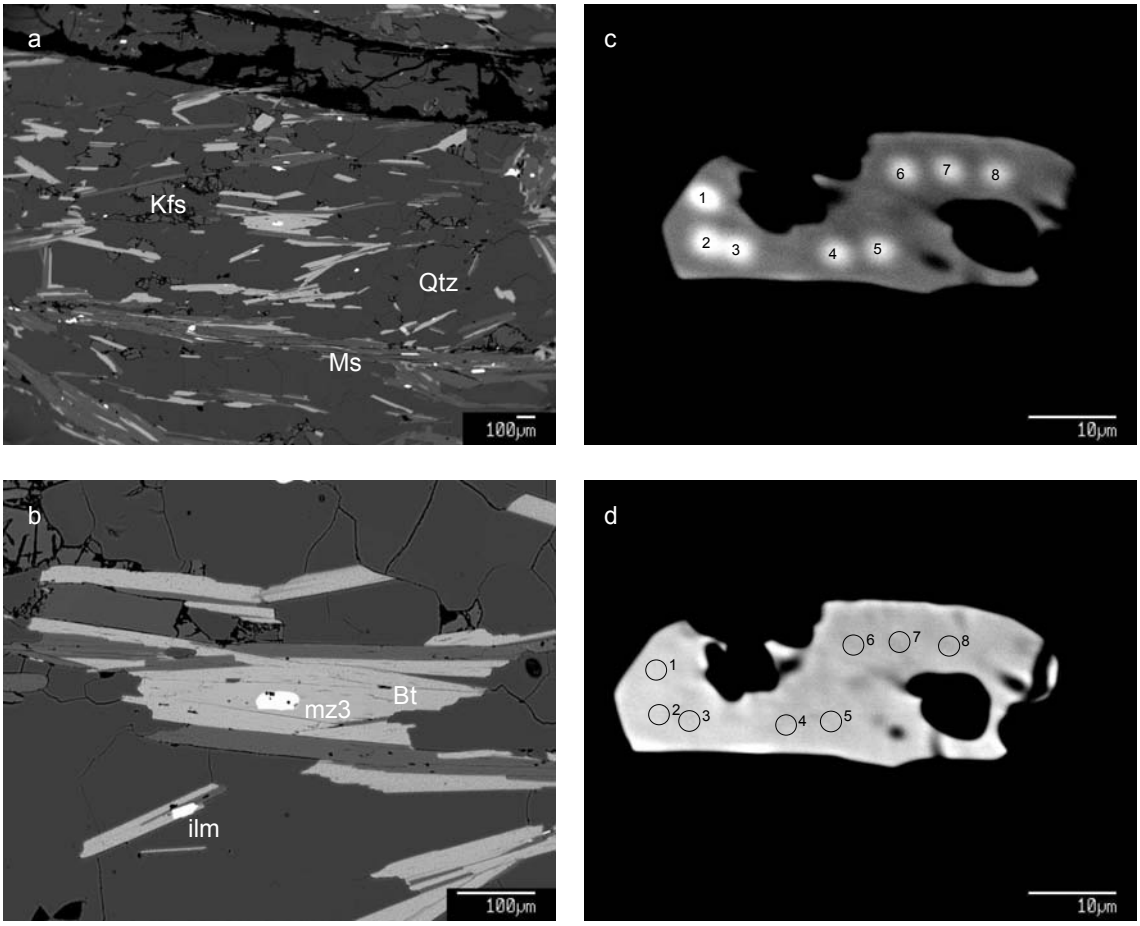


Figure 9. Backscatter electron images of sample R40-0 and monazite 3. a) and b) show the microstructural/textural setting of the monazite, c) shows the location of analyses and resultant beam damage, d) shows the grain prior to analysis.

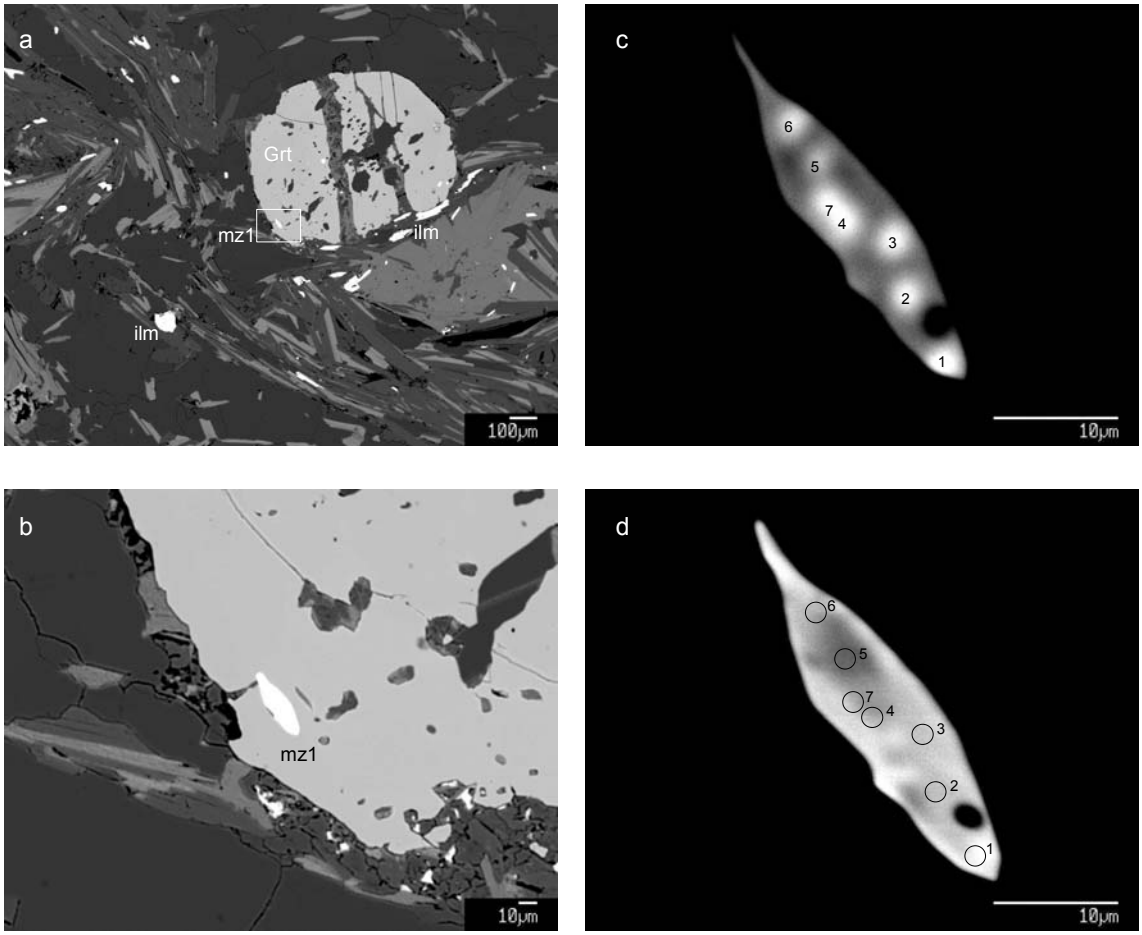


Figure 10. Backscatter electron images of sample R40-0 and monazite 1. a) and b) show the microstructural/textural setting of the monazite, c) shows the location of analyses and resultant beam damage, d) shows the grain prior to analysis.

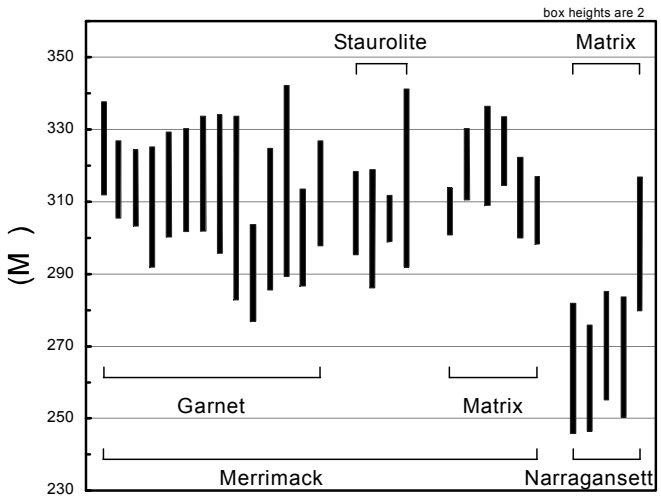
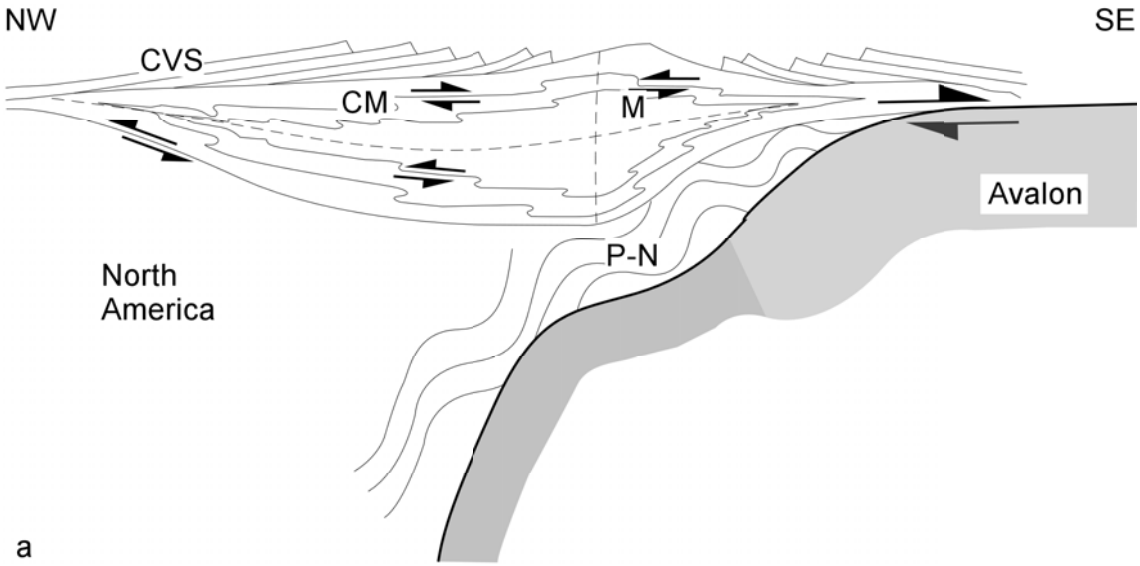
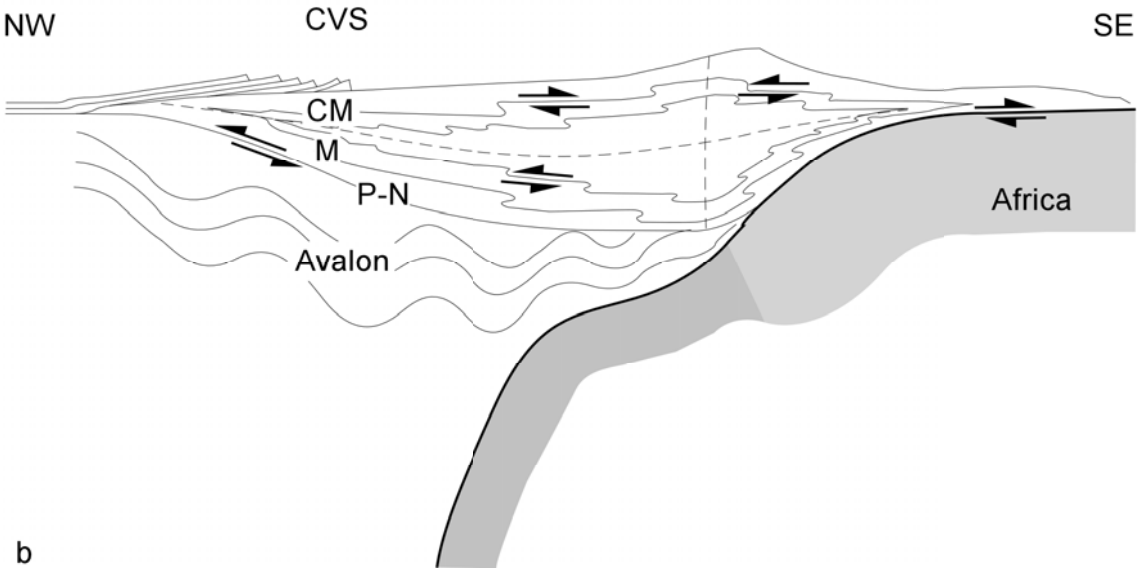


Figure 11. Weighted average ages for each monazite grain with 2σ errors in bold. The data is grouped according to provenance: Merrimack and Narragansett. Data additionally separated by whether the grain was included within a garnet or staurolite porphyroblast or situated in the matrix.

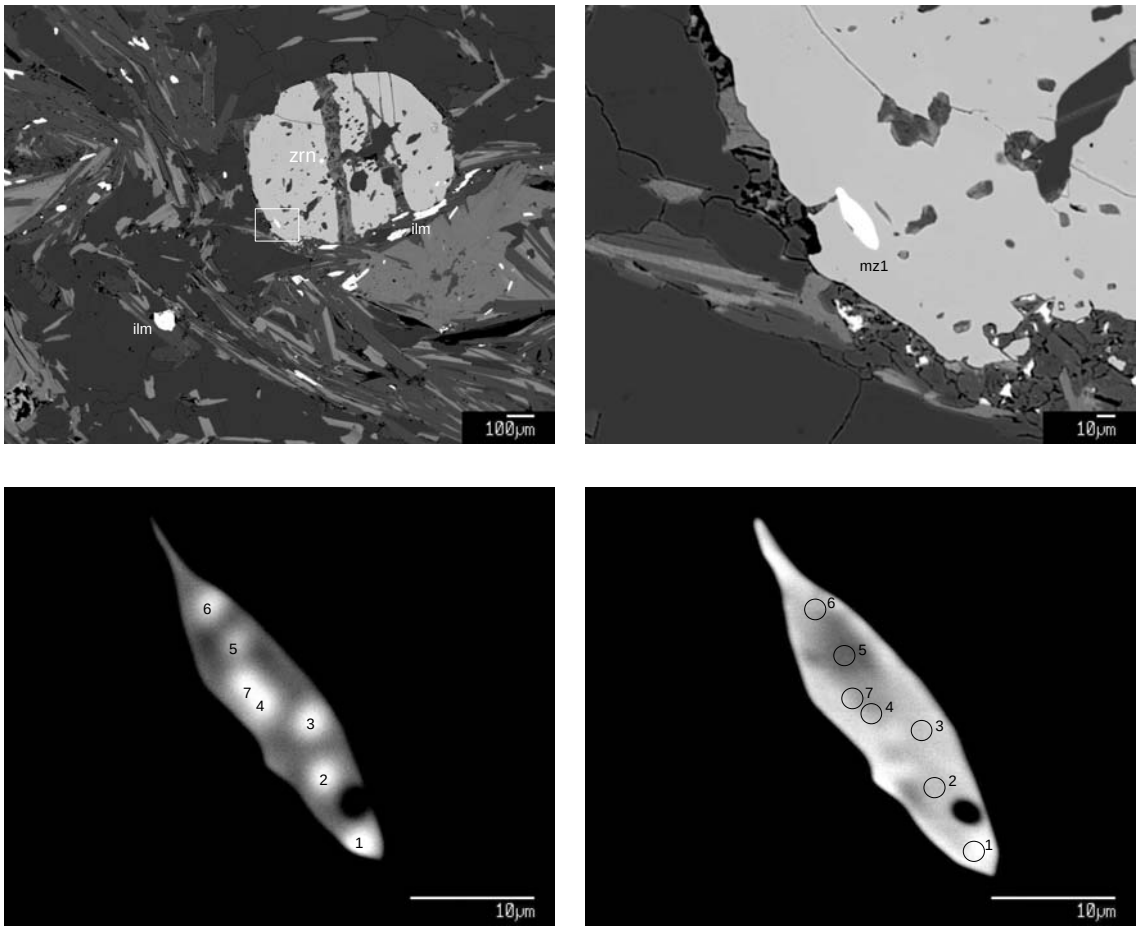
Conclusion

Figure 1. Schematic diagram to place the bulk orogenic directions measured for the Merrimack terrane into the generic model for orogenesis developed by Bell and Johnson (1989). This is not an effort to develop an integrated tectonic model but is used to graphically discuss the shear senses referred to in this study. Figure 1a shows how a top to the SE motion on the Putnam-Nashoba –Avalon boundary would be expected during the collision and emplacement of Avalon under the Putnam-Nashoba, Merrimack and Central Maine Terranes. At this time, the Merrimack terrane could experience N directed bulk orogenic flow, but this did not occur in response to stacking of thrust sheets from the NW. Figure 1b shows the arrival of Africa which would have dramatically changed the scale of the orogen. The core of the orogen would move in response to this scale change and the relationships between lithotectonic units and related shear senses could shift as a result. The bulk orogenic movement direction in the Merrimack terrane could be to the NW while the shear sense on the Putnam-Nashoba – Avalon boundary could have changed to top to the NW. In this example, with the Merrimack terrane now within the bottom half of the orogenic pile, stacking of thrust sheets from the NW does not create a shear sense quandary.

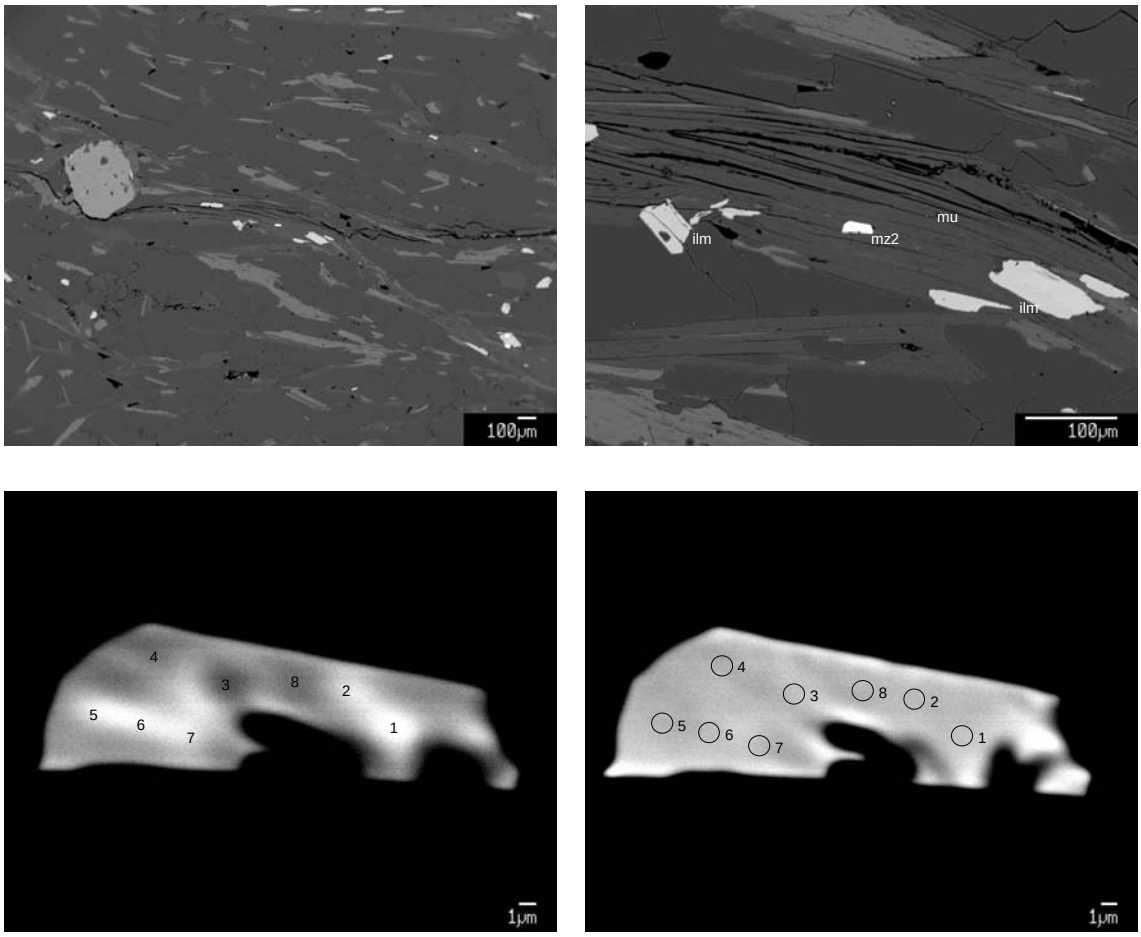

NW
SE
CVS
CM
M
Avalon
P-N
North
America
a


NW
CVS
SE
CM
M
P-N
Avalon
Africa
b

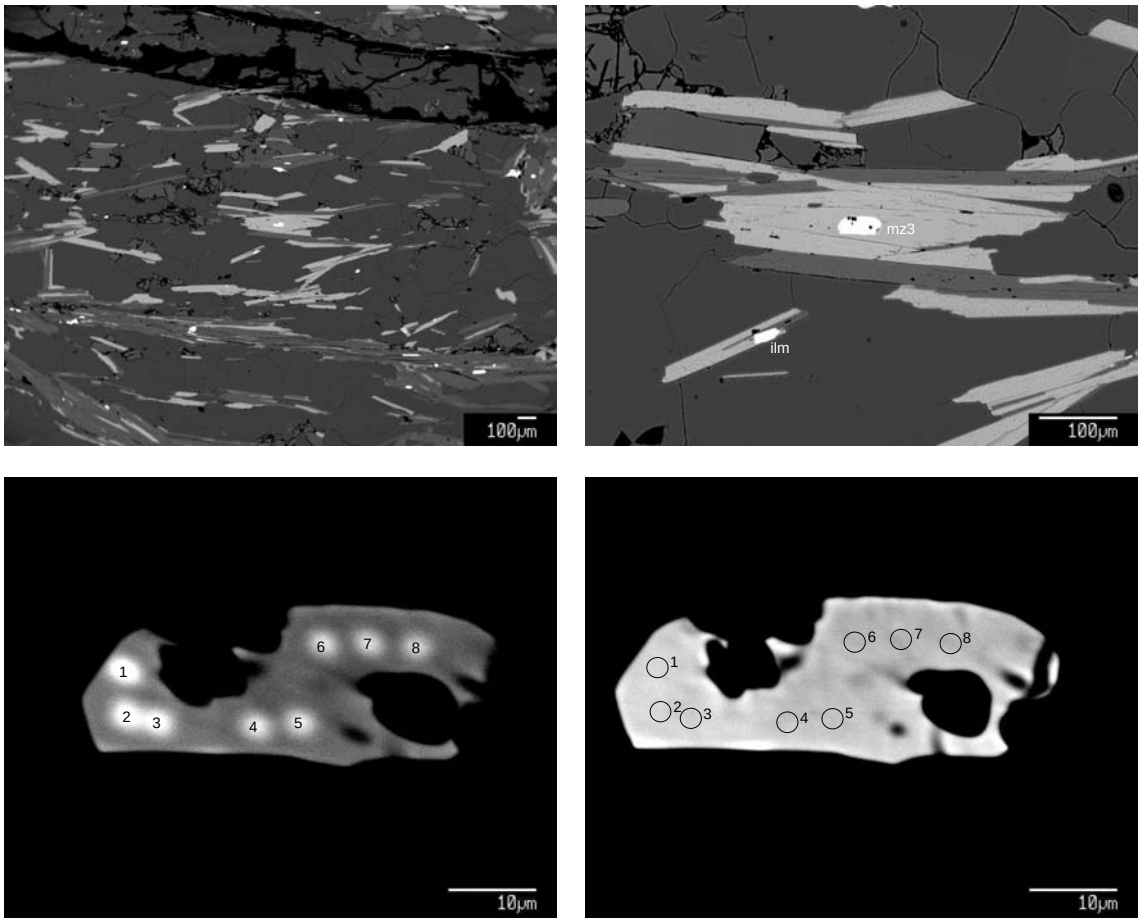
Appendix A: Monazite Images.



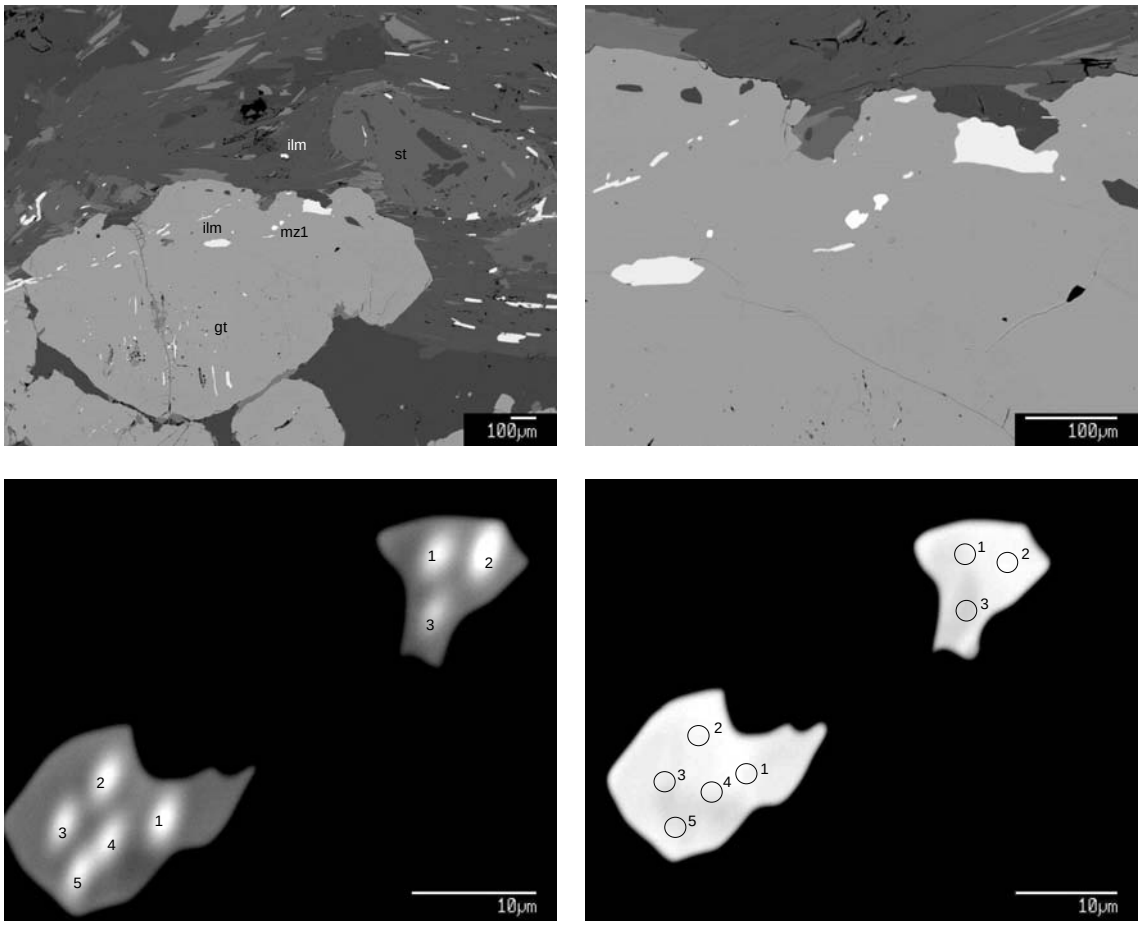
R40-0-mz1



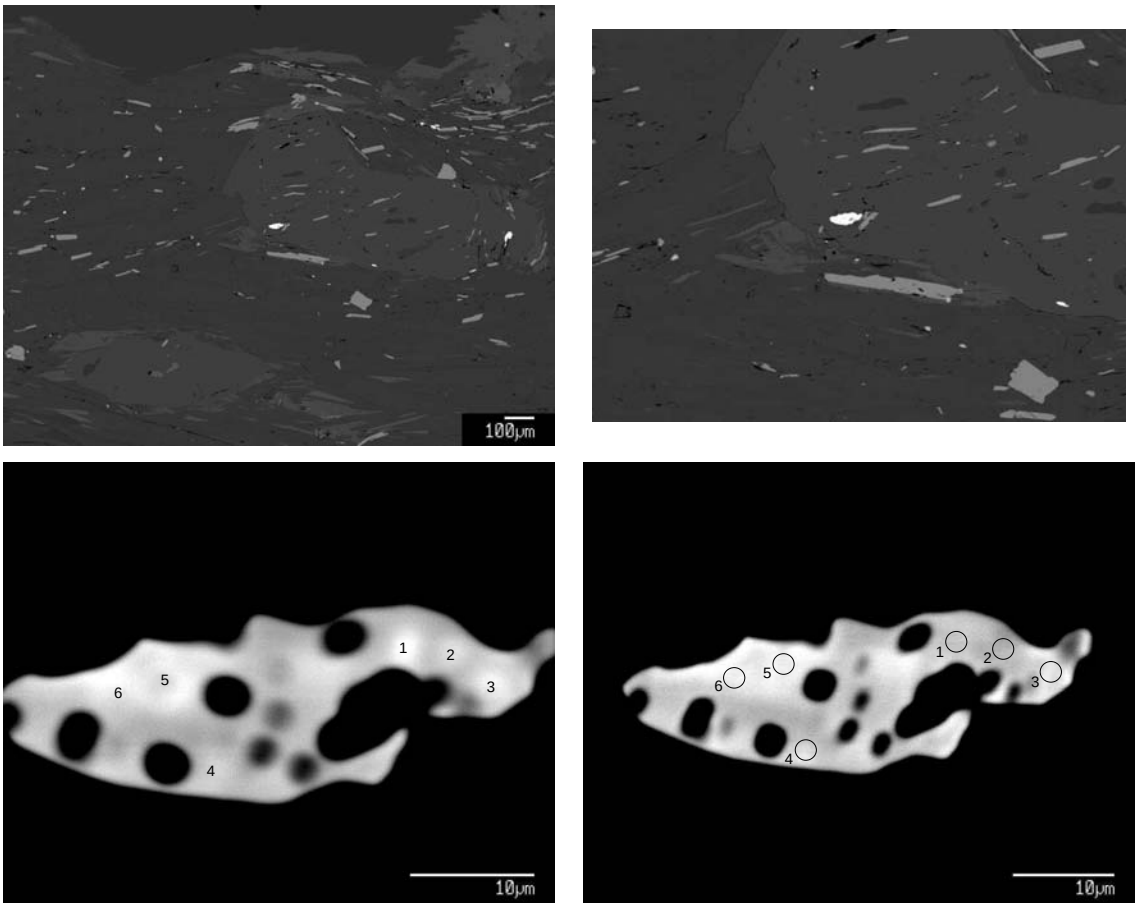
R40-0-mz2



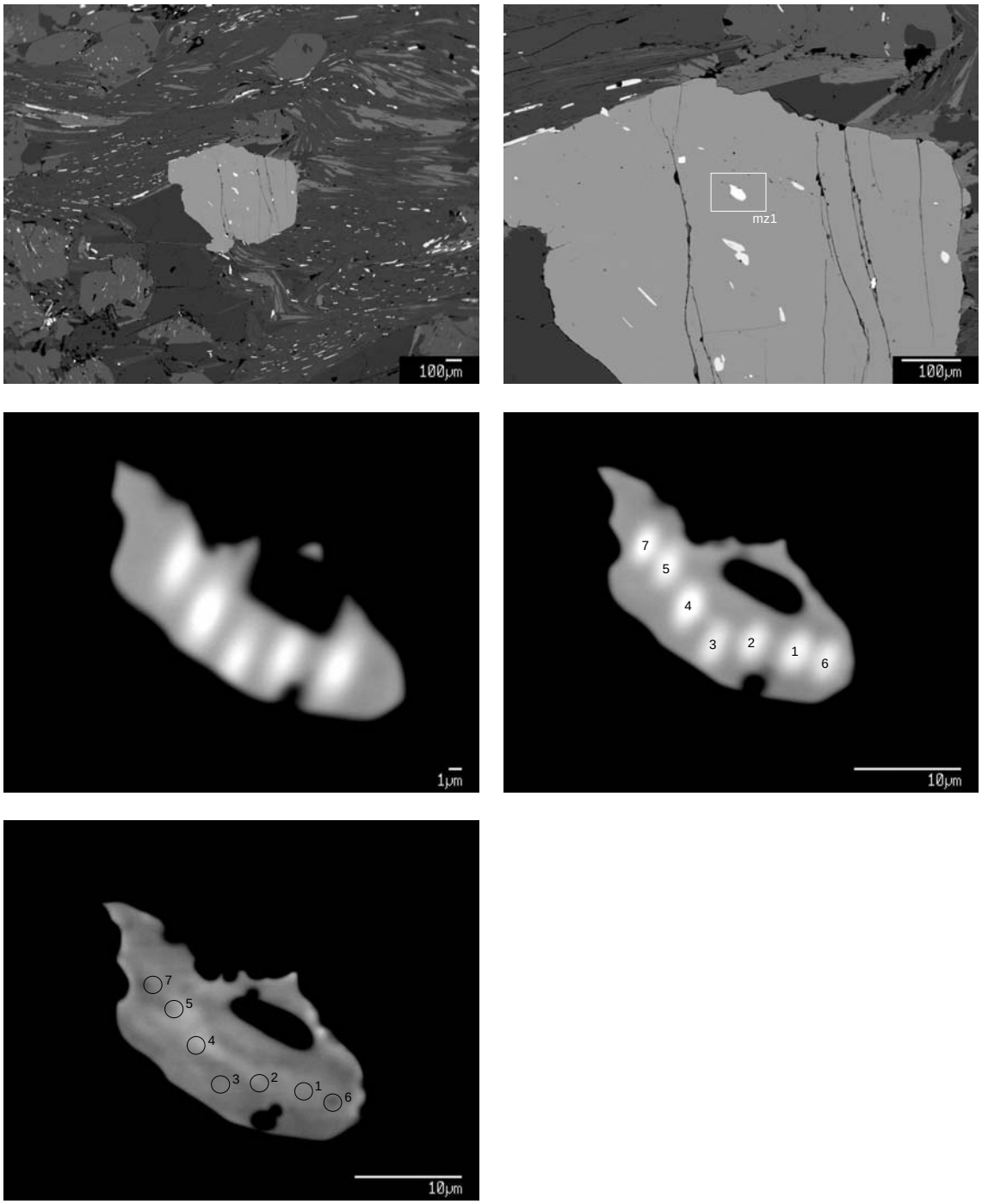
R40-0-mz3



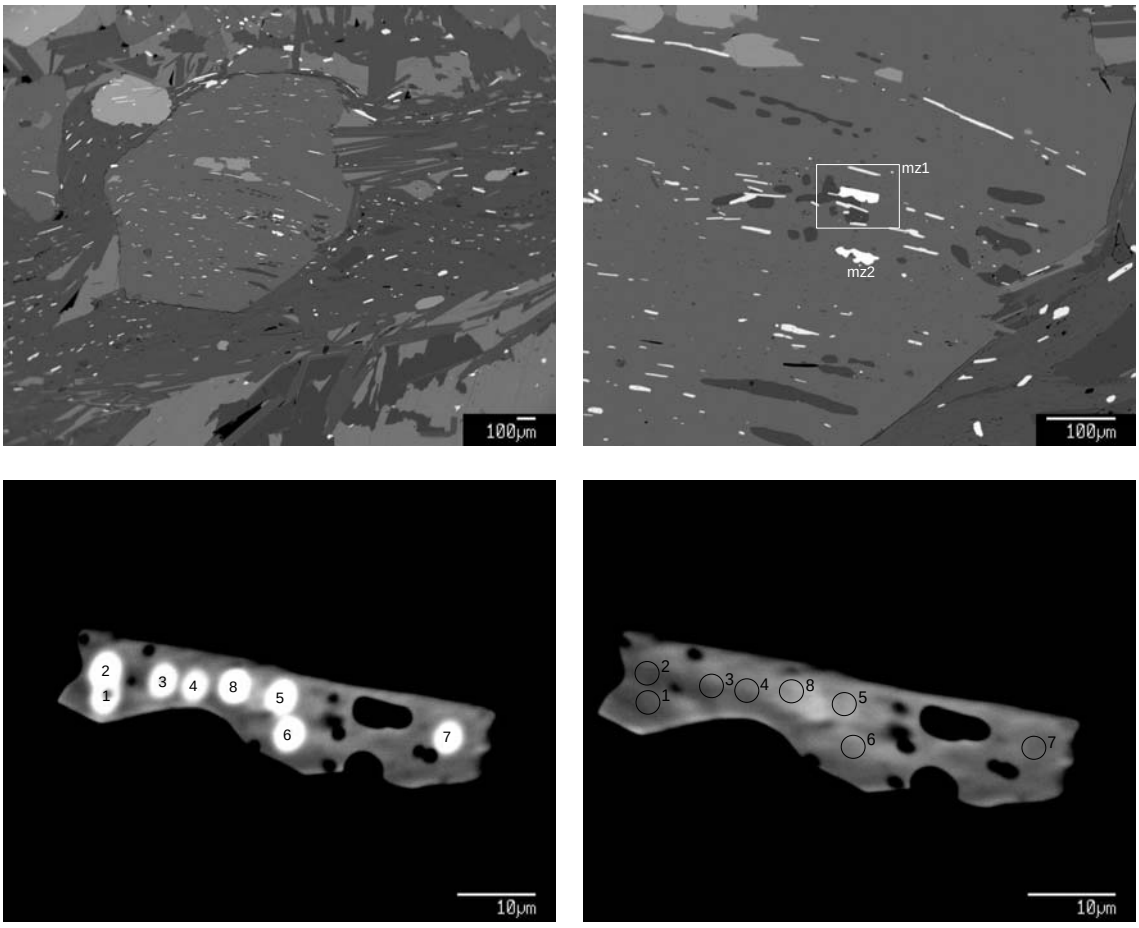
R46-0-mz1



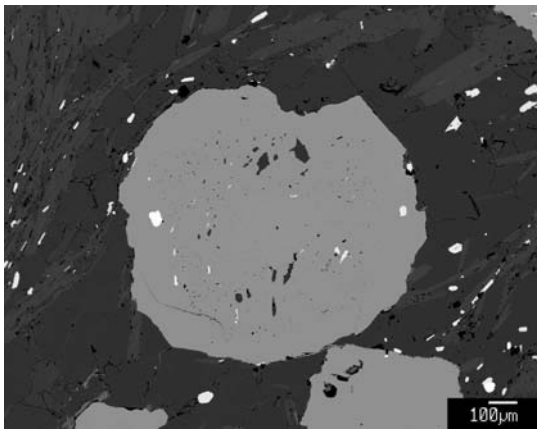
R46-0-mz2

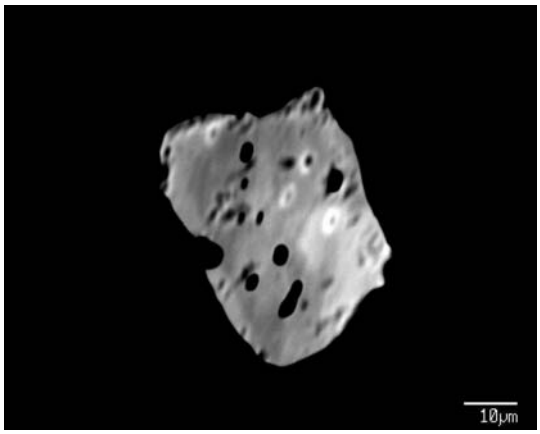


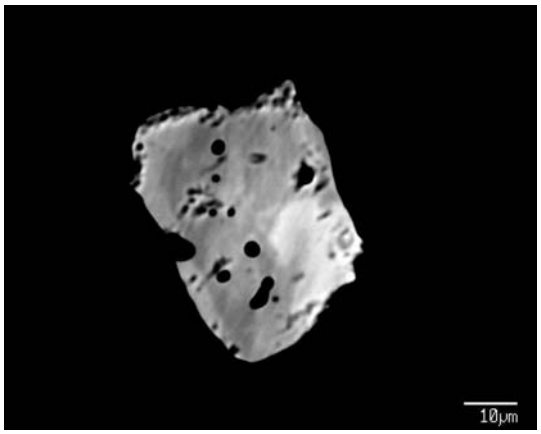
R46-0-mz3



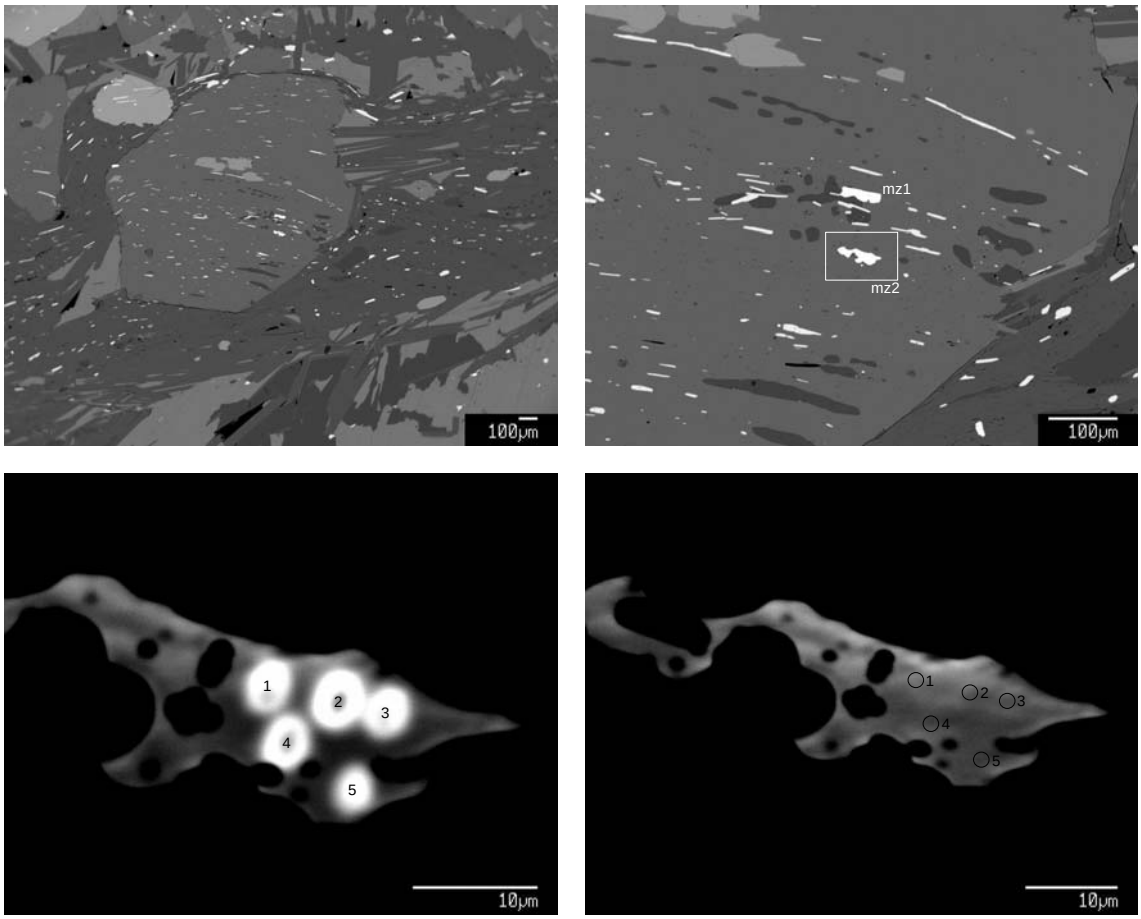
R50-70-mz1



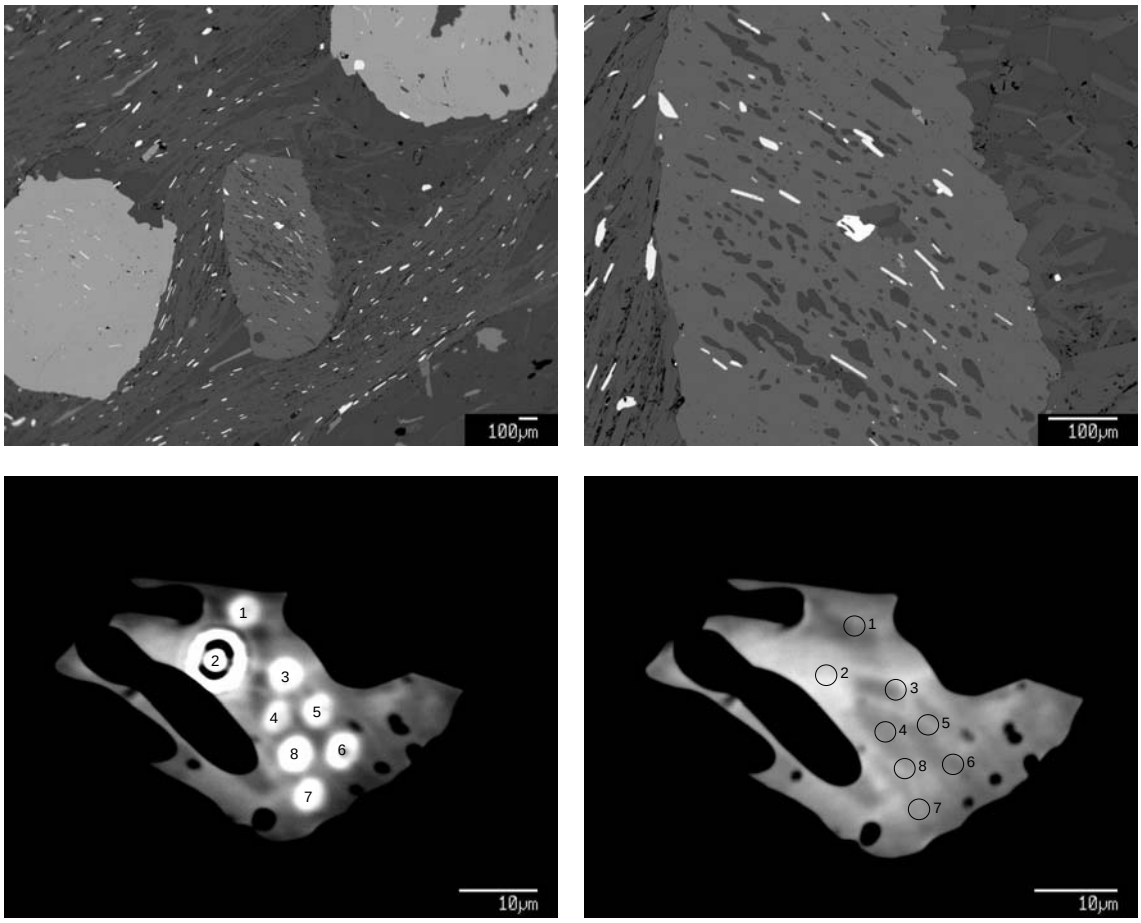




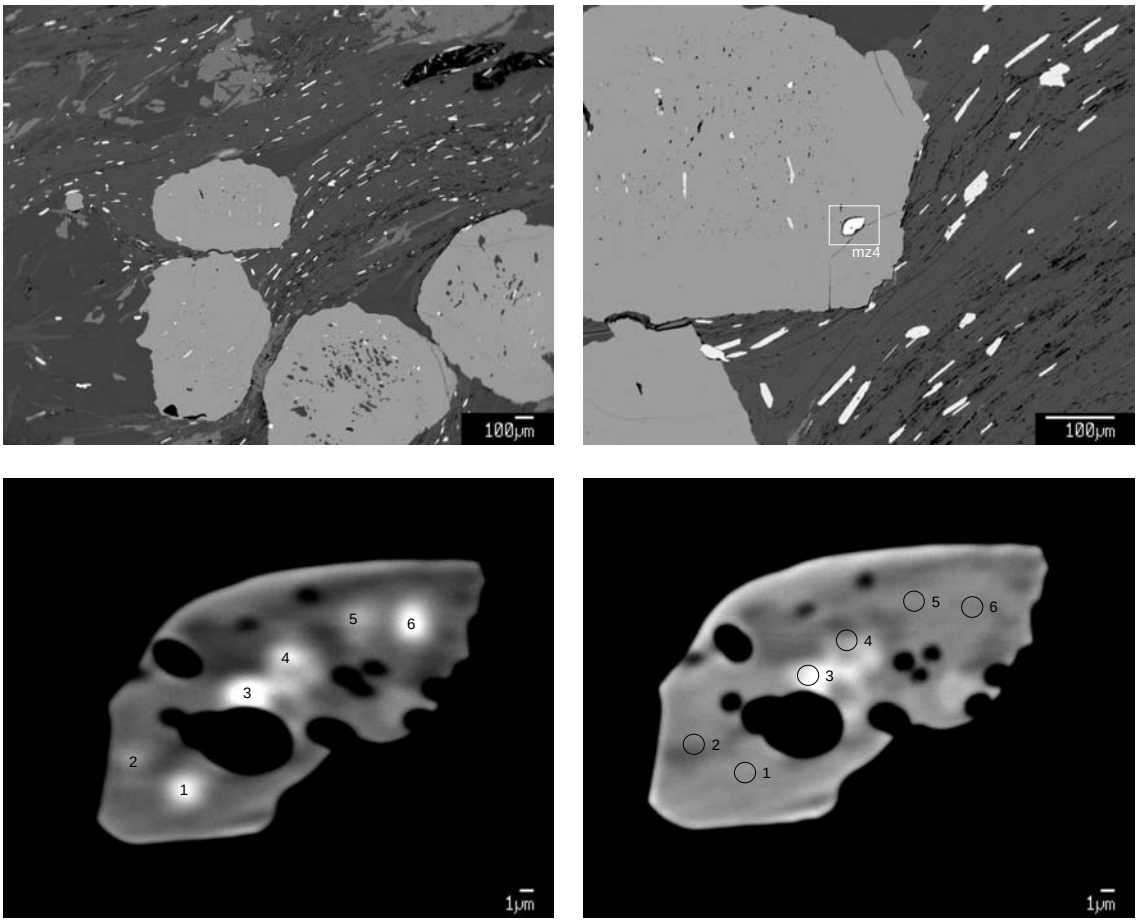
R50-70-mz1a



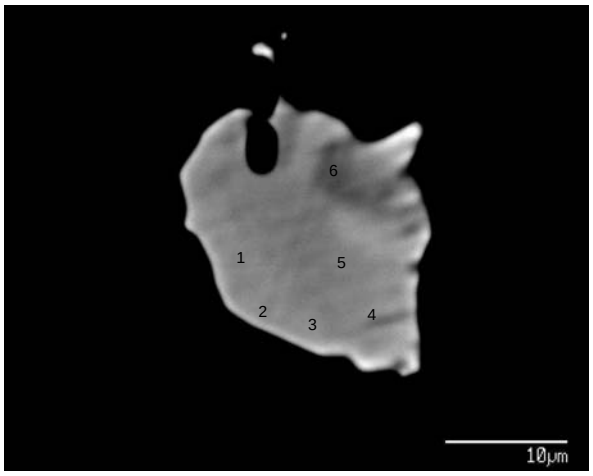
R50-70-mz2



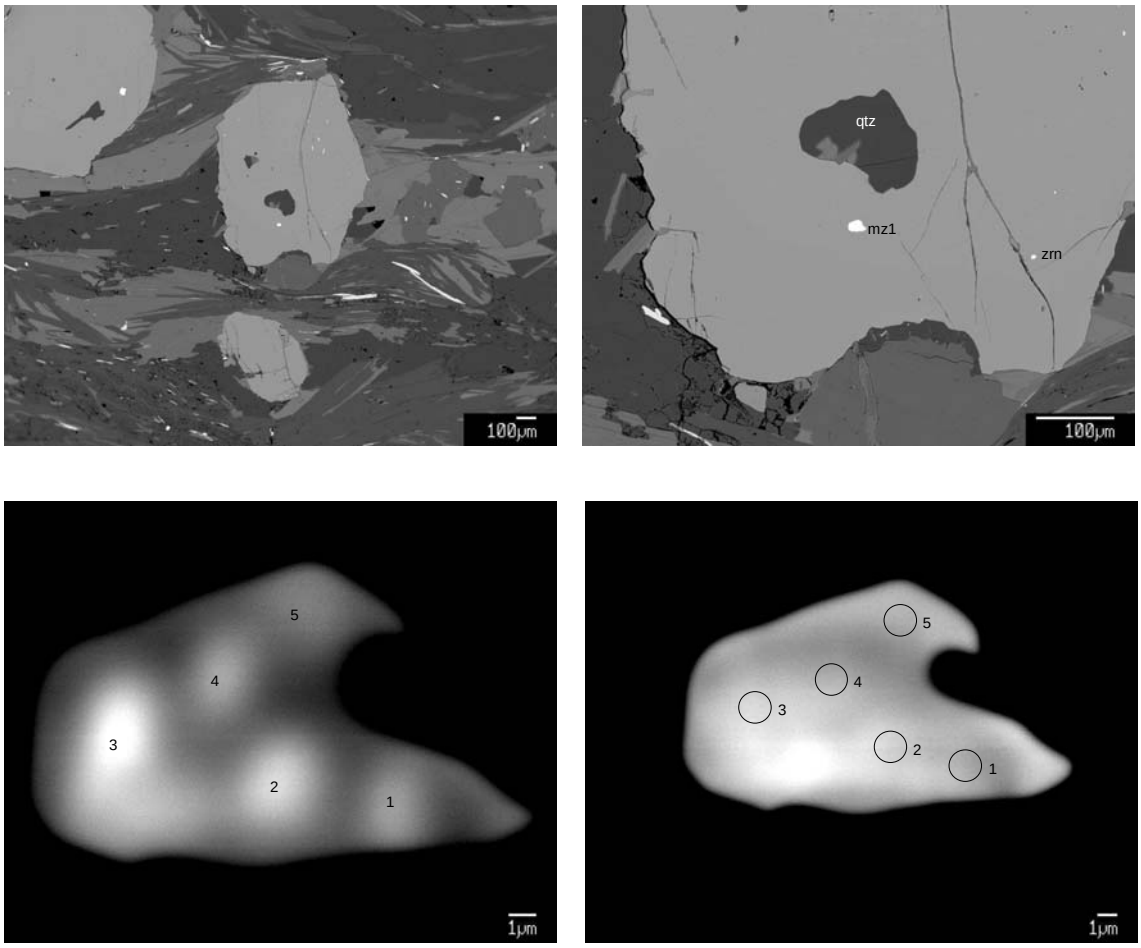
R50-70-mz3



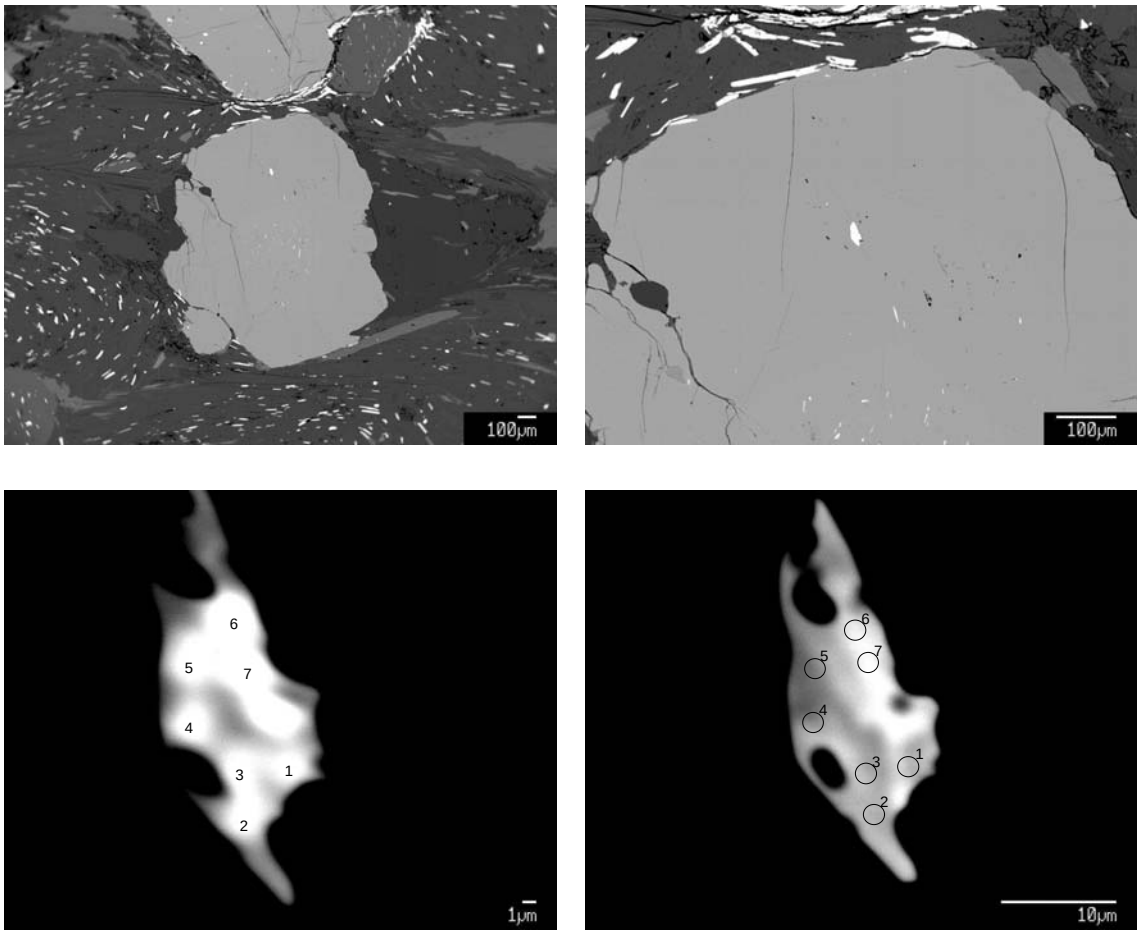
R50-70-mz4



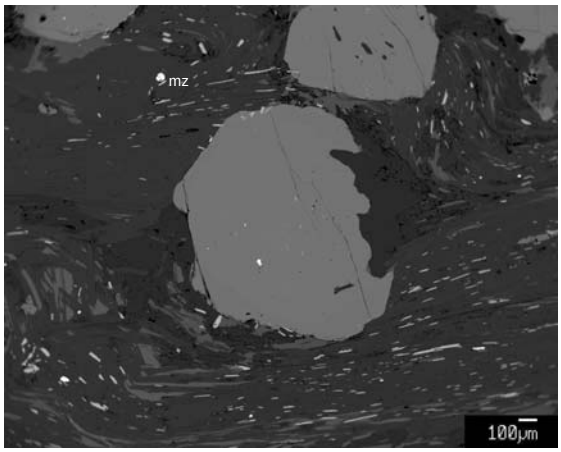
R50-70-mz5

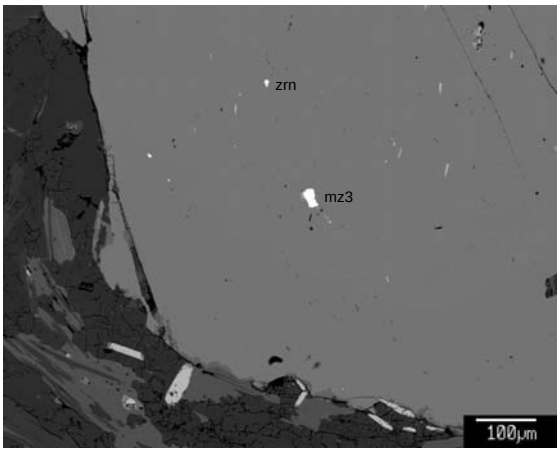


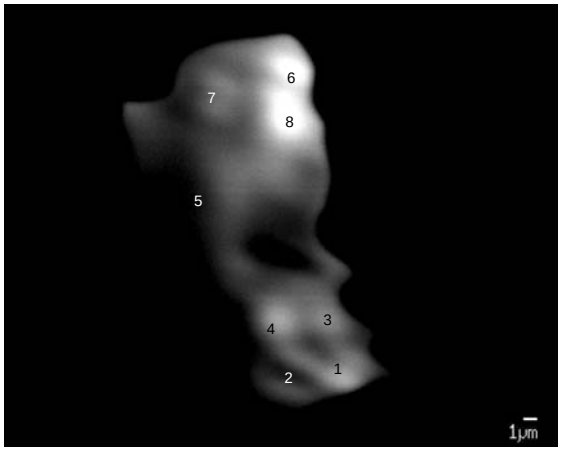
R76-70-mz1



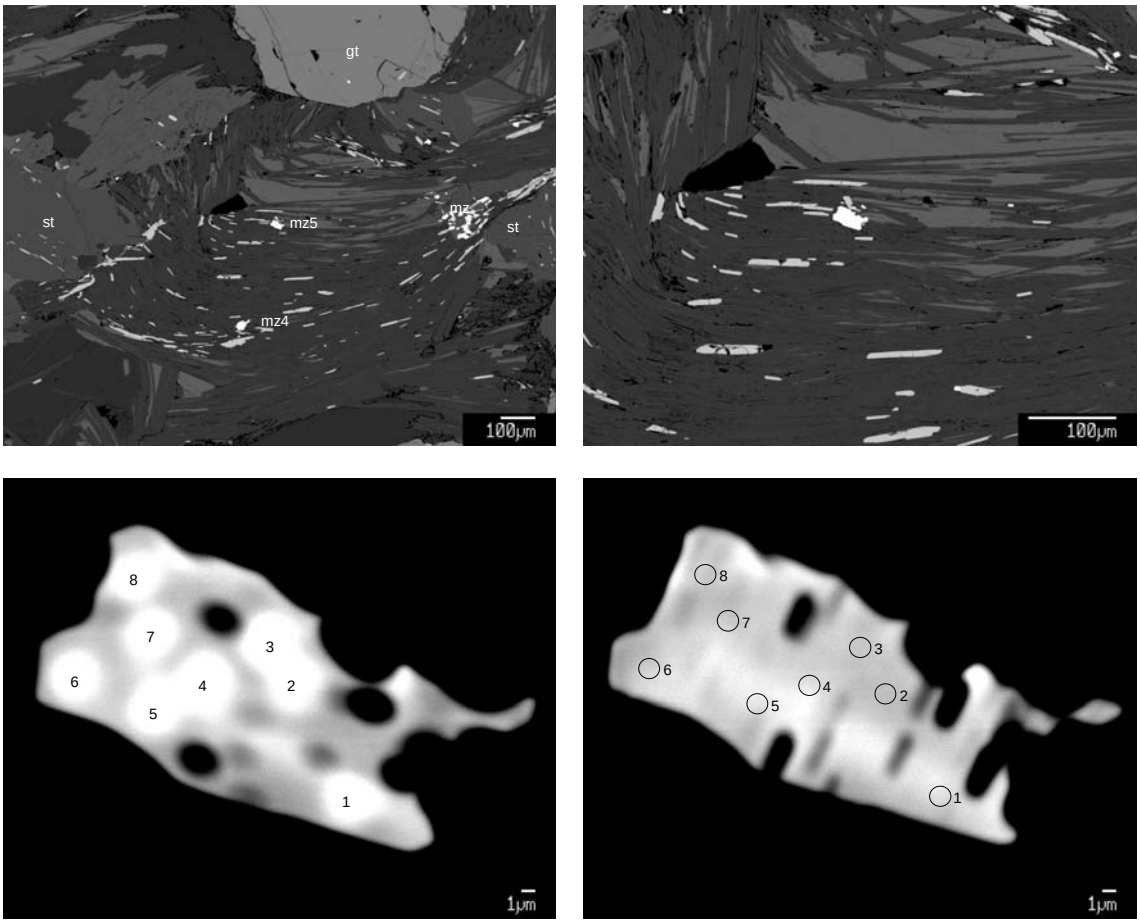
R76-70-mz2



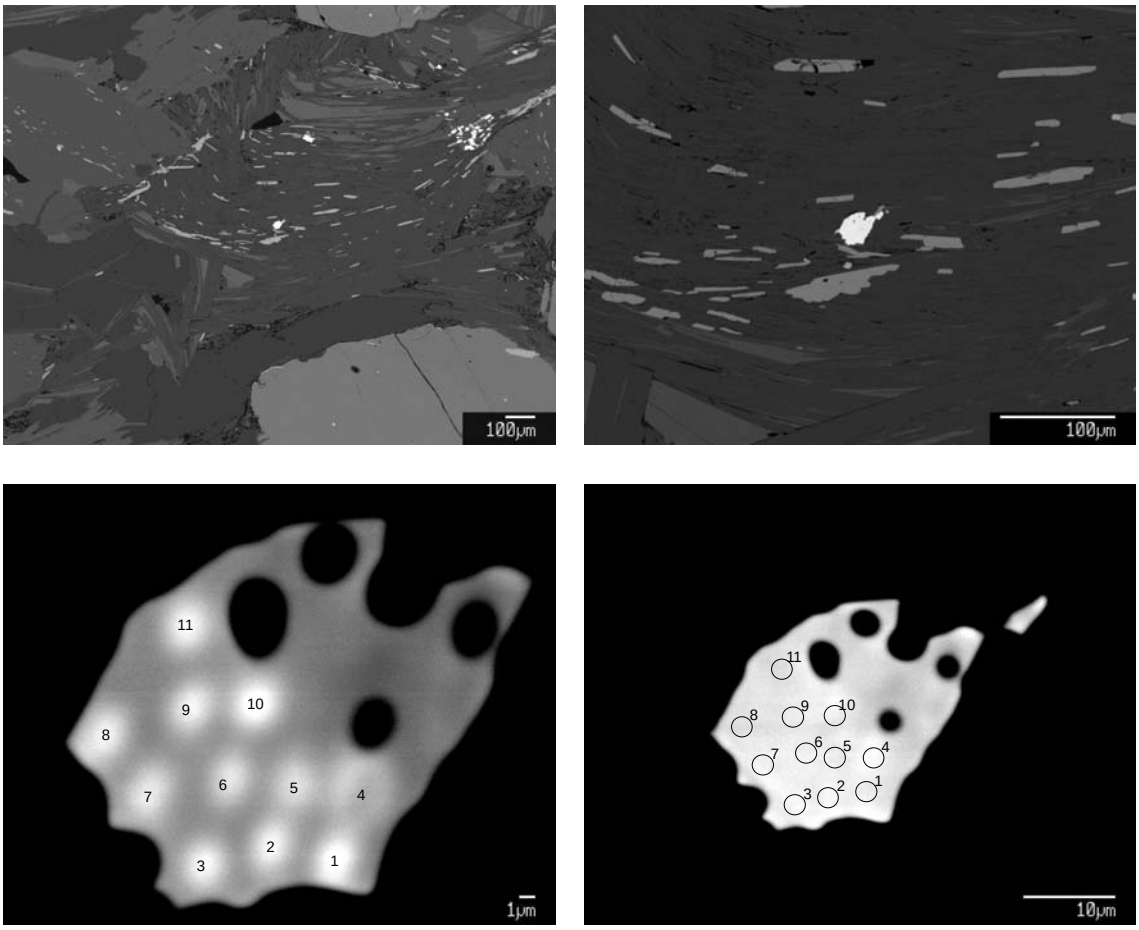




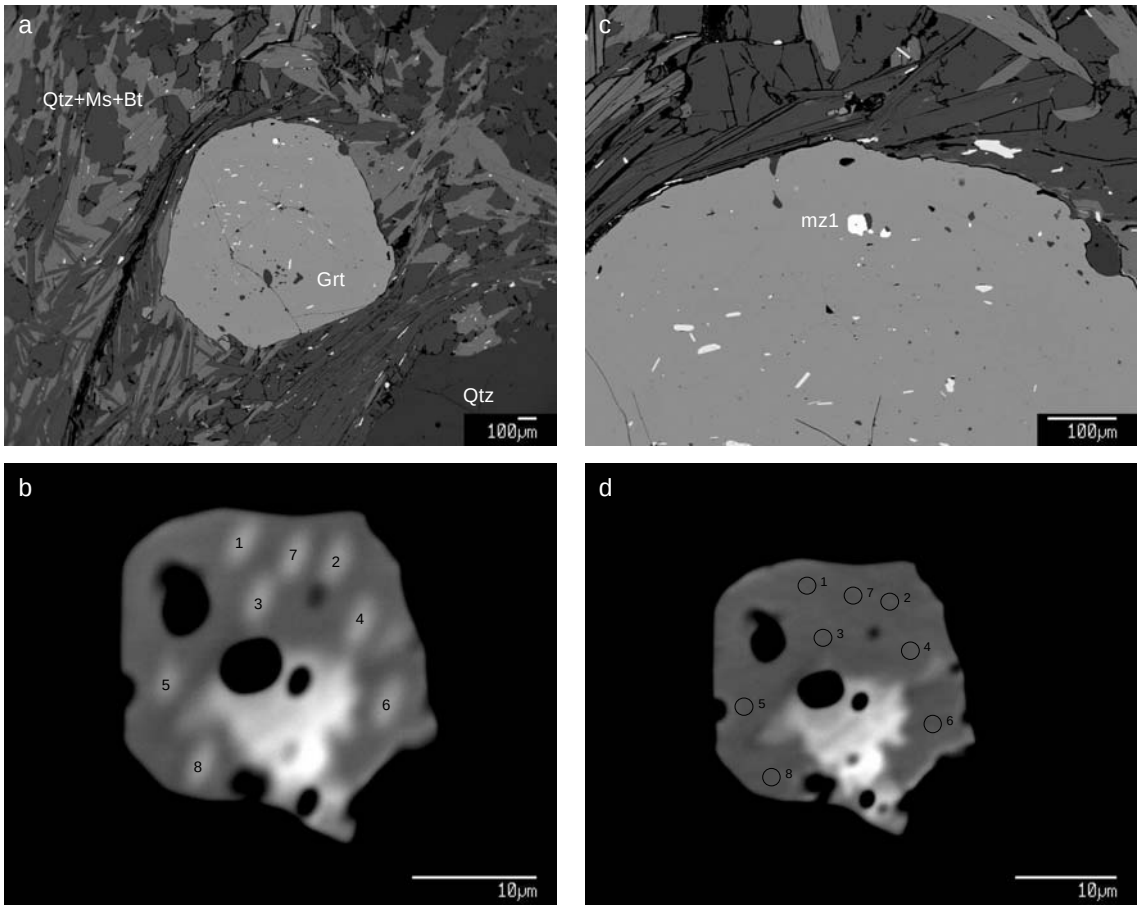
R76-70-mz3



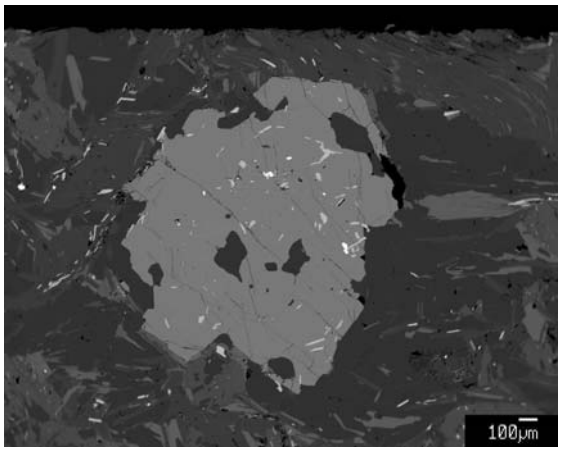
R76-70-mz4

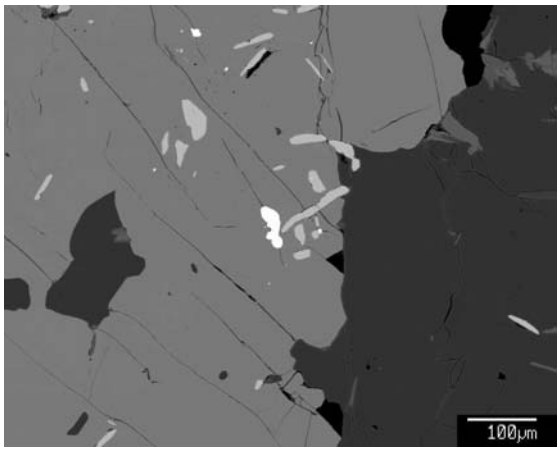


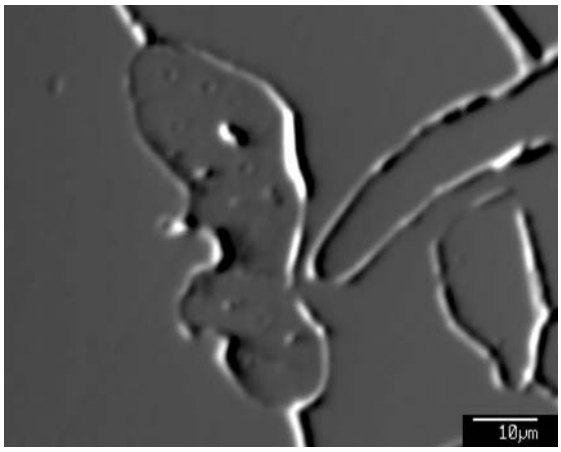
R76-70-mz5

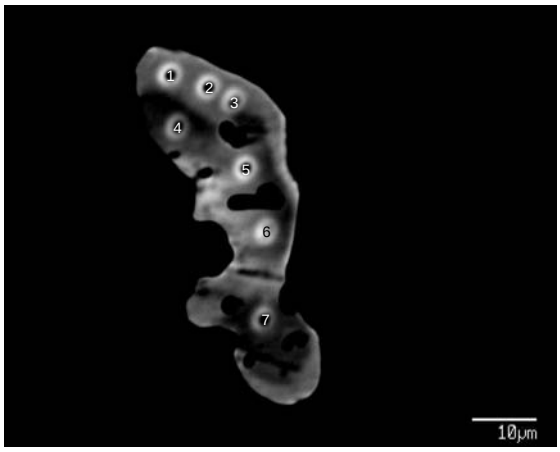

a
Qtz+Ms+Bt
Grt
Qtz
100µm
c
mz1
100µm
b
1
7
2
3
4
5
6
8
10µm
d
1
7
2
3
4
5
6
8
10µm

R96-10-mz1

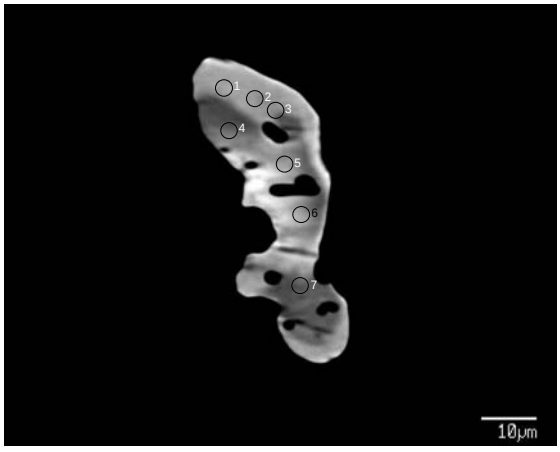


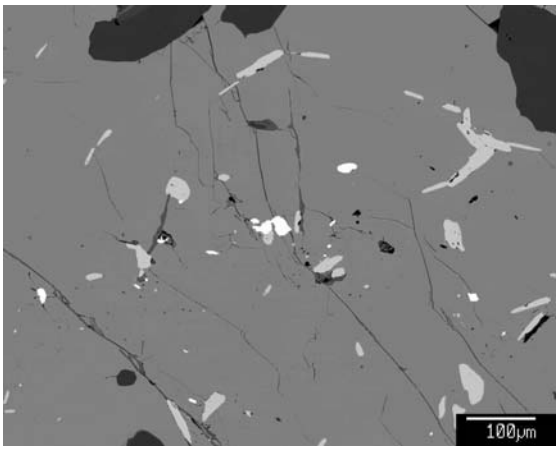


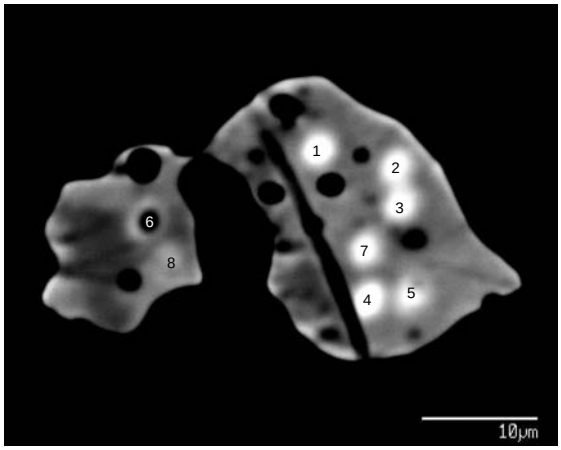


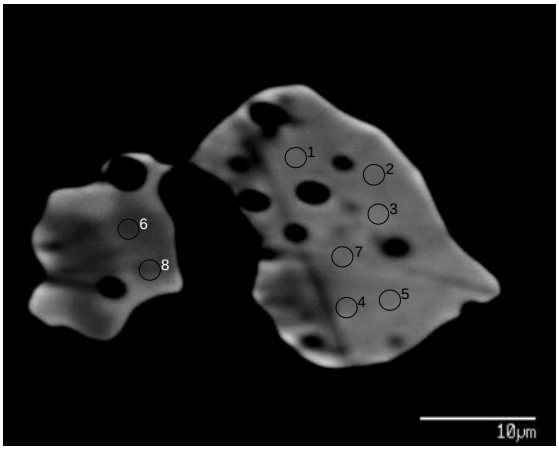


R98-10_mz1

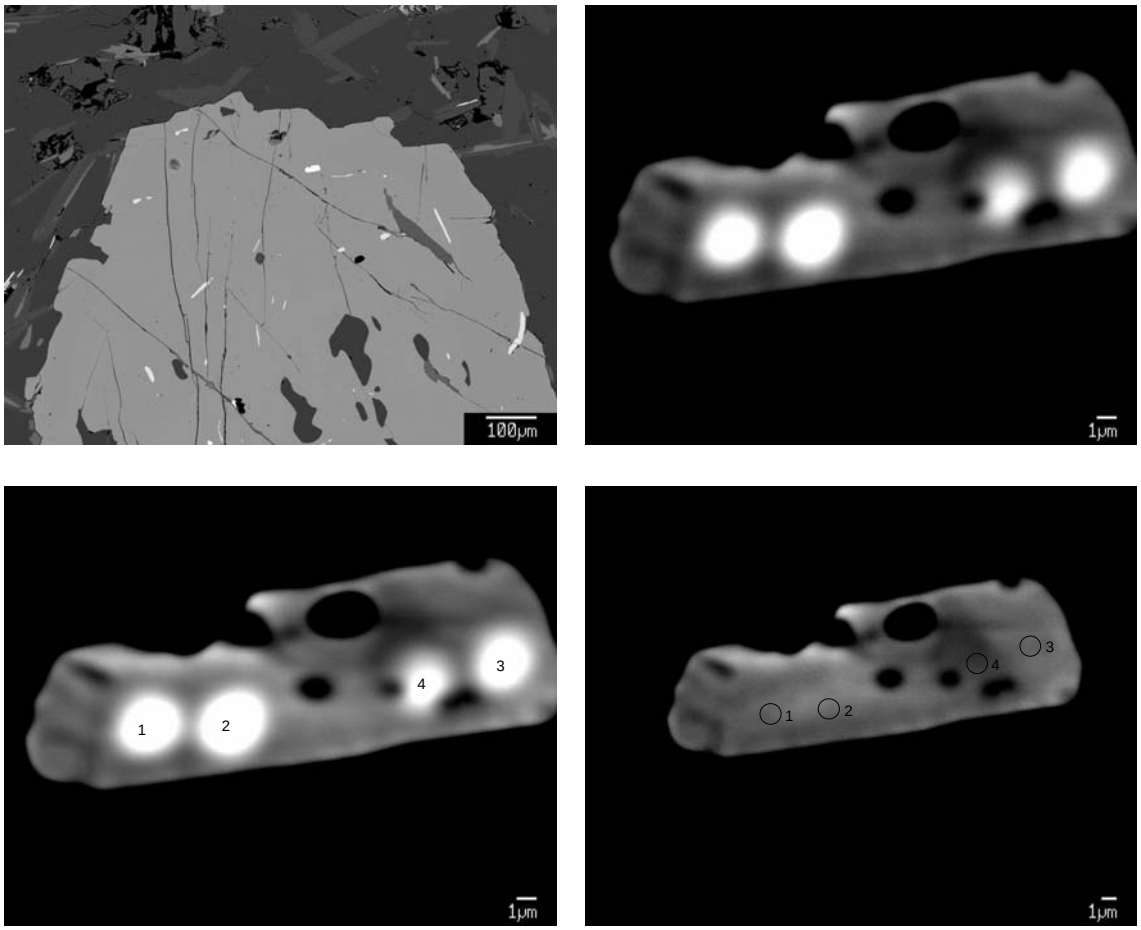




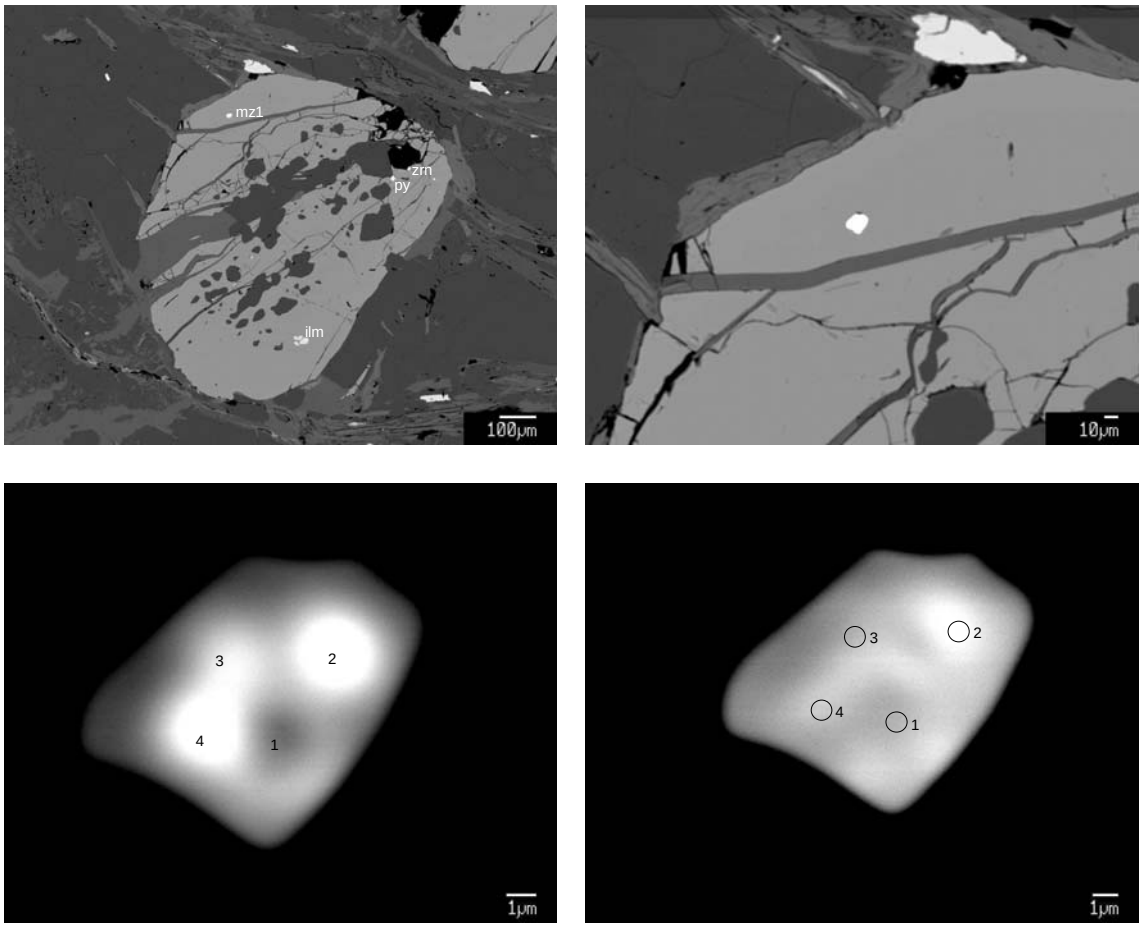




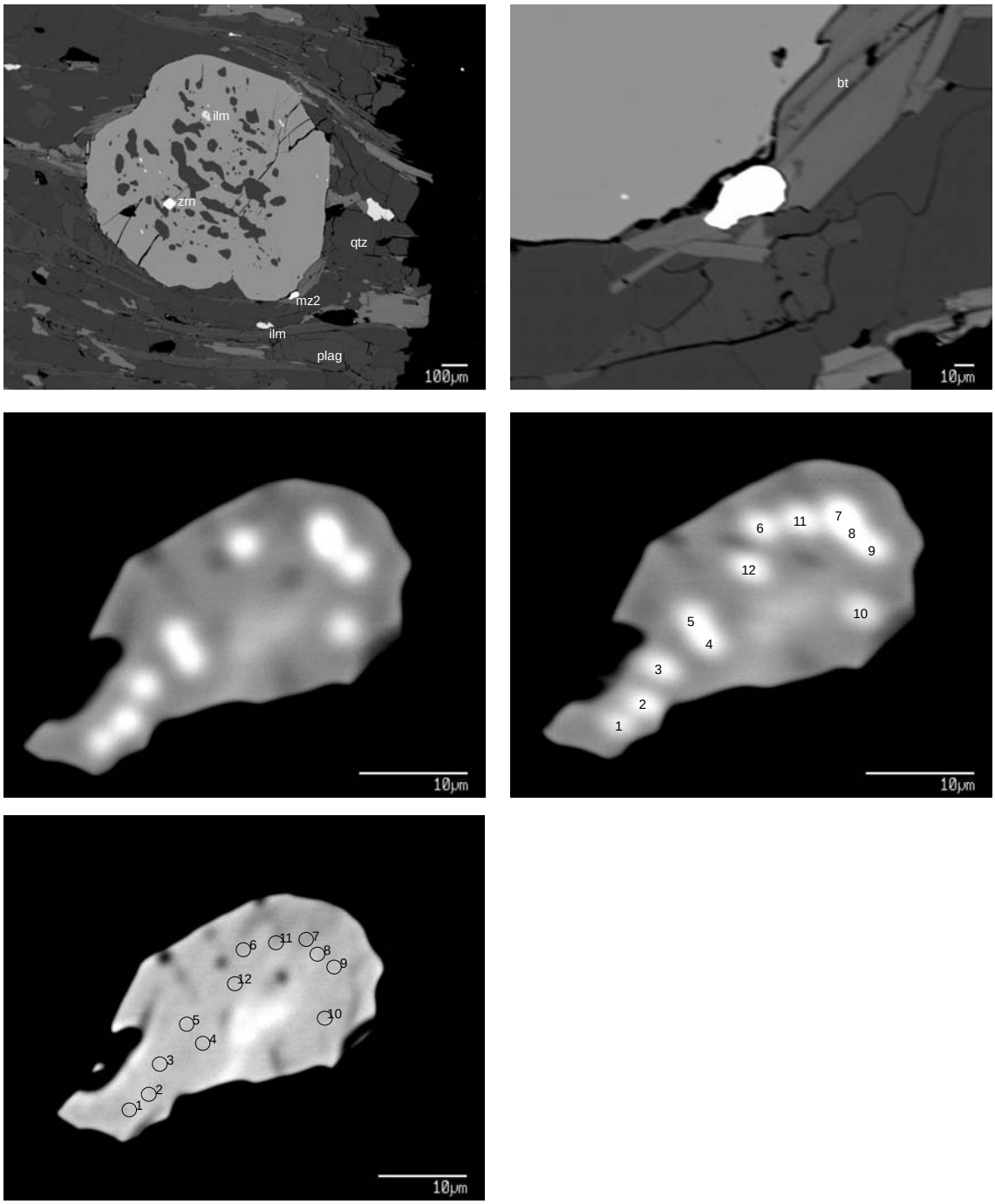
R98-10-mz2



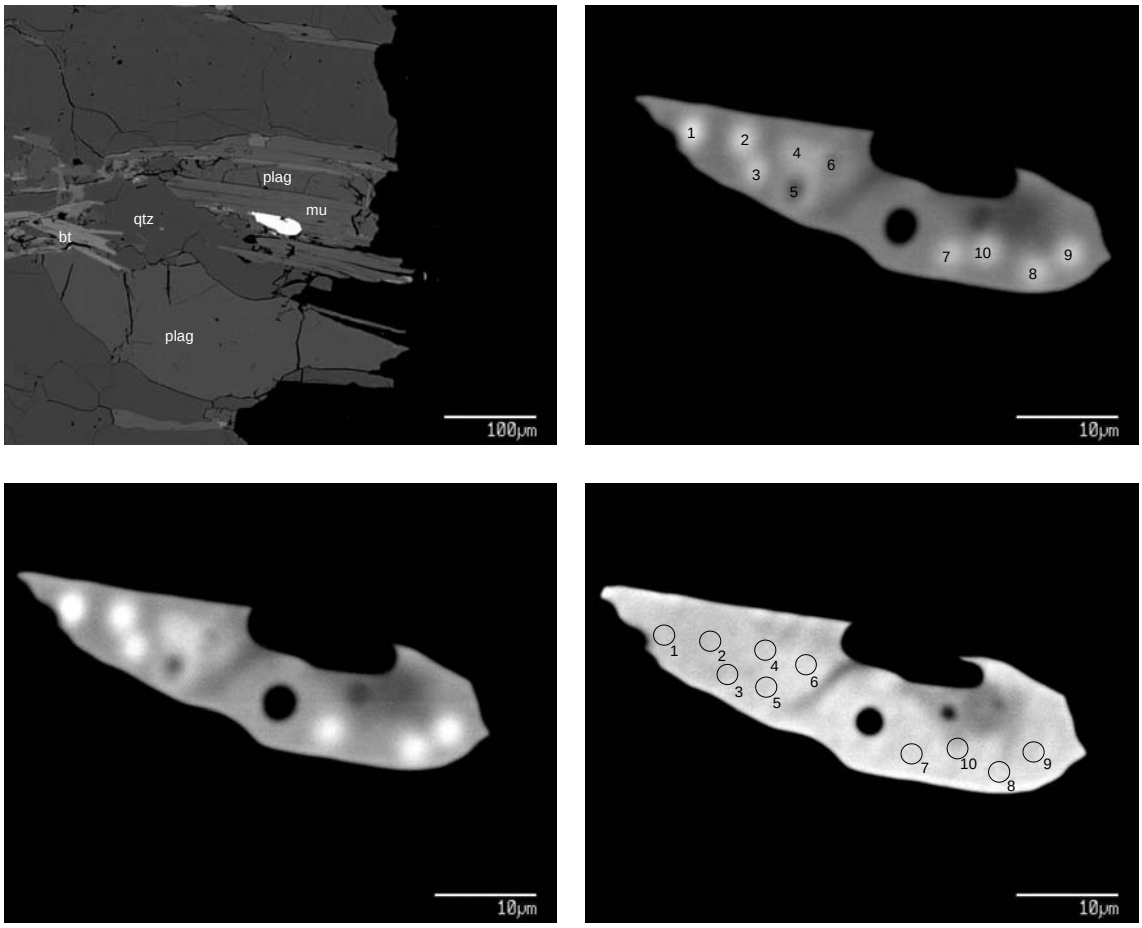
R98-10-mz3



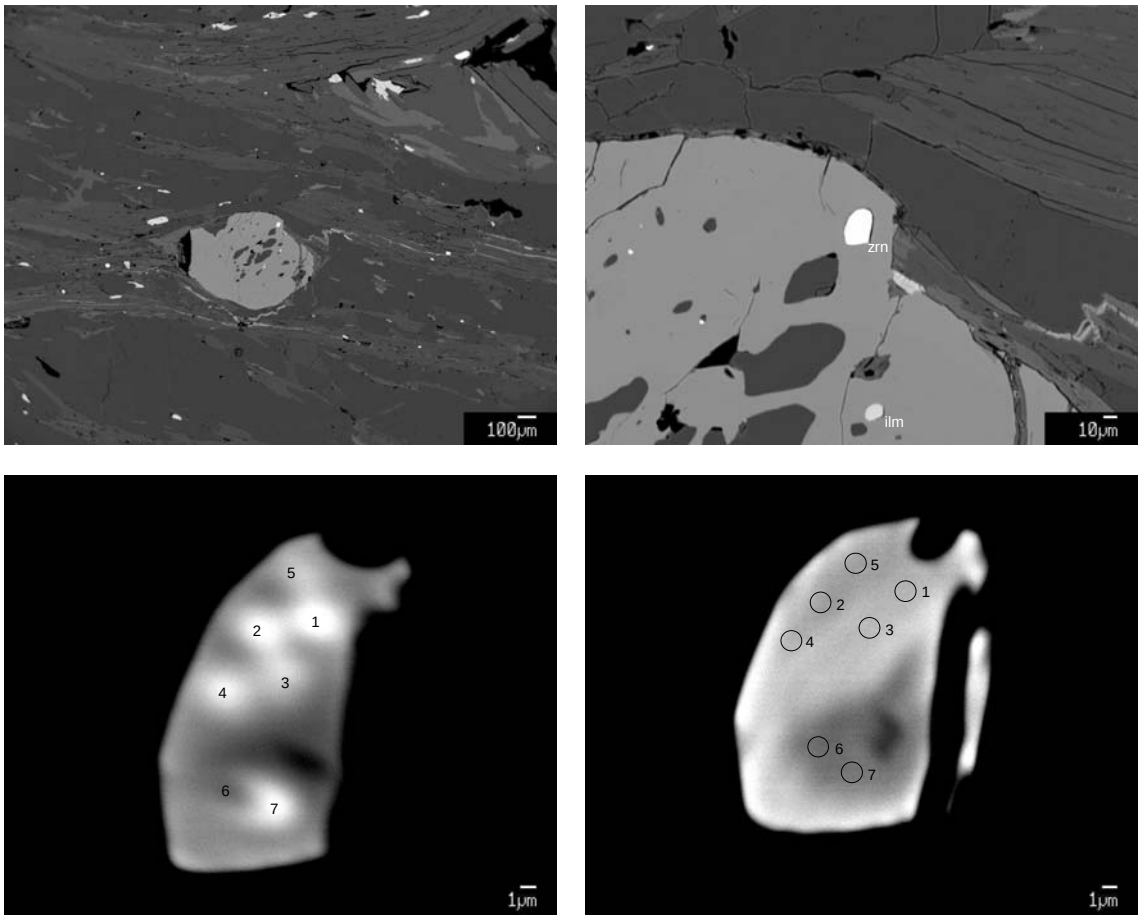
R109-0a-mz1


ilm
zrn
qtz
mz2
ilm
plag
100µm
bt
10µm
10µm
6
11
7
8
9
12
10
5
4
3
2
1
10µm
6
11
7
8
9
12
10
5
4
3
2
1
10µm

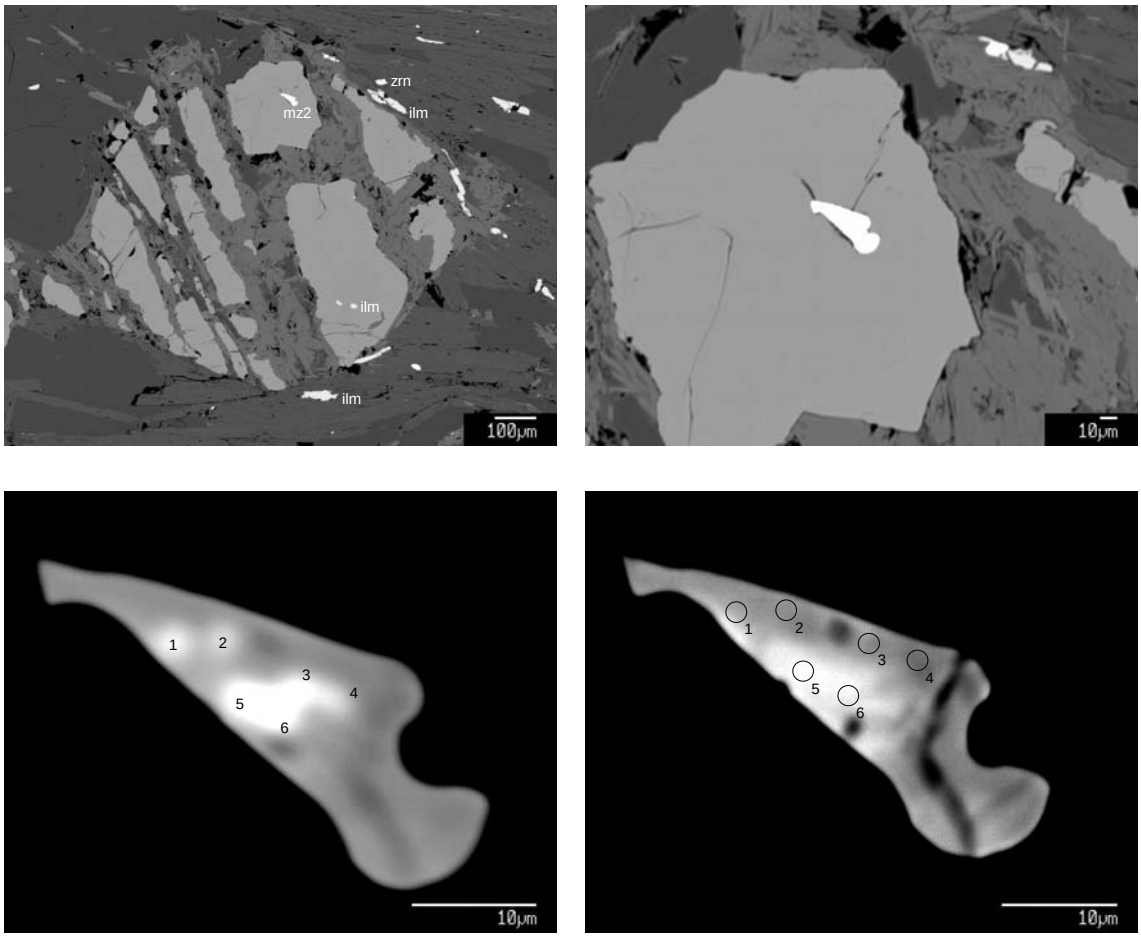
R109-0a-mz2


plag
mu
qtz
bt
plag
100µm
1
2
3
4
5
6
7
8
9
10
10µm
10µm
1
2
3
4
5
6
7
8
9
10
10µm

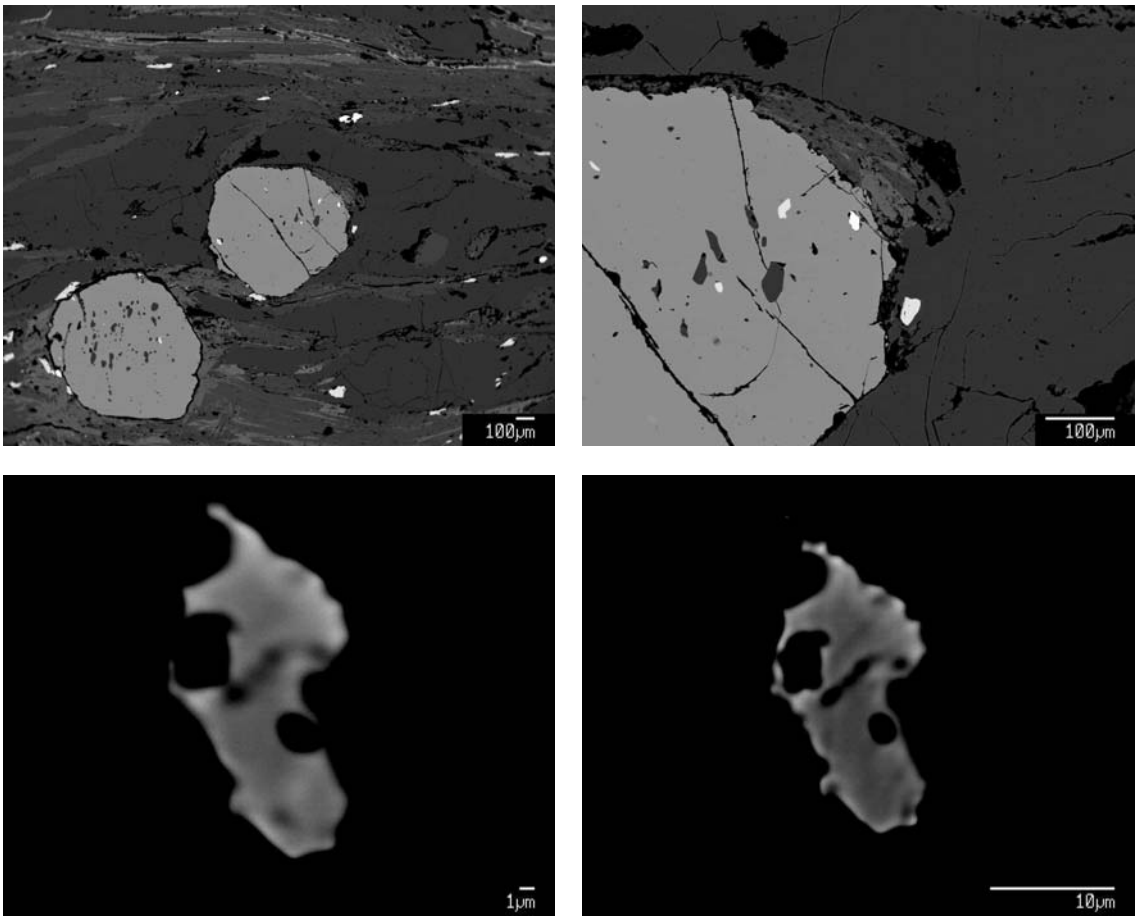
R109-0a-mz3



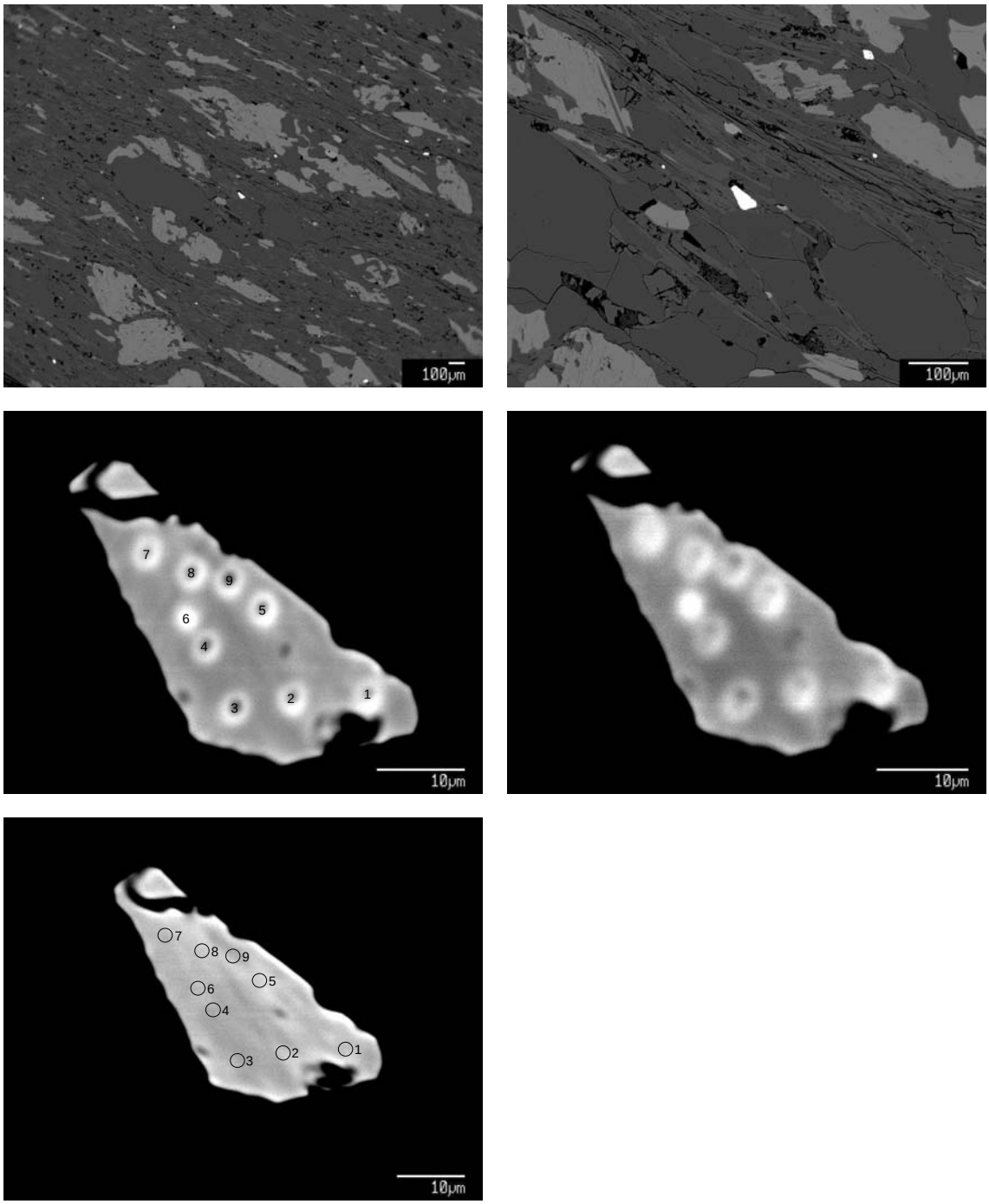
R109-0b-mz1



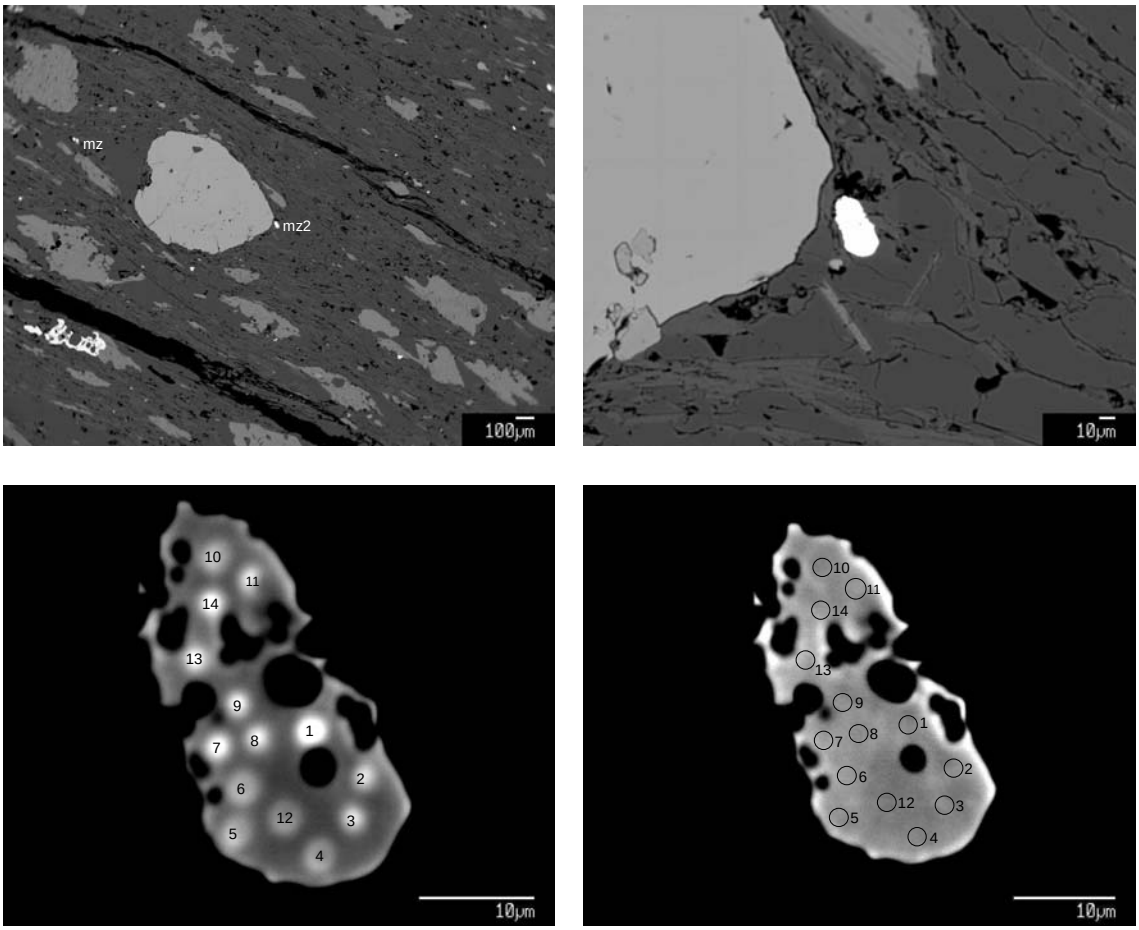
R109-0b-mz2



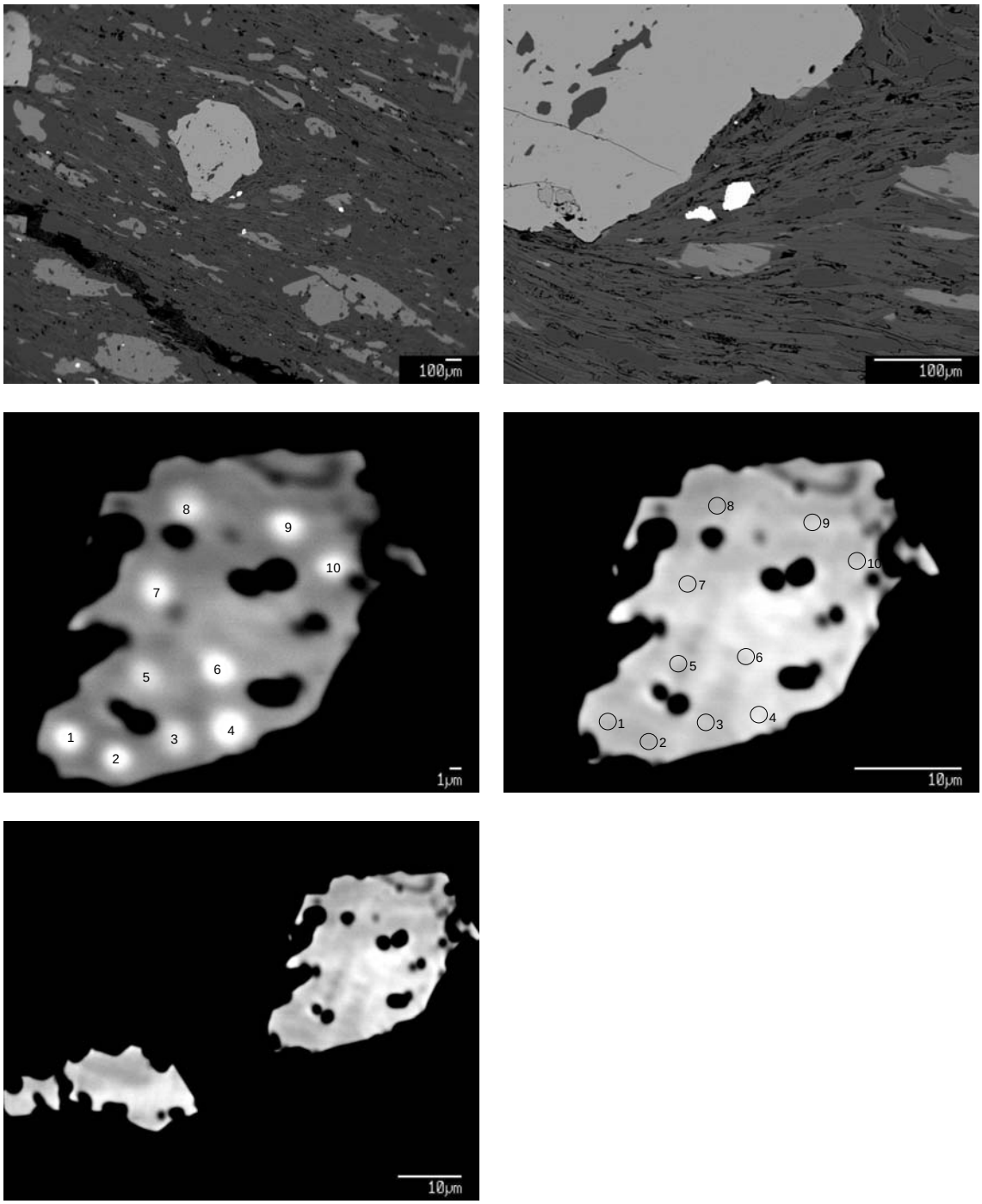
R109-0-mz1



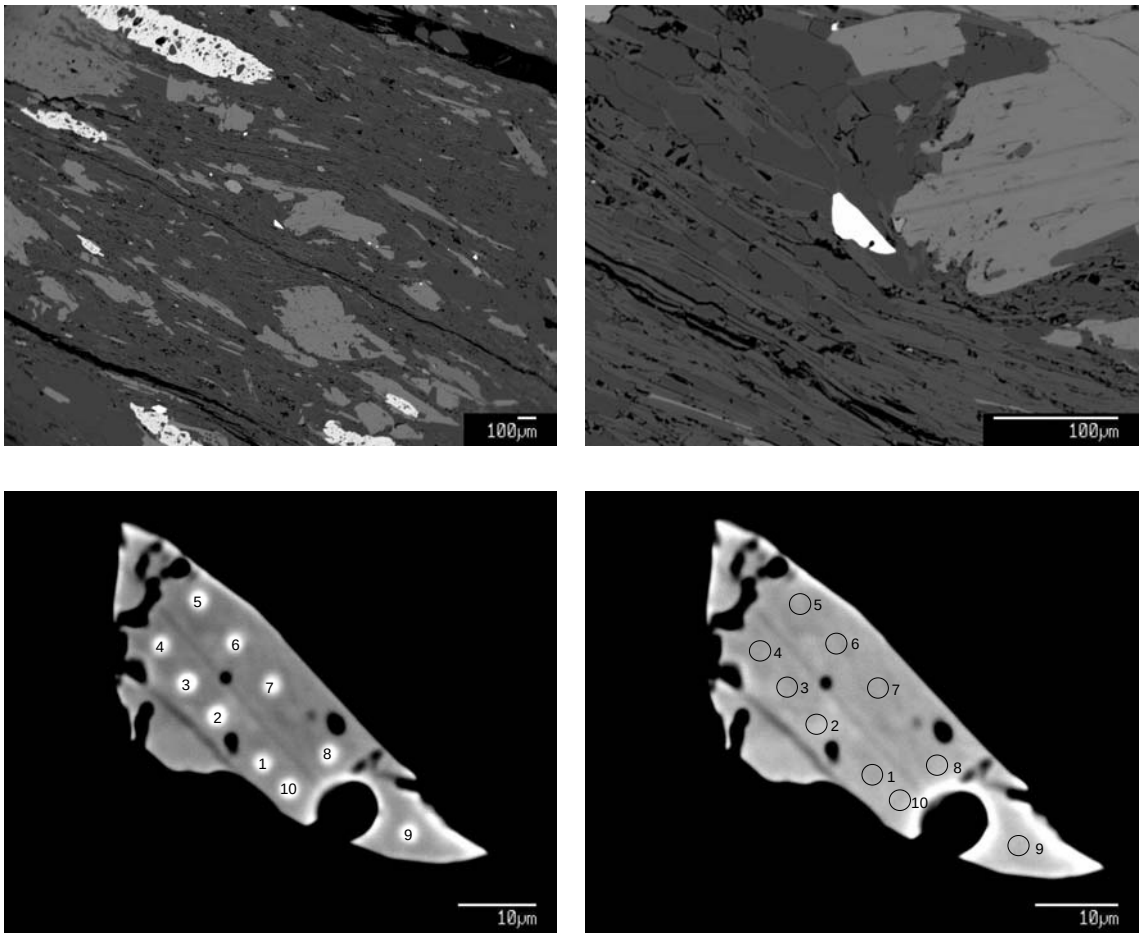
R225-150-mz1


mz
mz2
100µm
10µm
10
11
14
13
9
8
1
7
2
6
12
3
5
4
10µm
10
11
14
13
9
1
7
8
2
6
12
3
5
4
10µm

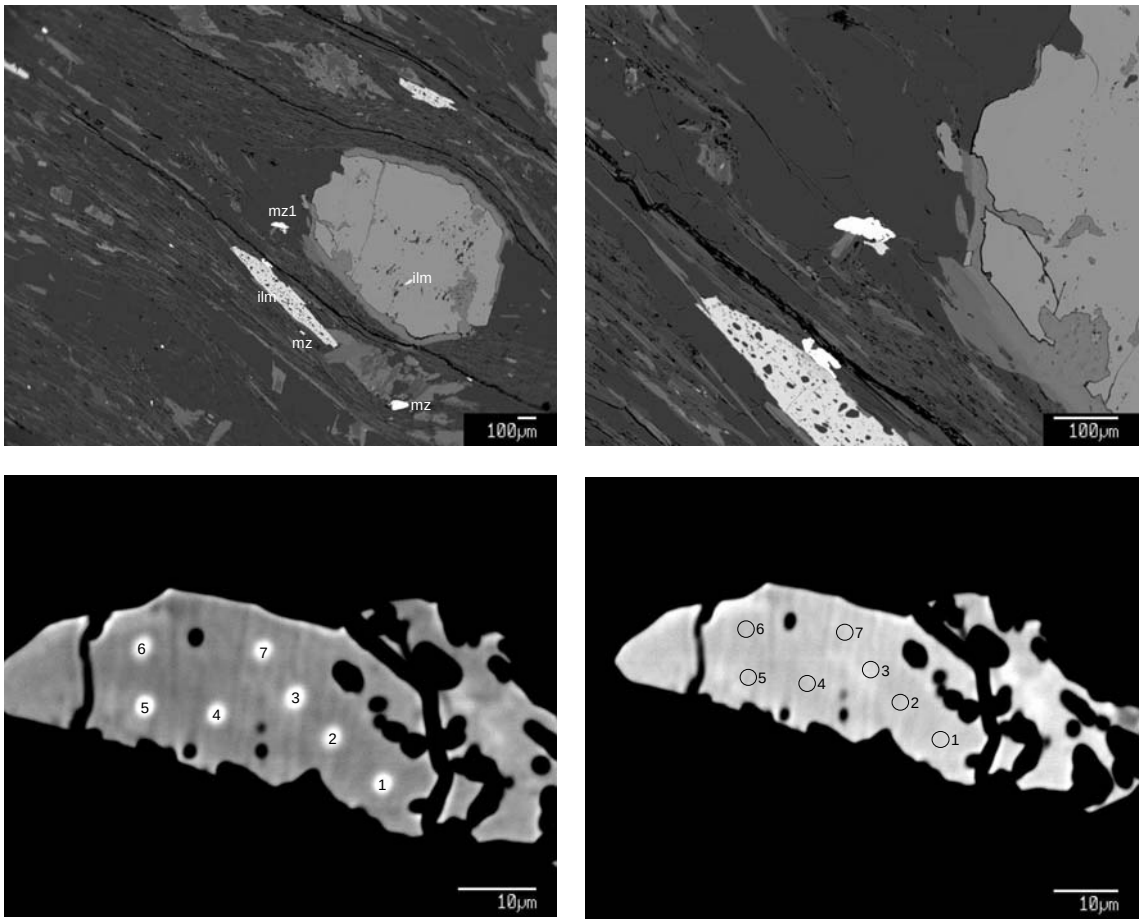
R225-150-mz2



R225-150-mz3



R225-150-mz4



R226-120-mz1

Appendix B: Monazite Electron Microprobe Data

Mass percent **Group : mona2004** **Sample : samri061005**

No.	SiO2	P2O5	CaO	Y2O3	La2O3	Ce2O3	Pr2O3	Nd2O3	Sm2O3	Gd2O3	Dy2O3	PbO	ThO2	UO2	Total
managot1	2.0051	27.3700	0.8981	0.2015	14.4500	28.9100	2.9800	9.6200	0.9831	0.4709	0.0948	0.2925	11.6700	0.2087	100.2335
managot2	1.9911	27.3900	0.9161	0.1980	14.3400	28.8500	2.9800	9.5800	0.9724	0.4440	0.0527	0.2907	11.7100	0.2036	99.9976
managot3	1.9950	27.4400	0.9091	0.2059	14.2800	28.7200	2.9900	9.7100	0.9522	0.4770	0.0901	0.2975	11.7800	0.2096	100.1358
managot4	1.9893	27.4200	0.9055	0.2044	14.4300	28.8800	2.9500	9.6400	0.9101	0.4160	0.0773	0.2842	11.7500	0.1971	100.1332
managot5	1.9936	27.4100	0.9117	0.1964	14.4100	28.8800	3.0000	9.7000	0.9901	0.3911	0.0801	0.2887	11.6900	0.2138	100.2343
R40-0-mz1-1	0.5586	30.8100	1.1714	0.3420	13.8000	28.6200	3.2400	11.8400	2.0600	1.4700	0.2455	0.1120	4.7200	0.9750	99.9977
R40-0-mz1-2	0.1625	30.6300	1.1504	0.4440	13.8400	28.6100	3.1400	12.1700	2.1000	1.5600	0.3102	0.1068	4.4800	1.0237	99.7597
R40-0-mz1-3	0.1686	30.5900	1.1810	0.4220	13.6900	28.6900	3.2300	12.1300	2.1000	1.5900	0.2451	0.1055	4.6700	1.0178	99.8633
R40-0-mz1-4	0.2650	30.6500	1.0516	1.0673	13.7200	28.3900	3.1800	12.0600	2.0800	1.7500	0.4866	0.0907	4.7700	0.6629	100.2620
R40-0-mz1-5	0.1629	30.7900	0.6596	1.1254	14.4500	29.8600	3.2300	12.3700	2.1000	1.5600	0.5281	0.0597	2.7100	0.5551	100.1857
R40-0-mz1-6	0.1823	30.6600	0.9248	0.3762	14.7200	29.9600	3.2600	12.1700	2.0200	1.3300	0.2699	0.0821	3.7500	0.6604	100.3925
R40-0-mz1-7	0.2623	30.6100	1.0581	1.0156	13.9800	28.5900	3.1800	11.8700	2.0900	1.6400	0.5152	0.1011	4.6200	0.6911	100.2600
R40-0-mz2-1	0.1773	30.6800	1.1588	0.3684	14.1500	28.8700	3.2500	12.0000	2.1300	1.5200	0.3263	0.1077	4.5600	1.0702	100.4008
R40-0-mz2-2	0.1911	30.7200	1.1627	0.3835	14.1500	28.9100	3.2600	12.1400	2.1200	1.5100	0.3008	0.1125	4.5300	1.0663	100.5890
R40-0-mz2-3	0.1721	30.6800	1.2141	0.3777	14.2400	28.6400	3.1700	12.0000	2.1500	1.5000	0.2909	0.1172	4.7900	1.1167	100.4924
R40-0-mz2-4	0.1749	30.6300	1.1391	0.3760	14.3800	28.8600	3.1300	11.7000	2.0700	1.4000	0.2883	0.1035	4.5200	1.0667	99.8705
R40-0-mz2-5	0.1735	30.7400	1.1008	0.3834	14.2500	29.3000	3.2700	11.9700	2.0600	1.4600	0.2553	0.1003	4.2300	1.0382	100.3615
R40-0-mz2-6	0.1642	30.7300	1.1451	0.3626	14.0300	29.1700	3.2100	12.1100	2.1000	1.4800	0.2047	0.1014	4.4900	1.0754	100.4052
R40-0-mz2-7	0.2052	30.6600	1.0766	0.6520	14.3200	28.8900	3.2100	11.9300	2.0500	1.5100	0.3809	0.1160	4.2500	1.0894	100.3720
R40-0-mz2-8	0.1811	30.7200	1.2084	0.3903	14.1600	28.8800	3.2200	11.9000	2.0000	1.4200	0.2713	0.1159	4.7300	1.1108	100.3411
R40-0-mz3-1	0.1542	30.2900	1.2270	0.3481	14.2300	29.0400	3.2100	12.1000	2.0500	1.5200	0.2624	0.1137	4.9700	1.0069	100.5223
R40-0-mz3-2	0.1603	30.3100	1.1387	0.3288	14.3000	29.0800	3.2400	11.9900	2.0500	1.5400	0.2620	0.1091	4.6400	1.0092	100.1581
R40-0-mz3-3	0.1560	30.3300	1.0810	0.2974	14.4100	29.3500	3.2000	12.1300	2.1500	1.5000	0.2440	0.1021	4.3900	0.9420	100.2826
R40-0-mz3-4	0.1448	30.4600	1.1118	0.3361	14.4800	29.1700	3.2200	11.8700	2.0800	1.4600	0.2324	0.0970	4.4100	0.9911	100.0632
R40-0-mz3-5	0.1391	30.4400	1.0676	0.2682	14.3500	29.6500	3.2300	11.9600	2.0900	1.5100	0.2289	0.0994	4.2400	0.9964	100.2696
R40-0-mz3-6	0.1300	30.5000	1.0986	0.3684	14.0600	29.1300	3.2100	12.1400	2.1400	1.5900	0.2413	0.1068	4.2000	1.0890	100.0041
R40-0-mz3-7	0.1385	30.4100	1.0924	0.3693	14.2900	29.0700	3.1500	12.0800	2.1500	1.5300	0.2415	0.1108	4.1500	1.1132	99.8957
R40-0-mz3-8	0.1420	30.3200	1.0918	0.3506	14.2500	29.3500	3.1500	12.0200	2.1000	1.4800	0.2048	0.1074	4.3000	1.0129	99.8795

k-ratio errors (1-sigma %)

No.	Si	P	Ca	Y	La	Ce	Pr	Nd	Sm	Gd	Dy	Pb	Th	U
managot1	0.5000	0.2419	0.8179	2.3835	0.6401	0.5250	1.3753	0.8562	2.5105	5.6097	34.6308	1.7515	0.3821	3.0865
managot2	0.5000	0.2419	0.8081	2.4135	0.6401	0.5250	1.3753	0.8654	2.5303	5.9492	62.0405	1.7614	0.3821	3.1364
managot3	0.5000	0.2419	0.8081	2.3137	0.6401	0.5250	1.3753	0.8562	2.5898	5.5398	36.2708	1.7316	0.3821	3.0665
managot4	0.5000	0.2419	0.8179	2.3336	0.6401	0.5250	1.3850	0.8562	2.7090	6.3686	42.4207	1.8011	0.3821	3.2062
managot5	0.5000	0.2419	0.8081	2.4335	0.6401	0.5250	1.3753	0.8562	2.4708	6.7081	40.7207	1.7614	0.3821	3.0166
R40-0-mz1-1	1.1883	0.2419	0.6815	1.4857	0.6488	0.5250	1.2788	0.7649	1.3194	1.9383	13.0822	4.0449	0.5284	0.9513
R40-0-mz1-2	3.2330	0.2419	0.6912	1.1573	0.6488	0.5250	1.3173	0.7558	1.3000	1.8398	10.5427	4.2247	0.5459	0.9220
R40-0-mz1-3	3.1331	0.2419	0.6815	1.2170	0.6488	0.5250	1.2884	0.7558	1.3097	1.8202	13.2622	4.2647	0.5371	0.9317
R40-0-mz1-4	2.1246	0.2419	0.7398	0.5749	0.6488	0.5250	1.2981	0.7558	1.3194	1.6729	6.8242	4.6943	0.5284	1.3054
R40-0-mz1-5	3.2730	0.2419	0.9749	0.5554	0.6313	0.5186	1.2884	0.7469	1.3097	1.8398	6.2646	6.7630	0.7001	1.5430
R40-0-mz1-6	2.9433	0.2419	0.7885	1.3463	0.6313	0.5186	1.2788	0.7558	1.3388	2.1258	12.0724	5.3937	0.5903	1.3153
R40-0-mz1-7	2.1346	0.2419	0.7301	0.5944	0.6401	0.5250	1.3077	0.7649	1.3097	1.7612	6.3945	4.2847	0.5371	1.2659
R40-0-mz2-1	2.9933	0.2419	0.6912	1.3762	0.6401	0.5250	1.2884	0.7649	1.2903	1.8890	9.9629	4.2048	0.5371	0.8927
R40-0-mz2-2	2.7935	0.2419	0.6912	1.3264	0.6401	0.5250	1.2788	0.7558	1.2903	1.8989	10.7927	4.0350	0.5459	0.8927
R40-0-mz2-3	3.0632	0.2419	0.6719	1.3463	0.6401	0.5250	1.3077	0.7558	1.2709	1.8989	11.1426	3.9051	0.5284	0.8538
R40-0-mz2-4	3.0332	0.2419	0.7009	1.3463	0.6313	0.5250	1.3173	0.7739	1.3097	2.0270	11.2226	4.3746	0.5459	0.8927
R40-0-mz2-5	3.0432	0.2419	0.7106	1.3264	0.6401	0.5250	1.2788	0.7649	1.3194	1.9482	12.7223	4.4845	0.5636	0.9122
R40-0-mz2-6	3.2330	0.2419	0.7009	1.3961	0.6401	0.5250	1.2981	0.7558	1.3097	1.9383	15.8718	4.4545	0.5459	0.8829
R40-0-mz2-7	2.6337	0.2419	0.7203	0.8401	0.6401	0.5250	1.2884	0.7649	1.3291	1.8890	8.5734	3.9051	0.5547	0.8829
R40-0-mz2-8	2.9234	0.2419	0.6719	1.2965	0.6401	0.5250	1.2884	0.7649	1.3582	1.9876	11.9324	3.9251	0.5284	0.8635
R40-0-mz3-1	3.4329	0.2419	0.6719	1.4558	0.6401	0.5250	1.2884	0.7558	1.3291	1.8792	12.3823	3.9850	0.5197	0.9317
R40-0-mz3-2	3.3030	0.2419	0.7009	1.5255	0.6401	0.5250	1.2788	0.7649	1.3291	1.8694	12.4023	4.1548	0.5371	0.9220
R40-0-mz3-3	3.3929	0.2419	0.7203	1.6751	0.6313	0.5250	1.2981	0.7558	1.2709	1.8989	13.2922	4.4145	0.5459	0.9806
R40-0-mz3-4	3.6127	0.2419	0.7106	1.4957	0.6313	0.5250	1.2884	0.7649	1.3097	1.9383	13.8821	4.6443	0.5459	0.9415
R40-0-mz3-5	3.7526	0.2419	0.7203	1.8446	0.6401	0.5186	1.2884	0.7558	1.3000	1.8792	14.1220	4.5544	0.5547	0.9415
R40-0-mz3-6	3.9825	0.2419	0.7106	1.3861	0.6401	0.5250	1.2884	0.7558	1.2806	1.8005	13.3622	4.2647	0.5636	0.8732
R40-0-mz3-7	3.7626	0.2419	0.7106	1.3861	0.6401	0.5250	1.3077	0.7558	1.2709	1.8694	13.4121	4.1049	0.5636	0.8635
R40-0-mz3-8	3.7026	0.2419	0.7106	1.4359	0.6401	0.5250	1.3173	0.7558	1.3000	1.9284	15.7818	4.1948	0.5547	0.9220

Mass percent **Group : mona2004** **Sample : samri061005**

No.	SiO2	P2O5	CaO	Y2O3	La2O3	Ce2O3	Pr2O3	Nd2O3	Sm2O3	Gd2O3	Dy2O3	PbO	ThO2	UO2	Total
managot1	2.0051	27.3700	0.8981	0.2015	14.4500	28.9100	2.9800	9.6200	0.9831	0.4709	0.0948	0.2925	11.6700	0.2087	100.2335
managot2	1.9911	27.3900	0.9161	0.1980	14.3400	28.8500	2.9800	9.5800	0.9724	0.4440	0.0527	0.2907	11.7100	0.2036	99.9976
managot3	1.9950	27.4400	0.9091	0.2059	14.2800	28.7200	2.9900	9.7100	0.9522	0.4770	0.0901	0.2975	11.7800	0.2096	100.1358
managot4	1.9893	27.4200	0.9055	0.2044	14.4300	28.8800	2.9500	9.6400	0.9101	0.4160	0.0773	0.2842	11.7500	0.1971	100.1332
managot5	1.9936	27.4100	0.9117	0.1964	14.4100	28.8800	3.0000	9.7000	0.9901	0.3911	0.0801	0.2887	11.6900	0.2138	100.2343
R46-0-mz1a-1	0.1658	30.6200	0.9227	1.0819	14.1800	29.1800	3.2000	12.2300	2.1200	1.6100	0.4938	0.0901	3.9200	0.7971	100.6439
R46-0-mz1a-2	0.1931	30.6700	1.0316	0.5919	14.1100	29.1500	3.2500	12.0400	2.0100	1.5700	0.3088	0.0843	4.1200	0.8382	99.9989
R46-0-mz1a-3	0.1329	30.8700	0.6155	1.7500	14.4000	29.3300	3.2900	12.2500	2.1000	1.6700	0.5987	0.0571	2.3200	0.5680	99.9785
R46-0-mz1b-1	0.1628	30.6700	1.0103	0.9548	14.9000	28.8600	3.1800	11.8000	1.9700	1.6000	0.4256	0.0880	3.9200	0.8848	100.4581
R46-0-mz1b-2	0.1619	30.5100	1.0575	0.9146	14.0800	29.0400	3.1800	12.2200	2.1300	1.5900	0.4287	0.0959	4.0900	0.9990	100.5302
R46-0-mz1b-3	0.1307	30.6700	0.8546	1.2900	14.1200	29.3800	3.2600	12.3700	2.1000	1.5900	0.5042	0.0810	3.3500	0.7572	100.4877
R46-0-mz1b-4	0.1594	30.6000	0.8697	1.5500	14.0700	28.8700	3.2000	12.2200	2.0800	1.7600	0.6089	0.0818	3.4600	0.8313	100.3935
R46-0-mz1b-5	0.1744	30.6700	0.7629	1.8800	14.4700	29.3300	3.2300	12.1000	2.0700	1.6500	0.6703	0.0721	3.0900	0.6716	100.8734
R46-0-mz2-1	0.2229	30.6400	1.0083	1.9300	13.7600	28.1800	3.1600	11.7100	2.0800	1.7300	0.7413	0.0958	4.6700	0.6344	100.6056
R46-0-mz2-2	0.1801	30.6600	0.7903	1.8000	14.0800	28.7500	3.2300	12.0200	2.1400	1.8000	0.7141	0.0636	3.5800	0.5692	100.4119
R46-0-mz2-3	0.2207	30.3900	0.9734	1.7500	13.8700	28.1600	3.0900	11.7400	2.0200	1.7500	0.6893	0.0853	4.4000	0.6200	99.7985
R46-0-mz2-4	0.1726	30.5600	0.7702	1.7500	14.2300	29.1600	3.1900	11.8900	2.0500	1.6700	0.6656	0.0700	3.5600	0.4803	100.2530
R46-0-mz2-5	0.3234	30.3900	1.0876	1.7300	13.7000	28.0800	3.1100	11.6800	1.9900	1.6400	0.6068	0.0946	5.5600	0.5511	100.5908
R46-0-mz2-6	0.2879	30.4200	1.0182	1.7500	13.7900	28.2500	3.1500	11.8000	2.0100	1.6500	0.6434	0.0974	5.0400	0.5188	100.4698

Mass percent **Group : mona2004** **Sample : NL110705** original label was R46-0-mz1, but changed here to mz3

No.	SiO2	P2O5	CaO	Y2O3	La2O3	Ce2O3	Pr2O3	Nd2O3	Sm2O3	Gd2O3	Dy2O3	PbO	ThO2	UO2	Total
R46-0-mz3-1	0.2528	30.7200	1.2315	1.8500	13.5800	27.1000	3.0000	11.5500	2.0200	1.8600	0.8648	0.1072	5.4300	0.7890	100.4044
R46-0-mz3-2	0.2648	30.7600	1.2219	1.8100	13.3100	26.9500	2.9800	11.5400	1.9600	1.8900	0.7670	0.1008	5.6300	0.7545	99.9895
R46-0-mz3-3	0.2849	30.6100	1.1759	1.7900	13.3400	27.2500	3.1100	11.6100	1.9800	1.9700	0.8319	0.0956	5.5000	0.7278	100.3254
R46-0-mz3-4	0.4069	30.4300	1.5600	1.8200	12.7900	25.9800	2.9200	11.2300	1.9300	1.9800	0.7388	0.1384	7.5900	0.8089	100.3871
R46-0-mz3-5	0.4230	30.2500	1.4400	1.6800	13.1200	26.5800	3.0000	11.3200	1.8800	1.9500	0.7501	0.1376	7.1500	0.7486	100.4894
R46-0-mz3-6	0.2344	30.6800	1.1129	1.8900	13.6500	27.4400	3.0300	11.6700	2.0800	1.9100	0.8478	0.0913	4.7600	0.7364	100.1774
R46-0-mz3-7	0.2872	30.1900	1.3691	1.6000	13.1400	26.5500	2.9900	11.4600	1.9700	1.9200	0.7088	0.1121	5.9800	0.9176	99.2464

k-ratio errors (1-sigma %)

No.	Si	P	Ca	Y	La	Ce	Pr	Nd	Sm	Gd	Dy	Pb	Th	U
managot1	0.5000	0.2419	0.8179	2.3835	0.6401	0.5250	1.3753	0.8562	2.5105	5.6097	34.6308	1.7515	0.3821	3.0865
managot2	0.5000	0.2419	0.8081	2.4135	0.6401	0.5250	1.3753	0.8654	2.5303	5.9492	62.0405	1.7614	0.3821	3.1364
managot3	0.5000	0.2419	0.8081	2.3137	0.6401	0.5250	1.3753	0.8562	2.5898	5.5398	36.2708	1.7316	0.3821	3.0665
managot4	0.5000	0.2419	0.8179	2.3336	0.6401	0.5250	1.3850	0.8562	2.7090	6.3686	42.4207	1.8011	0.3821	3.2062
managot5	0.5000	0.2419	0.8081	2.4335	0.6401	0.5250	1.3753	0.8562	2.4708	6.7081	40.7207	1.7614	0.3821	3.0166
R46-0-mz1a-1	3.1631	0.2419	0.7885	0.5652	0.6401	0.5250	1.2981	0.7558	1.2903	1.7907	6.6743	4.7542	0.5814	1.1279
R46-0-mz1a-2	2.8235	0.2419	0.7301	0.9291	0.6401	0.5250	1.2788	0.7558	1.3388	1.8300	10.5627	5.1539	0.5636	1.0787
R46-0-mz1a-3	3.9425	0.2419	1.0143	0.4111	0.6313	0.5250	1.2596	0.7469	1.2903	1.7219	5.5052	6.6830	0.7655	1.5034
R46-0-mz1b-1	3.2330	0.2419	0.7495	0.6237	0.6227	0.5250	1.2981	0.7649	1.3680	1.8005	7.7437	4.8641	0.5814	1.0394
R46-0-mz1b-2	3.2230	0.2419	0.7301	0.6433	0.6401	0.5250	1.3077	0.7558	1.2903	1.8202	7.6738	4.5344	0.5636	0.9415
R46-0-mz1b-3	3.9625	0.2419	0.8276	0.4973	0.6401	0.5250	1.2884	0.7469	1.3000	1.8202	6.5844	5.1439	0.6265	1.1771
R46-0-mz1b-4	3.2730	0.2419	0.8179	0.4397	0.6401	0.5250	1.2981	0.7558	1.3097	1.6533	5.4653	5.0340	0.6174	1.0885
R46-0-mz1b-5	3.0532	0.2419	0.8865	0.3828	0.6313	0.5250	1.2884	0.7558	1.3194	1.7612	4.9858	5.4537	0.6539	1.3054
R46-0-mz2-1	2.4440	0.2419	0.7495	0.3828	0.6488	0.5250	1.3077	0.7739	1.3097	1.6827	4.4964	4.2347	0.5371	1.3548
R46-0-mz2-2	2.9333	0.2419	0.8668	0.4016	0.6401	0.5250	1.2884	0.7558	1.2806	1.6141	4.6562	6.0233	0.6084	1.4835
R46-0-mz2-3	2.4640	0.2419	0.7690	0.4016	0.6488	0.5315	1.3270	0.7649	1.3388	1.6631	4.8060	4.7242	0.5459	1.3746
R46-0-mz2-4	3.0732	0.2419	0.8865	0.4016	0.6401	0.5250	1.2981	0.7649	1.3291	1.7219	4.9458	5.5836	0.6084	1.7217
R46-0-mz2-5	1.7955	0.2419	0.7203	0.4111	0.6488	0.5315	1.3173	0.7739	1.3485	1.7514	5.4553	4.2747	0.4940	1.5034
R46-0-mz2-6	1.9949	0.2419	0.7495	0.4016	0.6488	0.5250	1.3077	0.7649	1.3388	1.7514	5.1556	4.2147	0.5197	1.6025

k-ratio errors (1-sigma %)

No.	Si	P	Ca	Y	La	Ce	Pr	Nd	Sm	Gd	Dy	Pb	Th	U
R46-0-mz3-1	2.2138	0.2419	0.6841	0.3922	0.6441	0.4420	1.3534	0.7788	1.3657	1.6219	3.9168	3.8852	0.5111	1.1476
R46-0-mz3-2	2.1839	0.2419	0.6841	0.4016	0.6530	0.4420	1.3534	0.7788	1.3851	1.5925	4.3760	4.0649	0.5025	1.1771
R46-0-mz3-3	2.0242	0.2419	0.7034	0.4016	0.6530	0.4420	1.3147	0.7788	1.3754	1.5435	4.0765	4.2447	0.5025	1.2264
R46-0-mz3-4	1.4957	0.2419	0.6073	0.4016	0.6619	0.4500	1.3922	0.7879	1.4144	1.5435	4.5658	3.0865	0.4441	1.1082
R46-0-mz3-5	1.4558	0.2419	0.6264	0.4206	0.6530	0.4420	1.3534	0.7879	1.4534	1.5631	4.4959	3.1264	0.4522	1.1771
R46-0-mz3-6	2.3636	0.2419	0.7228	0.3922	0.6441	0.4420	1.3437	0.7697	1.3267	1.5827	3.9966	4.4445	0.5371	1.2166
R46-0-mz3-7	1.9942	0.2419	0.6456	0.4301	0.6530	0.4500	1.3534	0.7788	1.3949	1.5827	4.7456	3.7553	0.4855	1.0100

Mass percent Group : mona2004 Sample : ben190805

No.	SiO2	P2O5	CaO	Y2O3	La2O3	Ce2O3	Pr2O3	Nd2O3	Sm2O3	Gd2O3	Dy2O3	PbO	ThO2	UO2	Total
managot1	1.9927	27.0900	0.8949	0.1974	14.1000	29.1600	2.9900	9.6900	0.9297	0.4509	0.0348	0.2861	11.6300	0.2033	99.7283
managot2	2.0085	27.1200	0.8915	0.1911	14.0200	29.0500	2.8900	9.5400	0.9926	0.4395	0.0658	0.2947	11.5200	0.1960	99.2976
managot3	1.9799	27.1700	0.8847	0.1982	14.0400	29.1200	2.9400	9.6800	0.9430	0.4860	0.0588	0.2900	11.5600	0.2109	99.6397
managot4	1.9839	27.2000	0.8835	0.1961	14.2200	28.9400	2.9800	9.6000	0.9886	0.4560	0.1491	0.2871	11.6400	0.2148	99.8178
managot5	1.9803	27.2200	0.8799	0.1912	14.2000	29.1100	2.9100	9.6700	0.9546	0.4722	0.0929	0.2967	11.5600	0.2087	99.8246
R50-70-mz1-1	0.1885	30.4700	0.6023	1.7300	14.9200	30.0600	3.2100	11.9100	1.8700	1.6200	0.7789	0.0555	2.6900	0.4816	100.6153
R50-70-mz1-2	0.1679	30.3900	0.6186	1.7700	14.6700	30.1000	3.2600	12.1800	1.9800	1.7000	0.7842	0.0582	2.6700	0.5130	100.8906
R50-70-mz1-3	0.1981	30.6200	0.7454	1.8900	13.9800	28.9900	3.1500	11.7800	1.9500	1.7500	0.7697	0.0633	3.5500	0.5189	99.9907
R50-70-mz1-4	0.1889	30.4200	0.8466	1.7400	14.2600	29.1200	3.1800	11.9600	1.9300	1.7700	0.8038	0.0754	3.6300	0.6696	100.6292
R50-70-mz1-5	0.2686	30.4100	1.2190	1.5600	13.7400	27.7600	3.1000	11.5100	1.9500	1.8100	0.6978	0.1062	5.7000	0.7436	100.6225
R50-70-mz1-6	0.2148	30.4300	0.9098	1.7100	13.9000	28.7400	3.1300	11.8600	2.0200	1.9100	0.7853	0.0767	4.2100	0.6548	100.5898
R50-70-mz1-7	0.1685	30.6300	0.8743	2.2000	14.0700	28.5600	3.1400	11.6800	1.9900	1.9300	0.8972	0.0808	3.8300	0.7143	100.8042
R50-70-mz1-8	0.3232	30.3500	1.1030	1.4600	13.8100	28.4700	3.1100	11.6500	1.9600	1.7600	0.6692	0.1044	5.6500	0.5942	101.0604
R50-70-mz2-1	0.2638	30.3400	1.0269	1.4200	13.9600	28.7000	3.1400	11.9500	1.9800	1.7400	0.6210	0.0826	5.1000	0.5548	100.9216
R50-70-mz2-2	0.2485	30.5200	0.9591	1.6400	14.0800	28.6900	3.1400	11.7800	1.9800	1.8100	0.6683	0.0848	4.6700	0.5480	100.8597
R50-70-mz2-3	0.2148	30.6700	0.9801	1.9300	14.1400	28.3700	3.0800	11.7400	1.9900	1.8800	0.8158	0.0833	4.6400	0.5732	101.1498
R50-70-mz2-4	0.1744	30.6900	0.8254	1.8100	14.5000	29.2600	3.1600	11.6500	1.9500	1.8100	0.7319	0.0733	3.6900	0.5449	100.9055
R50-70-mz2-5	0.1569	30.7600	0.7248	1.9700	14.5000	29.4100	3.1800	11.8200	1.9300	1.7900	0.8664	0.0624	3.0900	0.5832	100.8764
R50-70-mz3-1	0.3010	30.3500	1.0629	0.7637	14.3800	29.3900	3.2100	12.0100	1.9300	1.3600	0.4424	0.0916	5.5900	0.5264	101.4496
R50-70-mz3-2	0.6697	29.6400	1.5900	0.1117	13.5200	27.8100	3.0700	11.5100	1.8000	0.8994	0.3955	0.1499	9.4900	0.5108	101.2303
R50-70-mz3-3	0.4649	29.9300	1.4600	0.1592	13.7300	28.6000	3.1600	11.8200	1.8100	1.0119	0.1605	0.1275	8.1100	0.4987	101.0971
R50-70-mz3-4	0.2813	30.3400	1.0520	0.1434	14.6500	29.9700	3.2400	12.3000	1.9300	1.0788	0.1933	0.0877	5.4800	0.4091	101.1925
R50-70-mz3-5	0.3036	30.3200	1.1976	0.4256	14.2200	29.3500	3.2100	11.8800	1.9900	1.3600	0.3222	0.1008	6.1200	0.5207	101.3634
R50-70-mz3-6	0.2362	30.3500	1.0090	0.7252	14.4200	29.5500	3.2600	11.9400	1.9300	1.3800	0.4192	0.0849	5.0500	0.4994	100.8916
R50-70-mz3-7	0.2836	30.3800	1.2258	0.7853	13.9700	28.8800	3.1600	11.9900	1.9100	1.4000	0.4483	0.0995	5.9600	0.6246	101.1613
R50-70-mz3-8	0.3243	30.1400	1.2447	0.2374	14.2900	29.2600	3.2200	11.9000	1.9100	1.1700	0.2260	0.1050	6.3900	0.4853	100.9462
R50-70-mz4-1	0.0694	30.7300	1.2677	0.6054	14.4500	29.6200	3.1300	11.7200	1.7800	1.2300	0.3601	0.1351	3.9200	1.8415	100.8887
R50-70-mz4-2	0.1391	30.6600	0.8774	0.9129	14.6600	30.0800	3.2500	12.1200	1.8600	1.3800	0.4496	0.0922	3.3600	1.0450	100.9141
R50-70-mz4-3	3.8000	29.4200	1.3493	0.6983	13.4400	27.4600	2.9500	10.9600	1.7400	1.2300	0.3777	0.1383	6.0900	1.2712	100.9691
R50-70-mz4-4	0.2312	30.6200	1.0575	1.1221	14.2600	29.1600	3.1600	11.6700	1.9400	1.5000	0.5351	0.0983	4.8900	0.7995	101.0830
R50-70-mz4-5	0.0753	30.7500	1.1994	0.6405	14.4700	29.3800	3.2300	11.8200	1.8100	1.1800	0.3324	0.1262	3.9300	1.8014	100.7750
R50-70-mz4-6	0.0752	30.8100	1.2557	0.6500	14.5000	29.4100	3.1900	11.7700	1.7700	1.2400	0.3217	0.1283	3.9800	1.9112	101.0424
R50-70-mz5-1	0.0777	30.9500	1.1232	0.8395	14.4000	29.5800	3.1500	11.8100	1.9000	1.3200	0.3948	0.1099	3.8300	1.4019	100.9174
R50-70-mz6-1	0.2159	30.6000	0.9592	0.6469	14.6200	29.2200	3.1800	11.9000	1.9900	1.3000	0.4321	0.0814	4.7500	0.5043	100.4368
R50-70-mz6-2	0.2374	30.6100	1.0853	0.6336	14.4600	28.8300	3.2100	11.8000	1.9700	1.3900	0.3205	0.0887	5.2700	0.5578	100.5038
R50-70-mz6-3	0.4797	30.1500	1.4100	0.5112	13.6400	27.5800	3.0600	11.3000	1.8500	1.2300	0.2798	0.1215	7.8600	0.5023	100.0327
R50-70-mz6-4	0.1317	30.7200	1.0564	0.1541	15.3900	29.8600	3.2100	11.4700	1.6800	0.9938	0.1921	0.0876	4.3700	0.8982	100.2453

k-ratio errors (1-sigma %)

No.	Si	P	Ca	Y	La	Ce	Pr	Nd	Sm	Gd	Dy	Pb	Th	U
managot1	0.4973	0.2506	0.8081	2.4035	0.6401	0.5250	1.3559	0.8562	2.6097	5.8194	93.5903	1.7603	0.3754	3.1757
managot2	0.4973	0.2506	0.8179	2.4834	0.6401	0.5250	1.3946	0.8654	2.4510	5.9492	49.3106	1.7205	0.3754	3.2655
managot3	0.4973	0.2506	0.8179	2.3835	0.6401	0.5250	1.3656	0.8562	2.5799	5.3901	55.1405	1.7404	0.3754	3.0759
managot4	0.4973	0.2506	0.8179	2.4135	0.6313	0.5250	1.3559	0.8562	2.4510	5.7495	21.7013	1.7503	0.3754	3.0260
managot5	0.4973	0.2506	0.8179	2.4834	0.6313	0.5250	1.3753	0.8562	2.5303	5.5199	34.7908	1.7006	0.3754	3.0958
R50-70-mz1-1	2.8430	0.2506	1.0341	0.4111	0.6227	0.5186	1.2788	0.7649	1.4264	1.7710	4.2268	6.6927	0.7058	1.7305
R50-70-mz1-2	3.1627	0.2506	1.0143	0.4016	0.6227	0.5186	1.2692	0.7558	1.3582	1.6827	4.1769	6.4028	0.7058	1.6410
R50-70-mz1-3	2.7531	0.2506	0.8963	0.3922	0.6313	0.5250	1.2981	0.7649	1.3680	1.6533	4.2568	5.8531	0.6042	1.6013
R50-70-mz1-4	2.8530	0.2506	0.8276	0.4111	0.6313	0.5250	1.2884	0.7649	1.3874	1.6435	4.1270	5.2135	0.6042	1.3039
R50-70-mz1-5	2.0841	0.2506	0.6719	0.4397	0.6401	0.5315	1.3077	0.7739	1.3874	1.6141	4.7361	3.8946	0.4888	1.1853
R50-70-mz1-6	2.5433	0.2506	0.7983	0.4111	0.6401	0.5250	1.3077	0.7649	1.3388	1.5261	4.1969	5.1035	0.5590	1.3237
R50-70-mz1-7	3.1327	0.2506	0.8179	0.3547	0.6313	0.5250	1.2981	0.7739	1.3582	1.5163	3.7277	4.8038	0.5860	1.2347
R50-70-mz1-8	1.7847	0.2506	0.7106	0.4588	0.6401	0.5250	1.3077	0.7739	1.3777	1.6533	4.9259	3.9745	0.4888	1.4327
R50-70-mz2-1	2.1340	0.2506	0.7398	0.4684	0.6401	0.5250	1.2981	0.7649	1.3582	1.6631	5.3054	4.8237	0.5148	1.5120
R50-70-mz2-2	2.2138	0.2506	0.7690	0.4206	0.6313	0.5250	1.2884	0.7649	1.3582	1.5945	4.9159	4.6639	0.5324	1.5318
R50-70-mz2-3	2.5234	0.2460	0.7593	0.3828	0.6313	0.5250	1.3173	0.7649	1.3485	1.5652	4.0771	4.6739	0.5324	1.4822
R50-70-mz2-4	3.0428	0.2460	0.8472	0.3922	0.6227	0.5250	1.2981	0.7739	1.3777	1.6043	4.5264	5.2534	0.5951	1.5517
R50-70-mz2-5	3.3126	0.2460	0.9159	0.3734	0.6313	0.5250	1.2884	0.7649	1.3777	1.6239	3.8475	5.9730	0.6592	1.4723
R50-70-mz3-1	1.8945	0.2506	0.7203	0.7316	0.6313	0.5250	1.2788	0.7649	1.3777	2.0566	7.3439	4.5640	0.4888	1.5715
R50-70-mz3-2	1.0084	0.2506	0.5757	4.1221	0.6401	0.5315	1.3270	0.7739	1.4654	2.9883	7.8837	2.9861	0.3982	1.5517
R50-70-mz3-3	1.3363	0.2506	0.6044	2.9529	0.6401	0.5250	1.2981	0.7649	1.4654	2.6903	19.9314	3.4552	0.4220	1.6112
R50-70-mz3-4	2.0042	0.2506	0.7301	3.2726	0.6227	0.5186	1.2788	0.7469	1.3777	2.5415	16.5717	4.9037	0.4974	1.9592
R50-70-mz3-5	1.8845	0.2506	0.6719	1.2070	0.6313	0.5250	1.2788	0.7649	1.3485	2.0665	10.0229	4.2443	0.4717	1.5815
R50-70-mz3-6	2.3336	0.2506	0.7398	0.7710	0.6313	0.5186	1.2692	0.7649	1.3874	2.0369	7.7137	4.9037	0.5148	1.6510
R50-70-mz3-7	1.9942	0.2506	0.6622	0.7218	0.6401	0.5250	1.3077	0.7558	1.4069	2.0172	7.2740	4.2343	0.4802	1.3633
R50-70-mz3-8	1.7947	0.2506	0.6622	2.0342	0.6313	0.5250	1.2788	0.7649	1.3971	2.3434	14.1120	4.1344	0.4632	1.6708
R50-70-mz4-1	7.1012	0.2460	0.6525	0.8896	0.6313	0.5186	1.3077	0.7649	1.4751	2.2543	9.0132	3.3953	0.5770	0.6008
R50-70-mz4-2	3.7123	0.2460	0.8081	0.6433	0.6227	0.5186	1.2596	0.7558	1.4264	2.0369	7.2740	4.6439	0.6224	0.9101
R50-70-mz4-3	0.3547	0.2506	0.6332	0.7809	0.6488	0.5315	1.3463	0.7920	1.4947	2.2444	8.5834	3.1857	0.4717	0.7737
R50-70-mz4-4	2.3835	0.2460	0.7301	0.5457	0.6313	0.5250	1.2884	0.7739	1.3777	1.8989	6.2046	4.2942	0.5235	1.1163
R50-70-mz4-5	6.5613	0.2460	0.6719	0.8500	0.6313	0.5250	1.2692	0.7649	1.4556	2.3533	9.8129	3.6150	0.5770	0.6103
R50-70-mz4-6	6.5213	0.2460	0.6622	0.8401	0.6227	0.5186	1.2884	0.7649	1.4947	2.2345	10.1228	3.5551	0.5770	0.5819
R50-70-mz5-1	6.3613	0.2460	0.7009	0.6825	0.6313	0.5186	1.2981	0.7649	1.3971	2.1258	8.3035	4.0445	0.5860	0.7253
R50-70-mz6-1	2.5433	0.2419	0.7908	0.8500	0.6265	0.4342	1.2954	0.7606	1.3657	2.2034	7.5835	5.1639	0.5371	1.6422
R50-70-mz6-2	2.3536	0.2419	0.7325	0.8698	0.6265	0.4342	1.2954	0.7697	1.3754	2.0847	10.2626	4.7842	0.5111	1.5133
R50-70-mz6-3	1.3164	0.2419	0.6360	1.0382	0.6441	0.4420	1.3341	0.7879	1.4534	2.3122	11.7123	3.5756	0.4360	1.6323
R50-70-mz6-4	3.9921	0.2419	0.7519	3.0927	0.6090	0.4264	1.2858	0.7788	1.5709	2.7984	16.8816	5.0640	0.5547	1.0296

Mass percent **Group : mona2004** **Sample : samri061005**

No.	SiO2	P2O5	CaO	Y2O3	La2O3	Ce2O3	Pr2O3	Nd2O3	Sm2O3	Gd2O3	Dy2O3	PbO	ThO2	UO2	Total
managot1	2.0051	27.3700	0.8981	0.2015	14.4500	28.9100	2.9800	9.6200	0.9831	0.4709	0.0948	0.2925	11.6700	0.2087	100.2335
managot2	1.9911	27.3900	0.9161	0.1980	14.3400	28.8500	2.9800	9.5800	0.9724	0.4440	0.0527	0.2907	11.7100	0.2036	99.9976
managot3	1.9950	27.4400	0.9091	0.2059	14.2800	28.7200	2.9900	9.7100	0.9522	0.4770	0.0901	0.2975	11.7800	0.2096	100.1358
managot4	1.9893	27.4200	0.9055	0.2044	14.4300	28.8800	2.9500	9.6400	0.9101	0.4160	0.0773	0.2842	11.7500	0.1971	100.1332
managot5	1.9936	27.4100	0.9117	0.1964	14.4100	28.8800	3.0000	9.7000	0.9901	0.3911	0.0801	0.2887	11.6900	0.2138	100.2343
R76-70-mz1-1	0.2005	30.7900	0.8119	1.4600	14.3600	29.0800	3.2700	11.9900	2.0300	1.7100	0.6843	0.0773	3.4500	0.6028	100.5485
R76-70-mz1-2	0.3375	30.4900	1.2449	1.4300	13.6100	27.7100	3.0900	11.5700	1.9900	1.9100	0.7539	0.1026	6.0300	0.6656	100.9829
R76-70-mz1-3	0.3535	30.3800	1.4700	1.4700	13.1900	26.6000	3.0300	11.1600	1.9200	1.9900	0.7397	0.1268	7.0600	0.8241	100.3698
R76-70-mz1-4	0.2883	30.6900	1.3891	1.7400	13.4000	26.9600	3.0600	11.1500	2.0100	1.9900	0.8810	0.1253	6.1800	1.0288	100.9440
R76-70-mz1-5	0.1826	30.8600	0.9200	1.7000	14.0200	28.7100	3.1400	11.7900	2.0800	1.8900	0.7832	0.0893	3.8500	0.8510	100.9021
R76-70-mz1-6	0.1111	30.8000	0.7856	0.8122	15.1900	29.8300	3.1700	11.9100	1.9300	1.5900	0.3769	0.0744	3.0900	0.7723	100.4677
R76-70-mz2-1	0.4360	27.6200	1.4700	0.7493	12.8700	26.7300	3.1700	11.5900	2.1100	1.8400	0.5243	0.1333	7.1100	0.7932	97.1978
R76-70-mz2-2	0.2969	27.8200	1.1638	0.9658	13.3600	27.4000	3.0900	11.9300	2.1200	1.8700	0.5881	0.1125	5.6600	0.6870	97.1075
R76-70-mz2-3	0.3169	27.8600	1.2093	0.8072	13.2900	27.5800	3.2000	12.0000	2.1600	1.8900	0.5578	0.0983	5.8700	0.7064	97.5897
R76-70-mz2-4	0.3091	30.3000	1.2492	1.1054	13.4700	27.7900	3.1800	12.0700	2.1700	1.9400	0.6415	0.1047	5.8200	0.7340	100.9289
R76-70-mz2-5	0.2201	30.4700	1.1396	0.8030	14.0900	28.6000	3.2200	12.2900	2.0600	1.7300	0.5261	0.1030	4.9900	0.8130	101.0926
R76-70-mz2-6	0.6045	29.9200	1.7500	0.9430	12.5800	26.0900	2.9800	11.4200	2.0300	1.8700	0.5448	0.1525	9.3600	0.7522	101.0647
R76-70-mz2-7	0.6220	29.8600	1.8400	0.7946	12.5700	25.8900	2.9500	11.2200	2.0100	1.8600	0.6036	0.1697	9.9000	0.7440	101.1042
R76-70-mz2-8	1.2796	28.9300	1.8600	0.7731	12.2700	25.5500	2.9200	11.1000	1.9300	1.7200	0.4697	0.1613	9.4000	0.6936	99.1243
R76-70-mz3-1	0.2452	30.8500	1.0868	1.0256	14.0600	28.2700	3.1900	12.0100	2.0900	1.8900	0.5861	0.0914	5.0100	0.6289	101.0732
R76-70-mz3-2	0.2623	30.5100	1.1861	1.0563	13.3900	27.2600	3.1300	11.6000	2.1200	1.8800	0.6082	0.1096	5.4900	0.7013	99.3465
R76-70-mz3-3	0.3367	30.4700	1.2622	0.8894	13.3900	27.3200	3.0900	11.8200	2.0900	1.8200	0.5018	0.1110	6.2800	0.6727	100.1005
R76-70-mz3-4	0.3046	30.3200	1.4000	1.0022	13.0100	26.5700	3.0700	11.5400	2.1100	1.9200	0.6765	0.1333	6.6700	0.8265	99.6033
R76-70-mz3-5	0.2067	30.5500	0.9203	0.9696	14.1500	28.4700	3.2500	11.9900	2.1000	1.8400	0.5131	0.0906	4.0800	0.6589	99.8220
R76-70-mz3-6	0.2636	30.5200	1.2694	0.6616	13.8100	27.7400	3.1200	11.5400	2.0600	1.7500	0.4026	0.1092	5.8300	0.7511	99.8700
R76-70-mz3-7	0.7563	29.6900	2.0200	0.5664	12.0000	24.7900	2.8000	10.8100	1.9300	1.7000	0.4056	0.1666	11.2800	0.7633	99.7565
R76-70-mz3-8	0.5844	29.9600	1.9000	0.6511	12.3400	25.4600	3.0000	11.1100	1.9900	1.7600	0.4467	0.1664	9.9500	0.8237	100.2119
R76-70-mz4-1	0.2913	30.3700	1.0576	1.1701	13.4200	27.5900	3.0900	11.8000	2.1600	1.9700	0.6224	0.0968	5.6400	0.6171	99.9398
R76-70-mz4-2	0.2579	30.6400	1.1180	1.4800	13.9400	27.6700	3.0500	11.4900	1.9100	1.9900	0.6490	0.0942	5.2100	0.6331	100.1756
R76-70-mz4-3	0.2869	30.5700	1.2914	1.5500	13.6100	27.2900	3.0400	11.3100	1.9500	2.0300	0.6984	0.1091	5.9600	0.7422	100.4868
R76-70-mz4-4	0.3198	30.4800	1.2752	1.3000	13.5500	27.4900	3.0500	11.6800	2.0800	1.9300	0.7069	0.1025	6.0900	0.6406	100.7431
R76-70-mz4-5	0.3220	30.4500	1.0899	1.1702	13.7100	27.6700	3.1500	11.8200	2.0900	1.9500	0.6707	0.0930	5.3100	0.6148	100.1527
R76-70-mz4-6	0.2962	30.5500	1.1460	1.2538	13.6500	27.6600	3.1300	11.7900	2.1200	1.9600	0.7542	0.0987	5.4300	0.6433	100.5257
R76-70-mz4-7	0.2707	30.5300	1.2679	1.2271	13.5400	27.3400	3.1300	11.7800	2.0700	1.9200	0.6824	0.1073	5.9000	0.6661	100.4779
R76-70-mz4-8	0.2831	30.5600	1.2157	1.1980	13.4100	27.3700	3.0300	11.7200	2.1100	1.9900	0.7124	0.1067	5.7500	0.6603	100.1614

k-ratio errors (1-sigma %)

No.	Si	P	Ca	Y	La	Ce	Pr	Nd	Sm	Gd	Dy	Pb	Th	U
managot1	0.5000	0.2419	0.8179	2.3835	0.6401	0.5250	1.3753	0.8562	2.5105	5.6097	34.6308	1.7515	0.3821	3.0865
managot2	0.5000	0.2419	0.8081	2.4135	0.6401	0.5250	1.3753	0.8654	2.5303	5.9492	62.0405	1.7614	0.3821	3.1364
managot3	0.5000	0.2419	0.8081	2.3137	0.6401	0.5250	1.3753	0.8562	2.5898	5.5398	36.2708	1.7316	0.3821	3.0665
managot4	0.5000	0.2419	0.8179	2.3336	0.6401	0.5250	1.3850	0.8562	2.7090	6.3686	42.4207	1.8011	0.3821	3.2062
managot5	0.5000	0.2419	0.8081	2.4335	0.6401	0.5250	1.3753	0.8562	2.4708	6.7081	40.7207	1.7614	0.3821	3.0166
R76-70-mz1-1	2.7036	0.2419	0.8570	0.4588	0.6401	0.5250	1.2788	0.7649	1.3388	1.7121	4.8859	5.2838	0.6174	1.4241
R76-70-mz1-2	1.7257	0.2419	0.6622	0.4684	0.6488	0.5315	1.3270	0.7739	1.3582	1.5554	4.4465	4.0849	0.4771	1.2955
R76-70-mz1-3	1.6559	0.2419	0.6044	0.4492	0.6576	0.5381	1.3463	0.7920	1.4166	1.5066	4.5463	3.3859	0.4522	1.0787
R76-70-mz1-4	1.9550	0.2419	0.6236	0.4111	0.6576	0.5315	1.3366	0.7920	1.3582	1.5066	3.8375	3.4258	0.4771	0.9122
R76-70-mz1-5	2.9234	0.2419	0.7983	0.4111	0.6401	0.5250	1.3173	0.7739	1.3194	1.5652	4.3067	4.6143	0.5903	1.0689
R76-70-mz1-6	4.6021	0.2419	0.8766	0.7021	0.6227	0.5186	1.3077	0.7649	1.3874	1.8103	8.6833	5.7135	0.6539	1.1574
R76-70-mz2-1	1.4169	0.2419	0.6044	0.7513	0.6665	0.5315	1.2981	0.7739	1.3000	1.5945	6.2746	3.3460	0.4522	1.1082
R76-70-mz2-2	1.9351	0.2419	0.6912	0.6237	0.6576	0.5315	1.3270	0.7649	1.2903	1.5847	5.6451	3.8752	0.4940	1.2659
R76-70-mz2-3	1.8353	0.2419	0.6719	0.7120	0.6576	0.5315	1.2981	0.7558	1.2709	1.5652	5.9049	4.4145	0.4855	1.2363
R76-70-mz2-4	1.8553	0.2419	0.6622	0.5554	0.6576	0.5315	1.2981	0.7558	1.2806	1.5359	5.1756	4.0949	0.4855	1.1870
R76-70-mz2-5	2.4640	0.2419	0.7009	0.7120	0.6401	0.5250	1.2884	0.7558	1.3291	1.6925	6.2746	4.2647	0.5197	1.1082
R76-70-mz2-6	1.0990	0.2419	0.5566	0.6237	0.6754	0.5381	1.3753	0.7829	1.3582	1.5847	6.1047	2.9368	0.4046	1.1476
R76-70-mz2-7	1.0692	0.2419	0.5376	0.7120	0.6754	0.5381	1.3850	0.7920	1.3582	1.5945	5.5252	2.6875	0.3970	1.1574
R76-70-mz2-8	0.6551	0.2419	0.5376	0.7316	0.6843	0.5381	1.3850	0.7920	1.3971	1.7023	7.0541	2.7872	0.4046	1.2166
R76-70-mz3-1	2.2743	0.2419	0.7203	0.5944	0.6401	0.5250	1.2981	0.7558	1.3194	1.5652	5.6851	4.6443	0.5197	1.3647
R76-70-mz3-2	2.1346	0.2419	0.6815	0.5749	0.6576	0.5315	1.3077	0.7739	1.2903	1.5750	5.4353	3.9351	0.4940	1.2462
R76-70-mz3-3	1.7257	0.2419	0.6622	0.6531	0.6576	0.5315	1.3173	0.7649	1.3097	1.6141	6.5944	3.9051	0.4687	1.2758
R76-70-mz3-4	1.8752	0.2419	0.6236	0.6042	0.6665	0.5381	1.3366	0.7739	1.3097	1.5554	4.8859	3.3160	0.4604	1.0787
R76-70-mz3-5	2.6038	0.2419	0.7885	0.6139	0.6401	0.5250	1.2788	0.7558	1.3097	1.6043	6.4445	4.7242	0.5725	1.3153
R76-70-mz3-6	2.1146	0.2419	0.6525	0.8302	0.6488	0.5315	1.3173	0.7739	1.3291	1.6729	8.1635	4.0150	0.4855	1.1673
R76-70-mz3-7	0.9306	0.2419	0.5092	0.9390	0.6843	0.5449	1.4237	0.8011	1.4069	1.7219	8.1435	2.7373	0.3821	1.1279
R76-70-mz3-8	1.1188	0.2419	0.5281	0.8401	0.6843	0.5381	1.3559	0.7920	1.3680	1.6729	7.4139	2.7273	0.3970	1.0689
R76-70-mz4-1	1.9450	0.2419	0.7301	0.5360	0.6576	0.5315	1.3366	0.7649	1.2806	1.5163	5.3654	4.3546	0.4940	1.3746
R76-70-mz4-2	2.1546	0.2419	0.7106	0.4492	0.6401	0.5315	1.3366	0.7739	1.4166	1.4968	5.1156	4.4145	0.5111	1.3548
R76-70-mz4-3	1.9750	0.2419	0.6525	0.4397	0.6488	0.5315	1.3463	0.7829	1.3874	1.4871	4.7960	3.8652	0.4855	1.1870
R76-70-mz4-4	1.8054	0.2419	0.6525	0.4973	0.6488	0.5315	1.3463	0.7739	1.3194	1.5456	4.7261	4.1149	0.4771	1.3351
R76-70-mz4-5	1.7955	0.2419	0.7203	0.5360	0.6488	0.5315	1.3173	0.7739	1.3194	1.5261	4.9858	4.5144	0.5025	1.3845
R76-70-mz4-6	1.9251	0.2419	0.7009	0.5070	0.6488	0.5315	1.3173	0.7649	1.3000	1.5261	4.4665	4.3046	0.5025	1.3450
R76-70-mz4-7	2.0747	0.2419	0.6525	0.5166	0.6488	0.5315	1.3270	0.7649	1.3194	1.5554	4.8959	3.9850	0.4855	1.2955
R76-70-mz4-8	2.0049	0.2419	0.6719	0.5263	0.6576	0.5315	1.3559	0.7739	1.3000	1.5066	4.7161	3.9950	0.4855	1.3054

Mass percent **Group : mona2004** **Sample : samri061005**

No.	SiO2	P2O5	CaO	Y2O3	La2O3	Ce2O3	Pr2O3	Nd2O3	Sm2O3	Gd2O3	Dy2O3	PbO	ThO2	UO2	Total
R76-70-mz5-1	0.2499	30.5500	1.0876	1.5900	13.8200	27.6900	3.2300	11.8800	2.1100	2.0800	0.7986	0.0957	4.9600	0.6453	100.8296
R76-70-mz5-2	0.1008	30.7400	1.0271	0.3928	14.5000	29.2100	3.3300	12.2200	2.0500	1.5600	0.2957	0.0969	3.7900	1.0756	100.4162
R76-70-mz5-3	0.0811	30.6800	1.0632	0.3229	14.4400	29.0600	3.1800	12.1300	2.0400	1.5400	0.2415	0.0976	3.7500	1.1517	99.8048
R76-70-mz5-4	0.2653	30.3900	1.1756	1.7400	13.5700	27.1600	3.0300	10.9400	1.8700	1.9300	0.7377	0.1079	5.4900	0.7362	99.1899
R76-70-mz5-5	0.1921	30.3900	1.0288	1.3500	13.6100	27.6800	3.1500	11.6100	2.0600	1.9800	0.5812	0.0967	4.5100	0.7686	99.0456
R76-70-mz5-6	0.0755	30.4800	0.9899	0.2831	14.2800	29.1100	3.2900	12.0800	2.0700	1.5400	0.1826	0.0898	3.5400	1.0605	99.0964
R76-70-mz5-7	0.0902	30.3900	0.9834	0.2718	14.4700	28.8600	3.2300	11.9600	2.0800	1.5200	0.2735	0.0871	3.5400	1.0065	98.7875
R76-70-mz5-8	0.1065	30.2200	0.9482	0.2436	14.6000	28.8100	3.1600	11.9400	2.0300	1.4400	0.2208	0.0946	3.3600	1.0004	98.1977
R76-70-mz5-9	0.0803	30.1900	0.9964	0.2730	14.4100	28.9200	3.1600	11.9400	2.0000	1.4700	0.2404	0.0944	3.4900	1.0596	98.3488
R76-70-mz5-10	0.2248	30.0400	1.1350	1.3200	13.4300	27.0500	3.1100	11.7500	2.0800	2.0000	0.6388	0.1133	4.9700	0.8195	98.7223
R76-70-mz5-11	0.0800	30.1500	0.9150	0.2366	14.8400	28.9300	3.2800	11.8200	1.9500	1.4500	0.2306	0.0841	3.2500	0.9923	98.2314

k-ratio errors (1-sigma %)

No.	Si	P	Ca	Y	La	Ce	Pr	Nd	Sm	Gd	Dy	Pb	Th	U
R76-70-mz5-1	2.2244	0.2419	0.7106	0.4301	0.6488	0.5315	1.2788	0.7649	1.3000	1.4481	4.1869	4.3346	0.5197	1.3252
R76-70-mz5-2	4.9920	0.2419	0.7398	1.3065	0.6313	0.5250	1.2500	0.7558	1.3291	1.8398	11.0126	4.6343	0.5903	0.8927
R76-70-mz5-3	6.1716	0.2419	0.7203	1.5455	0.6313	0.5250	1.2981	0.7558	1.3291	1.8595	13.4321	4.6443	0.5903	0.8440
R76-70-mz5-4	2.0947	0.2419	0.6815	0.4016	0.6488	0.5315	1.3366	0.7920	1.4264	1.5261	4.4864	3.8452	0.4940	1.1771
R76-70-mz5-5	2.7436	0.2419	0.7398	0.4780	0.6488	0.5315	1.3077	0.7739	1.3194	1.4968	5.6751	4.3246	0.5371	1.1377
R76-70-mz5-6	6.4715	0.2419	0.7495	1.7349	0.6313	0.5250	1.2596	0.7469	1.3000	1.8398	17.6016	4.9540	0.6084	0.8927
R76-70-mz5-7	5.4718	0.2419	0.7495	1.8047	0.6313	0.5250	1.2692	0.7558	1.2903	1.8595	11.7125	5.0540	0.6084	0.9220
R76-70-mz5-8	4.7421	0.2419	0.7690	1.9843	0.6227	0.5250	1.2884	0.7558	1.3194	1.9482	14.4320	4.6943	0.6174	0.9317
R76-70-mz5-9	6.0916	0.2419	0.7398	1.7847	0.6313	0.5250	1.2884	0.7558	1.3291	1.8989	13.2722	4.6943	0.6084	0.8829
R76-70-mz5-10	2.3841	0.2419	0.6912	0.4876	0.6488	0.5315	1.2981	0.7558	1.3000	1.4676	5.1256	3.7354	0.5197	1.0787
R76-70-mz5-11	6.1216	0.2419	0.7885	2.0342	0.6227	0.5250	1.2500	0.7558	1.3582	1.9186	13.8221	5.2338	0.6265	0.9317

Mass percent **Group : mona2004** **Sample : NL110705**

No.	SiO2	P2O5	CaO	Y2O3	La2O3	Ce2O3	Pr2O3	Nd2O3	Sm2O3	Gd2O3	Dy2O3	PbO	ThO2	UO2	Total
R96-10-mz1-1	0.2160	30.5600	0.8521	0.9368	14.1700	29.2200	3.2600	12.2600	1.9700	1.5200	0.4606	0.0843	3.5400	0.7412	99.8214
R96-10-mz1-2	0.2162	30.5900	0.8265	0.9549	14.4900	29.2900	3.1700	12.1200	1.9300	1.5200	0.4489	0.0733	3.3500	0.7422	99.7512
R96-10-mz1-3	0.2063	30.6300	0.8237	1.2084	13.7800	28.7300	3.2900	12.3700	2.0400	1.5700	0.5377	0.0861	3.5200	0.7296	99.5538
R96-10-mz1-4	0.2265	30.6100	0.9187	1.2440	13.7900	28.5500	3.1900	12.3500	1.9600	1.5600	0.4706	0.0784	3.8100	0.7297	99.5221
R96-10-mz1-5	0.1959	30.5800	0.8249	1.4800	13.7400	28.6000	3.1800	12.3000	1.9600	1.5500	0.5414	0.0767	3.4900	0.6747	99.2270
R96-10-mz1-6	0.2079	30.6400	0.8424	1.4200	13.7900	28.6500	3.1400	12.3700	2.0100	1.5300	0.5431	0.0749	3.4600	0.6755	99.3866
R96-10-mz1-7	0.2139	30.6700	0.8390	0.9608	14.0800	29.1300	3.2000	12.1800	1.9800	1.5000	0.4776	0.0687	3.4900	0.7603	99.5805
R96-10-mz1-8	0.2042	30.5900	0.8019	1.4300	13.8700	28.7700	3.2900	12.3800	1.9500	1.4800	0.5040	0.0730	3.2700	0.6102	99.2549

k-ratio errors (1-sigma %)

No.	Si	P	Ca	Y	La	Ce	Pr	Nd	Sm	Gd	Dy	Pb	Th	U
R96-10-mz1-1	2.5633	0.2419	0.8493	0.6335	0.6353	0.4342	1.2665	0.7515	1.3754	1.9070	7.1037	5.0440	0.6174	1.2067
R96-10-mz1-2	2.5533	0.2419	0.8688	0.6237	0.6265	0.4342	1.3051	0.7606	1.4046	1.9070	7.2836	5.6835	0.6356	1.2067
R96-10-mz1-3	2.6532	0.2419	0.8688	0.5263	0.6441	0.4342	1.2569	0.7515	1.3365	1.8578	6.1243	4.8841	0.6174	1.2264
R96-10-mz1-4	2.4534	0.2419	0.8102	0.5166	0.6353	0.4342	1.2954	0.7515	1.3851	1.8676	7.0238	5.2438	0.5993	1.2264
R96-10-mz1-5	2.7930	0.2419	0.8688	0.4588	0.6441	0.4342	1.2954	0.7515	1.3754	1.8676	6.0644	5.2838	0.6174	1.3054
R96-10-mz1-6	2.6432	0.2419	0.8591	0.4684	0.6353	0.4342	1.3147	0.7515	1.3559	1.8972	6.0344	5.4137	0.6265	1.3054
R96-10-mz1-7	2.5633	0.2419	0.8591	0.6237	0.6353	0.4342	1.2858	0.7606	1.3657	1.9268	6.8439	6.0033	0.6174	1.1771
R96-10-mz1-8	2.6832	0.2419	0.8884	0.4684	0.6353	0.4342	1.2569	0.7515	1.3851	1.9563	6.5340	5.5336	0.6447	1.4241

Mass percent **Group : mona2004** **Sample : ben180805**

No.	SiO2	P2O5	CaO	Y2O3	La2O3	Ce2O3	Pr2O3	Nd2O3	Sm2O3	Gd2O3	Dy2O3	PbO	ThO2	UO2	Total
managot1	2.0138	27.2500	0.8932	0.1966	14.1600	29.0300	2.8500	9.8200	0.9924	0.4568	0.0850	0.2826	11.5900	0.2042	99.9029
managot2	2.0081	27.3400	0.8801	0.2000	14.2900	28.9300	2.9700	9.7400	0.9903	0.4619	0.0672	0.2788	11.6100	0.2063	100.0510
managot3	1.9940	27.3300	0.8953	0.1927	14.2500	28.9200	2.9200	9.6800	0.9617	0.4385	0.0671	0.2882	11.6200	0.2061	99.8422
managot4	2.0089	27.3700	0.9020	0.1998	14.1600	28.7500	2.9600	9.6500	0.9874	0.4597	0.1050	0.2894	11.5400	0.2084	99.6687
managot5	2.0483	27.3600	0.8954	0.1963	14.2400	28.9000	2.9200	9.7200	0.9406	0.4634	0.0107	0.2902	11.5900	0.2062	99.8594
R98-mz1-1	0.2048	30.3600	0.9475	0.1371	14.4900	29.9700	3.2000	12.1600	1.9400	1.3100	0.0930	0.0899	4.0100	0.8153	99.7549
R98-mz1-2	0.1789	30.3700	0.9460	0.1509	14.5700	29.9400	3.2600	12.0100	1.9100	1.3400	0.1679	0.0834	3.8000	0.8421	99.5952
R98-mz1-3	0.1875	30.3100	0.8540	0.1216	14.6900	30.2200	3.2800	12.2200	1.9300	1.2300	0.1720	0.0656	3.6000	0.6857	99.5909
R98-mz1-4	0.1649	30.5100	0.5474	1.7700	14.3900	29.6400	3.2000	12.3600	2.1000	1.6500	0.6943	0.0492	2.2400	0.4901	99.8319
R98-mz1-5	0.2868	30.4400	0.9585	1.7800	13.6100	28.2000	3.1300	11.9800	2.0300	1.8200	0.7884	0.0818	4.6600	0.5401	100.3475
R98-mz1-6	0.2754	30.5600	1.0693	2.0100	13.1500	27.4600	3.0900	11.7700	2.0900	1.8600	0.9168	0.0907	5.0400	0.6334	100.0614
R98-mz1-7	0.1449	30.6400	0.5449	1.9200	14.4100	29.4400	3.2400	12.2800	2.0300	1.6500	0.7138	0.0584	2.1600	0.5162	99.7746
R98-mz2-1	0.2203	30.2000	0.8329	0.1696	14.8000	30.1600	3.2700	12.3600	1.9900	1.3100	0.1358	0.0640	3.6100	0.6746	99.8221
R98-mz2-2	0.1849	30.1600	0.9480	0.1611	14.4700	29.8900	3.2500	12.1200	2.0500	1.3100	0.1417	0.0799	3.7400	0.8668	99.3981
R98-mz2-3	0.2564	29.9900	0.9888	0.1654	14.1800	29.4000	3.2500	12.0400	1.9400	1.3000	0.1518	0.0828	3.9600	0.8924	98.6247
R98-mz2-4	0.1828	30.2000	0.8453	0.2847	14.6600	30.1300	3.2800	12.2000	1.9600	1.3800	0.2063	0.0646	3.4300	0.6590	99.5070
R98-mz2-5	0.1857	30.1700	0.9024	0.1195	14.7300	30.1400	3.2600	12.2200	1.8700	1.2600	0.1185	0.0815	3.7000	0.7682	99.5509
R98-mz2-6	0.1790	30.3100	0.7254	1.9000	13.5400	28.3900	3.1700	12.2700	2.1200	1.8000	0.8442	0.0672	2.8500	0.7244	98.9211
R98-mz2-7	0.1886	30.1000	0.9084	0.2055	14.4700	29.8000	3.2300	12.2100	1.9400	1.3600	0.1750	0.0769	3.6100	0.7813	99.0808
R98-mz2-8	0.1663	30.2000	0.7860	1.3400	13.8500	29.0600	3.2600	12.3800	2.0500	1.6900	0.6042	0.0673	3.1700	0.6860	99.3392
R98-mz3-1	0.2691	30.3900	1.0362	1.9400	13.2200	27.5600	3.0500	11.7400	1.9600	1.8800	0.8430	0.0932	4.6300	0.7007	99.3550
R98-mz3-2	0.3053	30.2900	1.0984	1.9500	12.9500	27.0500	3.0600	11.6200	1.9900	1.9200	0.9463	0.0986	5.1900	0.7130	99.2281
R98-mz3-3	0.1876	30.3300	0.8783	0.3358	14.5900	29.6800	3.3200	12.4100	1.9900	1.3600	0.2024	0.0734	3.5600	0.7378	99.6809
R98-mz3-4	0.1996	30.4000	0.7112	1.7400	14.1000	28.8300	3.1800	12.0200	2.0300	1.6500	0.7286	0.0597	3.0300	0.5297	99.2398

k-ratio errors (1-sigma %)

No.	Si	P	Ca	Y	La	Ce	Pr	Nd	Sm	Gd	Dy	Pb	Th	U
managot1	0.4876	0.2506	0.8081	2.3935	0.6313	0.5250	1.3946	0.8377	2.4411	5.7195	38.1308	1.7702	0.3754	3.1358
managot2	0.4876	0.2506	0.8081	2.3236	0.6227	0.5186	1.3366	0.8377	2.4113	5.5798	47.5606	1.7702	0.3680	3.0759
managot3	0.4876	0.2506	0.7788	2.3835	0.6140	0.5186	1.3366	0.8286	2.4411	5.7794	47.0606	1.7006	0.3680	3.0459
managot4	0.4780	0.2506	0.7788	2.2837	0.6140	0.5186	1.3173	0.8286	2.3618	5.4799	29.8310	1.6808	0.3680	2.9960
managot5	0.4684	0.2506	0.7788	2.3137	0.6140	0.5122	1.3270	0.8194	2.4708	5.4101	290.1901	1.6708	0.3680	2.9960
R98-mz1-1	2.6132	0.2506	0.7690	3.3625	0.6227	0.5186	1.2788	0.7469	1.3582	2.1258	34.4608	4.8737	0.5680	1.0966
R98-mz1-2	2.9629	0.2506	0.7690	3.0728	0.6227	0.5186	1.2692	0.7558	1.3874	2.0764	19.0815	5.2434	0.5860	1.0671
R98-mz1-3	2.8330	0.2506	0.8179	3.8022	0.6227	0.5186	1.2596	0.7469	1.3777	2.2642	18.5616	6.5328	0.6042	1.2644
R98-mz1-4	3.1827	0.2506	1.0933	0.4016	0.6227	0.5186	1.2788	0.7469	1.2709	1.7317	4.7660	7.3125	0.7811	1.7106
R98-mz1-5	1.9643	0.2460	0.7690	0.3922	0.6401	0.5250	1.2981	0.7558	1.3291	1.5945	4.2069	4.7838	0.5324	1.5418
R98-mz1-6	2.0342	0.2460	0.7203	0.3734	0.6488	0.5315	1.3077	0.7649	1.2903	1.5750	3.6479	4.3142	0.5148	1.3435
R98-mz1-7	3.5624	0.2460	1.1032	0.3828	0.6227	0.5186	1.2596	0.7469	1.3194	1.7317	4.6462	6.3728	0.8001	1.6311
R98-mz2-1	2.4634	0.2506	0.8374	2.7830	0.6140	0.5186	1.2596	0.7469	1.3388	2.1159	23.6912	6.6527	0.6042	1.2841
R98-mz2-2	2.8829	0.2506	0.7690	2.9229	0.6227	0.5186	1.2596	0.7558	1.3000	2.1258	22.7513	5.4333	0.5860	1.0474
R98-mz2-3	2.1639	0.2506	0.7495	2.8430	0.6313	0.5186	1.2596	0.7558	1.3680	2.1356	21.1314	5.2534	0.5680	1.0179
R98-mz2-4	2.9129	0.2506	0.8179	1.7249	0.6227	0.5186	1.2596	0.7469	1.3582	2.0270	15.6718	6.5628	0.6133	1.3138
R98-mz2-5	2.8530	0.2506	0.7983	3.8722	0.6227	0.5186	1.2596	0.7469	1.4166	2.1851	27.0311	5.3933	0.5951	1.1557
R98-mz2-6	2.9529	0.2506	0.9061	0.3828	0.6401	0.5250	1.2884	0.7469	1.2709	1.6141	3.9273	5.6432	0.6778	1.2149
R98-mz2-7	2.8030	0.2506	0.7885	2.3137	0.6227	0.5186	1.2692	0.7469	1.3680	2.0468	18.3016	5.6132	0.6042	1.1360
R98-mz2-8	3.1827	0.2506	0.8668	0.4780	0.6401	0.5250	1.2596	0.7469	1.3097	1.6925	5.4253	5.8831	0.6408	1.2742
R98-mz3-1	2.0641	0.2460	0.7301	0.3734	0.6488	0.5315	1.3173	0.7649	1.3680	1.5652	3.9972	4.2542	0.5324	1.2446
R98-mz3-2	1.8645	0.2460	0.7106	0.3734	0.6576	0.5315	1.3077	0.7739	1.3485	1.5359	3.5481	4.0345	0.5061	1.2248
R98-mz3-3	2.8530	0.2506	0.8081	1.4857	0.6227	0.5186	1.2404	0.7469	1.3388	2.0665	15.9918	5.8531	0.6042	1.2051
R98-mz3-4	2.6832	0.2506	0.9257	0.4016	0.6313	0.5250	1.2884	0.7558	1.3194	1.7416	4.5463	6.2729	0.6592	1.5914

Mass percent **Group : mona2004** **Sample : samri051005**

No.	SiO2	P2O5	CaO	Y2O3	La2O3	Ce2O3	Pr2O3	Nd2O3	Sm2O3	Gd2O3	Dy2O3	PbO	ThO2	UO2	Total
managot1	2.0262	27.4100	0.9166	0.2012	14.3100	29.0300	2.8500	9.6000	0.9780	0.4398	0.0951	0.2904	11.7600	0.2165	100.2030
managot2	2.0313	27.4200	0.9043	0.2042	14.4700	28.8100	2.9300	9.5900	0.9541	0.4310	0.0896	0.2890	11.6300	0.1931	100.0250
managot3	2.0257	27.3200	0.8950	0.1974	14.5700	28.7500	2.9100	9.6900	0.9755	0.4424	0.0618	0.2883	11.7100	0.2062	100.1212
managot4	2.0316	27.2700	0.9102	0.2124	14.3400	28.8200	2.8400	9.6900	0.9878	0.4679	0.0618	0.2844	11.7100	0.1911	99.8964
R109-0a-mz1-1	0.2887	30.2500	1.1894	1.7200	12.5400	26.8700	2.9400	11.5900	2.1600	2.3800	0.7670	0.1021	5.6600	0.5842	99.0894
R109-0a-mz1-2	0.5754	29.8200	1.7400	1.7800	11.5200	24.7400	2.8000	11.1500	2.1200	2.4800	0.7755	0.1423	9.2000	0.7008	99.6160
R109-0a-mz1-3	0.3036	30.2800	1.2090	1.7400	12.5800	26.5000	2.9500	11.8100	2.2100	2.3500	0.6776	0.1107	5.9300	0.5886	99.2894
R109-0a-mz1-4	0.3174	30.3200	1.2949	1.7200	12.6100	26.7700	3.0200	11.6400	2.1900	2.3500	0.8194	0.1115	6.3200	0.6230	100.1584
R109-0a-mz2-1	0.1650	30.5800	1.0173	0.6445	14.1200	29.2000	3.2400	12.1300	2.0200	1.5300	0.2894	0.0857	4.0400	0.8977	99.9903
R109-0a-mz2-2	0.1668	30.3900	1.0960	0.6125	14.1500	28.9900	3.2000	12.2000	2.1500	1.5700	0.3312	0.0952	4.2500	0.9948	100.2281
R109-0a-mz2-3	0.1443	30.4800	1.0632	0.5534	14.1900	29.1800	3.1000	12.1300	2.0700	1.5200	0.2535	0.0987	4.2500	0.9449	100.0094
R109-0a-mz2-4	0.1363	30.3000	1.0326	0.4446	14.4000	29.4400	3.2000	12.1900	2.0800	1.5100	0.2788	0.0928	4.1100	0.8725	100.1172
R109-0a-mz2-5	0.1364	30.3800	1.0438	0.5288	14.3000	29.3500	3.2500	12.4800	2.0900	1.5600	0.3006	0.0984	4.2300	0.9160	100.6950
R109-0a-mz2-6	0.1338	30.1100	0.9991	0.4089	14.1900	29.8300	3.2800	12.4700	2.1200	1.5100	0.1737	0.0860	4.1000	0.8608	100.3017
R109-0a-mz2-7	0.2187	30.0700	0.9573	1.6600	13.4900	28.4900	3.0900	12.2100	2.1300	1.9000	0.7189	0.0789	4.3800	0.7092	100.1420
R109-0a-mz2-8	0.2559	30.1700	1.0992	1.6700	13.3700	27.8200	3.1300	12.2700	2.1500	1.9300	0.7542	0.1032	5.1700	0.7503	100.6871
R109-0a-mz2-9	0.1468	30.1400	1.0631	0.8641	13.8300	29.1300	3.1500	12.4900	2.1600	1.7200	0.4420	0.1044	4.2700	0.9577	100.5015
R109-0a-mz2-10	0.1633	30.1900	1.0229	0.8378	13.9000	29.2000	3.2000	12.5600	2.1600	1.6700	0.4355	0.0992	4.0200	0.8960	100.3863
R109-0a-mz2-11	0.1997	30.0900	1.0090	1.1587	13.6900	28.7400	3.1500	12.2700	2.0800	1.7700	0.5018	0.0872	4.5000	0.7113	99.9946
R109-0a-mz2-12	0.1421	30.1000	1.0171	0.4020	14.2800	29.5200	3.1700	12.5700	2.0600	1.5100	0.2525	0.0884	4.0600	0.8475	100.0487
R109-0a-mz3-1	0.2428	30.4100	1.0392	0.8726	14.0200	29.1000	3.1800	12.2000	2.1200	1.6600	0.4545	0.0967	4.2000	0.9112	100.5399
R109-0a-mz3-2	0.1518	30.5100	1.0151	0.8356	14.1300	28.9800	3.2100	12.0400	2.0600	1.5600	0.4103	0.0853	4.1100	0.8766	100.0069
R109-0a-mz3-3	0.1549	30.3500	1.0205	0.7803	14.3900	29.3800	3.1300	12.3600	2.0500	1.5800	0.3958	0.0890	4.1100	0.8641	100.6864
R109-0a-mz3-4	0.1573	30.3200	1.0315	0.7090	14.0800	29.1800	3.1500	12.0800	2.0500	1.5200	0.3560	0.0902	4.1400	0.8891	99.7848
R109-0a-mz3-5	0.1498	30.2700	1.0170	0.6541	14.3600	29.2800	3.1200	11.9600	1.9600	1.5100	0.3050	0.0921	4.1800	0.8998	99.7894
R109-0a-mz3-6	0.1497	30.3300	1.0197	0.5634	14.3300	29.4200	3.1500	12.2600	2.0100	1.4800	0.3162	0.0914	4.2000	0.8857	100.2372
R109-0a-mz3-7	0.1397	30.3200	1.0251	0.7188	14.2400	29.5000	3.1600	12.1900	2.0400	1.5200	0.3478	0.0862	4.1800	0.8788	100.3783
R109-0a-mz3-8	0.1775	30.1900	1.1179	0.8407	14.2100	28.9800	3.1400	12.0000	2.0000	1.6100	0.3654	0.1079	4.5700	0.9354	100.2800
R109-0a-mz3-9	0.1610	30.2500	1.0638	0.8409	14.0900	29.1500	3.1500	12.1300	2.0600	1.5800	0.3788	0.0945	4.3200	0.9289	100.2314
R109-0a-mz3-10	0.1530	30.3500	0.9536	1.1304	14.0500	29.1300	3.2100	12.1800	2.1100	1.7400	0.4768	0.0872	3.8800	0.8426	100.3260

k-ratio errors (1-sigma %)

No.	Si	P	Ca	Y	La	Ce	Pr	Nd	Sm	Gd	Dy	Pb	Th	U	
managot1	0.5000	0.2419	0.8081	2.3636	0.6401	0.5250	1.4237	0.8654	2.5204	5.9991	34.2508	1.7614	0.3821	2.9967	
managot2	0.5000	0.2419	0.8081	2.3336	0.6401	0.5250	1.3946	0.8562	2.5700	6.0989	36.4708	1.7713	0.3821	3.2661	
managot3	0.5000	0.2419	0.8179	2.4135	0.6313	0.5250	1.3946	0.8562	2.5204	5.9691	52.8105	1.7713	0.3821	3.1064	
managot4	0.5000	0.2419	0.8081	2.2338	0.6401	0.5250	1.4334	0.8562	2.4807	5.6297	52.7305	1.7912	0.3821	3.2861	
R109-0a-mz1-1	1.9650	0.2419	0.6815	0.4111	0.6754	0.5315	1.3850	0.7739	1.2709	1.3025	4.3466	4.0649	0.4940	1.4439	
R109-0a-mz1-2	1.1287	0.2419	0.5566	0.4016	0.7021	0.5449	1.4334	0.7920	1.3097	1.2542	4.3466	3.0466	0.4123	1.2166	
R109-0a-mz1-3	1.8852	0.2419	0.6815	0.4016	0.6754	0.5381	1.3753	0.7649	1.2613	1.3122	4.9458	3.8053	0.4855	1.4340	
R109-0a-mz1-4	1.8154	0.2419	0.6525	0.4111	0.6754	0.5315	1.3463	0.7739	1.2709	1.3219	4.1070	3.7753	0.4687	1.3647	
R109-0a-mz2-1	3.2230	0.2419	0.7398	0.8599	0.6401	0.5250	1.2692	0.7558	1.3388	1.8595	11.2226	5.0340	0.5725	1.0198	
R109-0a-mz2-2	3.1631	0.2419	0.7106	0.8797	0.6401	0.5250	1.2981	0.7558	1.2806	1.8398	9.8529	4.6443	0.5547	0.9415	
R109-0a-mz2-3	3.6527	0.2419	0.7203	0.9688	0.6401	0.5250	1.3173	0.7558	1.3097	1.8694	12.7823	4.4845	0.5547	0.9708	
R109-0a-mz2-4	3.8026	0.2419	0.7398	1.1573	0.6401	0.5250	1.2981	0.7558	1.3097	1.8890	11.6225	4.7542	0.5636	1.0492	
R109-0a-mz2-5	3.8026	0.2419	0.7398	0.9985	0.6401	0.5250	1.2788	0.7469	1.3097	1.8398	10.8826	4.5244	0.5636	1.0100	
R109-0a-mz2-6	3.8525	0.2419	0.7495	1.2369	0.6401	0.5186	1.2692	0.7469	1.2903	1.8890	18.8015	5.1039	0.5636	1.0591	
R109-0a-mz2-7	2.4640	0.2419	0.7690	0.4206	0.6576	0.5250	1.3270	0.7558	1.2903	1.5652	4.6562	5.0839	0.5547	1.2462	
R109-0a-mz2-8	2.1645	0.2419	0.7106	0.4111	0.6576	0.5315	1.3173	0.7558	1.2806	1.5456	4.4565	4.0749	0.5111	1.1870	
R109-0a-mz2-9	3.5628	0.2419	0.7301	0.6727	0.6488	0.5250	1.3077	0.7469	1.2806	1.7023	7.4539	4.2147	0.5547	0.9806	
R109-0a-mz2-10	3.2131	0.2419	0.7398	0.6825	0.6488	0.5250	1.2884	0.7469	1.2709	1.7416	7.5438	4.4245	0.5725	1.0296	
R109-0a-mz2-11	2.6837	0.2419	0.7495	0.5360	0.6488	0.5250	1.3077	0.7558	1.3194	1.6533	6.5944	4.8042	0.5459	1.2363	
R109-0a-mz2-12	3.6327	0.2419	0.7398	1.2567	0.6401	0.5250	1.3077	0.7379	1.3291	1.8989	12.8822	5.0340	0.5725	1.0787	
R109-0a-mz3-1	2.2643	0.2419	0.7398	0.6629	0.6401	0.5250	1.3077	0.7558	1.2903	1.7416	7.2140	4.4745	0.5636	1.0100	
R109-0a-mz3-2	3.5328	0.2419	0.7398	0.6923	0.6401	0.5250	1.2788	0.7558	1.3194	1.8300	7.9036	4.9640	0.5636	1.0394	
R109-0a-mz3-3	3.3729	0.2419	0.7398	0.7218	0.6313	0.5250	1.3173	0.7469	1.3194	1.8103	8.2435	4.8641	0.5725	1.0591	
R109-0a-mz3-4	3.3230	0.2419	0.7398	0.7809	0.6401	0.5250	1.3077	0.7558	1.3194	1.8792	9.1731	4.8042	0.5636	1.0296	
R109-0a-mz3-5	3.4628	0.2419	0.7495	0.8302	0.6313	0.5250	1.3173	0.7558	1.3777	1.8890	10.6127	4.7342	0.5636	1.0198	
R109-0a-mz3-6	3.4728	0.2419	0.7398	0.9489	0.6313	0.5250	1.3077	0.7558	1.3485	1.9186	10.2828	4.7642	0.5636	1.0296	
R109-0a-mz3-7	3.7326	0.2419	0.7398	0.7710	0.6401	0.5250	1.3077	0.7558	1.3291	1.8792	9.3631	4.9940	0.5636	1.0394	
R109-0a-mz3-8	2.9833	0.2419	0.7009	0.6825	0.6401	0.5250	1.3077	0.7558	1.3582	1.7808	8.9332	4.0749	0.5371	0.9904	
R109-0a-mz3-9	3.2630	0.2419	0.7301	0.6825	0.6401	0.5250	1.3077	0.7558	1.3194	1.8202	8.6133	4.5744	0.5547	0.9904	
R109-0a-mz3-10	3.4129	0.2419	0.7788	0.5457	0.6401	0.5250	1.2884	0.7558	1.3000	1.6729	6.9142	4.8641	0.5814	1.0787	

Mass percent **Group : mona2004** **Sample : samri051005**

No.	SiO2	P2O5	CaO	Y2O3	La2O3	Ce2O3	Pr2O3	Nd2O3	Sm2O3	Gd2O3	Dy2O3	PbO	ThO2	UO2	Total
R109-0b-mz1-1	0.1538	30.4000	1.0664	0.3732	14.4600	29.5100	3.1600	12.2800	2.0200	1.4000	0.1745	0.0908	4.2700	0.8906	100.2795
R109-0b-mz1-2	0.1585	30.4100	1.0411	0.4910	14.6400	29.7500	3.1400	12.2100	2.0000	1.3800	0.2563	0.0895	4.2300	0.8465	100.6736
R109-0b-mz1-3	0.1685	30.2800	1.0980	0.2213	14.4800	29.5000	3.2500	12.1000	1.9000	1.2900	0.1688	0.0975	4.5500	0.9019	100.0372
R109-0b-mz1-4	0.1775	30.3600	1.1258	0.1645	14.4100	29.5600	3.1100	12.1400	1.9500	1.2200	0.1533	0.0895	4.6900	0.8770	100.0593
R109-0b-mz1-5	0.1660	30.4900	1.0160	0.7025	14.5000	29.1900	3.0600	11.9800	2.0400	1.5900	0.2821	0.0878	4.0100	0.8589	100.0039
R109-0b-mz1-6	0.1136	30.5800	0.5998	1.1842	14.8500	30.2200	3.1800	12.1100	1.9200	1.4400	0.5488	0.0605	2.4900	0.4664	99.7872
R109-0b-mz1-7	0.1184	30.7400	0.6635	1.2552	14.6300	30.1100	3.1900	12.2200	1.9900	1.6100	0.5652	0.0604	2.6800	0.5338	100.3918
R109-0b-mz2-1	0.2543	30.4400	1.2091	0.8076	13.8100	28.7500	3.0200	12.3100	2.1200	1.4200	0.4216	0.0921	5.1000	0.6306	100.4238
R109-0b-mz2-2	0.1515	30.5300	0.7534	0.7755	14.8200	29.9300	3.1700	12.5000	2.1100	1.4600	0.4498	0.0651	3.0100	0.6212	100.3709
R109-0b-mz2-3	0.3339	30.3100	1.4900	1.7700	12.7500	26.6500	2.9400	11.6800	2.1500	2.0500	0.8325	0.1147	6.7900	0.7863	100.7032
R109-0b-mz2-4	0.2342	30.5100	1.1236	1.4400	13.7000	28.3700	3.0700	12.0800	2.0600	1.7400	0.6916	0.0972	4.8700	0.6973	100.7248
R109-0b-mz2-5	0.4287	30.1100	1.7300	1.5000	12.0900	25.6400	2.7700	11.2400	2.1000	2.0200	0.6375	0.1524	8.6200	0.7923	99.8972
R109-0b-mz2-6	0.3937	30.2100	1.7600	1.4300	12.2800	25.8900	2.7900	11.5900	2.1300	1.9900	0.6685	0.1565	8.5400	0.8527	100.7467

k-ratio errors (1-sigma %)

No.	Si	P	Ca	Y	La	Ce	Pr	Nd	Sm	Gd	Dy	Pb	Th	U
R109-0b-mz1-1	3.4229	0.2419	0.7301	1.3562	0.6313	0.5250	1.3077	0.7469	1.3485	2.0369	18.7215	4.8841	0.5547	1.0296
R109-0b-mz1-2	3.3230	0.2419	0.7398	1.0679	0.6313	0.5186	1.3270	0.7558	1.3582	2.0566	12.7223	4.8941	0.5547	1.0689
R109-0b-mz1-3	3.1131	0.2419	0.7106	2.1739	0.6313	0.5250	1.2788	0.7558	1.4166	2.1752	19.2115	4.6043	0.5459	1.0198
R109-0b-mz1-4	2.9933	0.2419	0.7009	2.8729	0.6313	0.5250	1.3270	0.7558	1.3777	2.2840	21.0314	5.0240	0.5371	1.0394
R109-0b-mz1-5	3.1531	0.2419	0.7495	0.7908	0.6313	0.5250	1.3366	0.7558	1.3291	1.8005	11.6225	4.9540	0.5725	1.0591
R109-0b-mz1-6	4.5022	0.2419	1.0341	0.5263	0.6313	0.5186	1.2981	0.7558	1.3874	1.9679	5.9948	6.6530	0.7374	1.7912
R109-0b-mz1-7	4.3523	0.2419	0.9749	0.5070	0.6313	0.5186	1.2981	0.7558	1.3582	1.7907	5.8649	6.6130	0.7094	1.5926
R109-0b-mz2-1	2.1845	0.2419	0.6719	0.7120	0.6488	0.5250	1.3559	0.7558	1.3000	2.0172	7.8137	4.6643	0.5111	1.3647
R109-0b-mz2-2	3.4428	0.2419	0.8963	0.7316	0.6313	0.5186	1.2981	0.7469	1.3000	1.9482	7.3039	6.4631	0.6631	1.3944
R109-0b-mz2-3	1.7357	0.2419	0.6044	0.4016	0.6665	0.5381	1.3850	0.7739	1.2903	1.4676	4.0571	3.6854	0.4604	1.1279
R109-0b-mz2-4	2.3442	0.2419	0.7009	0.4588	0.6488	0.5250	1.3366	0.7558	1.3291	1.6925	4.8459	4.3346	0.5284	1.2560
R109-0b-mz2-5	1.4169	0.2419	0.5566	0.4492	0.6843	0.5381	1.4431	0.7920	1.3097	1.4871	5.2755	2.8969	0.4201	1.1180
R109-0b-mz2-6	1.5264	0.2419	0.5566	0.4588	0.6843	0.5381	1.4431	0.7739	1.3000	1.5163	5.0157	2.8371	0.4201	1.0492

Mass percent **Group : mona2004** **Sample : smari071005**

No.	SiO2	P2O5	CaO	Y2O3	La2O3	Ce2O3	Pr2O3	Nd2O3	Sm2O3	Gd2O3	Dy2O3	PbO	ThO2	UO2	Total
managot1	1.9890	27.1800	0.9272	0.1980	14.2600	28.7800	2.9700	9.6300	0.9775	0.4836	0.0509	0.2856	11.6200	0.2119	99.6422
managot2	1.9658	27.2200	0.9316	0.1986	14.2800	28.5200	2.9800	9.4500	0.9402	0.4907	0.0909	0.2875	11.6800	0.1925	99.3066
managot3	1.9996	27.2100	0.9245	0.1936	14.2000	28.7000	2.9900	9.5900	0.9979	0.4230	0.1206	0.2851	11.6300	0.1833	99.5262
managot4	1.9876	27.2900	0.9153	0.2065	14.0800	28.6200	2.9500	9.6500	0.9854	0.4225	0.0533	0.2814	11.7700	0.2123	99.5039
managot5	2.0028	27.3200	0.9155	0.2039	14.1500	28.7000	2.9500	9.5800	0.9971	0.4134	0.1286	0.2966	11.6900	0.2039	99.6307
R225-150-mz2-1	0.1970	30.5700	0.7955	0.5724	14.2300	29.7200	3.3600	12.9500	2.3500	1.8300	0.3298	0.0528	3.4700	0.4607	100.9143
R225-150-mz2-2	0.2362	30.6800	0.8277	0.5400	14.0900	29.7000	3.2900	12.8900	2.3000	1.7700	0.3786	0.0649	3.6500	0.4367	100.8812
R225-150-mz2-3	0.2139	30.7000	0.7133	0.5421	14.3900	29.8500	3.3600	13.0100	2.3100	1.7200	0.4172	0.0524	3.2700	0.4122	100.9858
R225-150-mz2-4	0.2483	30.6600	0.7363	0.5001	14.4300	29.6100	3.3700	12.7100	2.2300	1.6500	0.3203	0.0548	3.2900	0.4064	100.2408
R225-150-mz2-5	0.2384	30.9400	0.7126	0.5309	14.2100	29.2800	3.4000	12.8800	2.2500	1.6500	0.3248	0.0397	3.2300	0.3874	100.0983
R225-150-mz2-6	0.2458	30.8100	0.8304	0.5381	14.1200	29.1600	3.3100	12.6600	2.2700	1.7600	0.3785	0.0514	3.8900	0.4352	100.4881
R225-150-mz2-7	0.2387	30.9600	0.8502	0.5391	14.0300	29.6800	3.3600	12.8400	2.3200	1.7500	0.4343	0.0584	3.8700	0.4400	101.3993
R225-150-mz2-8	0.1988	30.7900	0.7932	0.5519	14.2800	29.8800	3.3700	13.0400	2.3300	1.8100	0.3924	0.0554	3.6500	0.4292	101.5982
R225-150-mz2-9	0.2076	30.7300	0.8087	0.5278	14.1900	29.7900	3.3300	12.9900	2.3500	1.7800	0.3712	0.0595	3.6800	0.4129	101.2551
R225-150-mz2-10	0.1879	30.7700	0.7770	0.5635	14.3800	29.5700	3.3700	12.8100	2.2900	1.7500	0.3727	0.0545	3.4800	0.4224	100.8242
R225-150-mz2-11	0.2154	30.5600	0.8375	0.5451	14.2900	29.2400	3.3300	12.4800	2.2800	1.7000	0.3735	0.0577	3.8200	0.4504	100.2080
R225-150-mz2-12	0.1858	30.5400	0.6583	0.5325	14.6200	30.1500	3.4000	12.9000	2.2900	1.7100	0.3400	0.0397	2.9700	0.3847	100.7437
R225-150-mz2-13	0.2328	30.4900	0.8396	0.5497	14.2400	29.8600	3.4000	12.7800	2.2800	1.7300	0.4013	0.0637	3.9700	0.4562	101.3226
R225-150-mz2-14	0.2124	30.4400	0.8446	0.5504	14.1400	29.6100	3.4500	12.9800	2.3500	1.8600	0.3116	0.0622	3.7700	0.4580	101.0672
R225-150-mz3-1	0.1870	30.5500	0.7584	0.5783	14.2100	29.4600	3.4100	13.1500	2.3000	1.7700	0.3699	0.0494	3.4200	0.4603	100.6992
R225-150-mz3-2	0.1766	30.5700	0.6812	0.5209	14.3000	30.0500	3.4200	13.2100	2.3400	1.8400	0.3916	0.0457	3.1300	0.4090	101.1086
R225-150-mz3-3	0.1796	30.6200	0.6682	0.3818	14.0900	29.6200	3.3600	13.0100	2.3200	1.9100	0.3061	0.0547	3.0400	0.4063	99.9892
R225-150-mz3-4	0.2233	30.3800	0.9753	0.3984	13.6500	28.6700	3.2500	12.7300	2.3900	1.9900	0.3170	0.0746	4.3300	0.6272	100.0366
R225-150-mz3-5	0.1821	30.7400	0.8277	0.4898	13.8400	29.3100	3.2900	12.4900	2.3500	1.8800	0.3215	0.0660	3.7100	0.4810	100.0054
R225-150-mz3-6	0.2135	30.3500	0.9198	0.3099	13.8900	29.2400	3.3600	12.8700	2.3100	1.9200	0.2518	0.0689	4.3200	0.5365	100.5905
R225-150-mz3-8	0.1816	30.5400	0.7677	0.4720	14.2000	29.5000	3.3200	12.8900	2.2800	1.8800	0.3229	0.0520	3.3500	0.4506	100.2316
R225-150-mz3-7	0.1760	30.5700	0.8189	0.5184	13.8700	29.5400	3.3700	12.7700	2.2900	1.8700	0.3441	0.0573	3.6900	0.4779	100.3899
R225-150-mz3-9	0.1579	30.3800	0.7050	0.4360	14.1500	29.8200	3.4500	13.0100	2.3600	1.8900	0.3687	0.0517	3.1800	0.4176	100.4004
R225-150-mz3-10	0.2395	30.4500	0.9050	0.3844	13.9600	28.9700	3.3900	12.8500	2.3000	1.8900	0.2659	0.0715	4.3300	0.4523	100.4893

k-ratio errors (1-sigma %)

No.	Si	P	Ca	Y	La	Ce	Pr	Nd	Sm	Gd	Dy	Pb	Th	U
managot1	0.5096	0.2419	0.7983	2.4235	0.6401	0.5250	1.3753	0.8562	2.5105	5.4400	64.1004	1.7813	0.3821	3.0466
managot2	0.5096	0.2419	0.7983	2.4135	0.6401	0.5250	1.3753	0.8654	2.6097	5.3801	36.1308	1.7713	0.3821	3.2761
managot3	0.5000	0.2419	0.7983	2.4734	0.6401	0.5250	1.3753	0.8562	2.4708	6.2287	27.0611	1.7912	0.3821	3.3959
managot4	0.5096	0.2419	0.8081	2.3137	0.6401	0.5250	1.3850	0.8562	2.5006	6.2287	61.3605	1.8011	0.3821	3.0266
managot5	0.5000	0.2419	0.8081	2.3536	0.6401	0.5250	1.3850	0.8654	2.4708	6.3885	25.5011	1.7117	0.3821	3.1264
R225-150-mz2-1	2.7336	0.2419	0.8668	0.9489	0.6401	0.5186	1.2596	0.7290	1.1937	1.6043	9.9529	7.7626	0.6174	1.8011
R225-150-mz2-2	2.3442	0.2419	0.8472	0.9886	0.6401	0.5186	1.2788	0.7290	1.2130	1.6533	8.6833	6.4931	0.5993	1.8807
R225-150-mz2-3	2.5538	0.2419	0.9257	0.9886	0.6313	0.5186	1.2500	0.7290	1.2033	1.6925	7.8637	7.8525	0.6356	1.9702
R225-150-mz2-4	2.2444	0.2419	0.9061	1.0580	0.6313	0.5186	1.2404	0.7379	1.2419	1.7514	10.2328	7.5526	0.6356	1.9901
R225-150-mz2-5	2.3342	0.2419	0.9257	1.0084	0.6401	0.5250	1.2404	0.7290	1.2419	1.7514	10.0929	9.8920	0.6356	2.0796
R225-150-mz2-6	2.2743	0.2419	0.8472	0.9985	0.6401	0.5250	1.2596	0.7379	1.2226	1.6533	8.6333	7.8725	0.5814	1.8707
R225-150-mz2-7	2.3442	0.2419	0.8276	0.9985	0.6401	0.5186	1.2500	0.7379	1.2130	1.6729	7.5738	7.1128	0.5814	1.8508
R225-150-mz2-8	2.7336	0.2419	0.8668	0.9787	0.6401	0.5186	1.2500	0.7290	1.2033	1.6239	8.3435	7.4427	0.5993	1.9105
R225-150-mz2-9	2.6138	0.2419	0.8570	1.0183	0.6401	0.5186	1.2596	0.7290	1.1937	1.6533	8.8632	7.0029	0.5993	1.9702
R225-150-mz2-10	2.8734	0.2419	0.8766	0.9589	0.6313	0.5250	1.2500	0.7379	1.2130	1.6729	8.7833	7.5526	0.6174	1.9304
R225-150-mz2-11	2.5339	0.2419	0.8374	0.9886	0.6401	0.5250	1.2596	0.7469	1.2226	1.7121	8.7833	7.1528	0.5903	1.8210
R225-150-mz2-12	2.9134	0.2419	0.9749	1.0084	0.6313	0.5186	1.2404	0.7290	1.2130	1.7023	9.5530	9.9720	0.6723	2.0995
R225-150-mz2-13	2.3841	0.2419	0.8374	0.9787	0.6401	0.5186	1.2404	0.7379	1.2226	1.6925	8.1735	6.5630	0.5725	1.7912
R225-150-mz2-14	2.5838	0.2419	0.8276	0.9787	0.6401	0.5186	1.2212	0.7290	1.1937	1.5847	10.5227	6.7130	0.5903	1.8011
R225-150-mz3-1	2.8734	0.2419	0.8865	0.9390	0.6401	0.5250	1.2404	0.7201	1.2226	1.6631	8.8533	8.1625	0.6174	1.7912
R225-150-mz3-2	3.0432	0.2419	0.9552	1.0283	0.6313	0.5186	1.2308	0.7201	1.1937	1.5945	8.3235	8.7523	0.6539	1.9901
R225-150-mz3-3	3.0033	0.2419	0.9651	1.3463	0.6401	0.5186	1.2404	0.7290	1.1937	1.5359	10.5127	7.6026	0.6539	1.9801
R225-150-mz3-4	2.4540	0.2419	0.7593	1.2866	0.6488	0.5250	1.2884	0.7379	1.1744	1.4968	10.2528	5.7435	0.5547	1.3647
R225-150-mz3-5	2.9633	0.2419	0.8374	1.0878	0.6401	0.5250	1.2596	0.7469	1.1841	1.5456	10.0829	6.3631	0.5903	1.7018
R225-150-mz3-6	2.5538	0.2419	0.7885	1.6152	0.6401	0.5250	1.2500	0.7379	1.2033	1.5456	12.8822	6.1732	0.5547	1.5628
R225-150-mz3-8	2.9433	0.2419	0.8865	1.1176	0.6401	0.5250	1.2596	0.7290	1.2226	1.5554	10.0929	7.9025	0.6265	1.8210
R225-150-mz3-7	3.0332	0.2419	0.8472	1.0183	0.6488	0.5186	1.2500	0.7379	1.2226	1.5750	9.4830	7.2028	0.5993	1.7217
R225-150-mz3-9	3.3529	0.2419	0.9356	1.1871	0.6401	0.5186	1.2212	0.7290	1.1841	1.5554	8.8133	7.9325	0.6447	1.9503
R225-150-mz3-10	2.3142	0.2419	0.7983	1.3264	0.6401	0.5250	1.2404	0.7379	1.2130	1.5652	12.2424	5.9334	0.5547	1.8011

Mass percent **Group : mona2004** **Sample : smari071005**

No.	SiO2	P2O5	CaO	Y2O3	La2O3	Ce2O3	Pr2O3	Nd2O3	Sm2O3	Gd2O3	Dy2O3	PbO	ThO2	UO2	Total
R225-150-mz4-1	0.1947	30.4600	0.6617	0.4826	14.4500	30.1800	3.3700	13.0100	2.3000	1.7000	0.3553	0.0495	2.8300	0.3967	100.4620
R225-150-mz4-2	0.1978	30.4700	0.8304	0.4788	14.0100	29.5700	3.3400	13.0200	2.4100	1.8700	0.4003	0.0594	3.6400	0.5237	100.8472
R225-150-mz4-3	0.1743	30.6100	0.7637	0.5243	14.2700	30.2900	3.3300	13.0500	2.3900	1.8200	0.3551	0.0575	3.1800	0.4984	101.3374
R225-150-mz4-4	0.1785	30.5100	0.6435	0.4962	14.5000	30.2400	3.4300	12.9600	2.3100	1.8100	0.3460	0.0417	2.8800	0.4308	100.7986
R225-150-mz4-5	0.2012	30.6000	0.7488	0.3824	14.3500	30.0400	3.4300	13.1800	2.3100	1.7300	0.3258	0.0579	3.2300	0.4116	101.0211
R225-150-mz4-6	0.1812	30.5200	0.7582	0.5047	14.4900	29.8500	3.3700	13.0800	2.3500	1.7500	0.3643	0.0483	3.2200	0.4457	100.9566
R225-150-mz4-7	0.1846	30.5400	0.7114	0.4955	14.5300	29.9200	3.3700	12.8400	2.2500	1.6700	0.4011	0.0492	3.1900	0.4256	100.6013
R225-150-mz4-8	0.1943	30.4500	0.7379	0.5258	14.4000	29.7800	3.4500	12.9500	2.3100	1.7600	0.4131	0.0492	3.2000	0.4590	100.7034
R225-150-mz4-9	0.2303	30.4600	0.7292	0.4784	14.6400	30.1200	3.4300	12.8600	2.3200	1.7100	0.3773	0.0578	3.2300	0.4226	101.0896
R225-150-mz4-10	0.1953	30.5400	0.7439	0.4380	14.4100	29.9600	3.3500	13.1800	2.3300	1.6900	0.3597	0.0500	3.2300	0.4266	100.9273

k-ratio errors (1-sigma %)

No.	Si	P	Ca	Y	La	Ce	Pr	Nd	Sm	Gd	Dy	Pb	Th	U
R225-150-mz4-1	2.7735	0.2419	0.9749	1.0977	0.6313	0.5186	1.2500	0.7290	1.2130	1.7023	9.1831	8.2924	0.6815	2.0398
R225-150-mz4-2	2.7436	0.2419	0.8472	1.0977	0.6401	0.5186	1.2596	0.7290	1.1744	1.5847	8.1735	7.0228	0.5993	1.5926
R225-150-mz4-3	3.0532	0.2419	0.8865	1.0183	0.6401	0.5186	1.2596	0.7290	1.1744	1.6141	9.2031	7.2128	0.6447	1.6720
R225-150-mz4-4	2.9933	0.2419	0.9946	1.0679	0.6313	0.5186	1.2308	0.7290	1.2033	1.6141	9.4431	9.5521	0.6815	1.8906
R225-150-mz4-5	2.6936	0.2419	0.8963	1.3363	0.6313	0.5186	1.2308	0.7201	1.2033	1.6729	9.9929	7.2628	0.6356	1.9702
R225-150-mz4-6	2.9733	0.2419	0.8865	1.0580	0.6313	0.5186	1.2500	0.7290	1.1841	1.6631	9.0032	8.4024	0.6356	1.8310
R225-150-mz4-7	2.8934	0.2419	0.9356	1.0679	0.6313	0.5186	1.2500	0.7290	1.2323	1.7317	8.1136	8.2824	0.6356	1.9006
R225-150-mz4-8	2.7635	0.2419	0.9061	1.0183	0.6313	0.5186	1.2212	0.7290	1.2033	1.6533	7.9536	8.3224	0.6447	1.7912
R225-150-mz4-9	2.3741	0.2419	0.9159	1.0977	0.6313	0.5186	1.2308	0.7290	1.2033	1.7023	8.6533	7.1928	0.6356	1.9304
R225-150-mz4-10	2.7635	0.2419	0.9061	1.1871	0.6313	0.5186	1.2596	0.7201	1.1937	1.7219	9.0532	8.1924	0.6356	1.9006

Mass percent **Group : mona2004** **Sample : samri061005**

No.	SiO2	P2O5	CaO	Y2O3	La2O3	Ce2O3	Pr2O3	Nd2O3	Sm2O3	Gd2O3	Dy2O3	PbO	ThO2	UO2	Total
managot1	2.0051	27.3700	0.8981	0.2015	14.4500	28.9100	2.9800	9.6200	0.9831	0.4709	0.0948	0.2925	11.6700	0.2087	100.2335
managot2	1.9911	27.3900	0.9161	0.1980	14.3400	28.8500	2.9800	9.5800	0.9724	0.4440	0.0527	0.2907	11.7100	0.2036	99.9976
managot3	1.9950	27.4400	0.9091	0.2059	14.2800	28.7200	2.9900	9.7100	0.9522	0.4770	0.0901	0.2975	11.7800	0.2096	100.1358
managot4	1.9893	27.4200	0.9055	0.2044	14.4300	28.8800	2.9500	9.6400	0.9101	0.4160	0.0773	0.2842	11.7500	0.1971	100.1332
managot5	1.9936	27.4100	0.9117	0.1964	14.4100	28.8800	3.0000	9.7000	0.9901	0.3911	0.0801	0.2887	11.6900	0.2138	100.2343
R225-150-mz1-1	0.2352	30.0200	0.8338	0.5057	13.6500	28.5500	3.2500	12.5200	2.2900	1.7600	0.3834	0.0605	3.7300	0.4784	98.2946
R225-150-mz1-2	0.1935	29.9300	0.8155	0.5184	13.8000	28.7700	3.2500	12.3100	2.3000	1.8500	0.3414	0.0619	3.6100	0.5364	98.3140
R225-150-mz1-3	0.1993	30.0700	0.6913	0.4569	14.1800	29.2700	3.3300	12.4600	2.2000	1.6100	0.2716	0.0477	3.0600	0.3928	98.2625
R225-150-mz1-4	0.1835	30.2000	0.7119	0.4686	14.0100	29.1200	3.3100	12.5500	2.2900	1.8100	0.3931	0.0541	3.1700	0.4767	98.7717
R225-150-mz1-5	0.2730	30.1400	0.9916	0.2349	13.5500	28.8000	3.2700	12.5400	2.2000	1.7300	0.1315	0.0766	4.6900	0.5296	99.1895
R225-150-mz1-6	0.2348	30.3000	0.7785	0.4528	13.8100	28.9600	3.3600	12.5900	2.3000	1.8100	0.3491	0.0615	3.6800	0.4596	99.1733
R225-150-mz1-7	0.2675	30.2600	0.8769	0.4712	14.0900	28.8700	3.3100	12.5700	2.2500	1.6800	0.3199	0.0629	4.2000	0.4484	99.7073
R225-150-mz1-8	0.2756	30.2800	0.8768	0.3154	13.7700	28.9600	3.3000	12.7500	2.3300	1.8300	0.2855	0.0642	4.2300	0.4822	99.7795
R225-150-mz1-9	0.2459	30.3600	0.8058	0.2683	14.0500	29.3800	3.3100	12.7800	2.2900	1.8200	0.2916	0.0458	3.7600	0.4764	99.9102

k-ratio errors (1-sigma %)

No.	Si	P	Ca	Y	La	Ce	Pr	Nd	Sm	Gd	Dy	Pb	Th	U
managot1	0.5000	0.2419	0.8179	2.3835	0.6401	0.5250	1.3753	0.8562	2.5105	5.6097	34.6308	1.7515	0.3821	3.0865
managot2	0.5000	0.2419	0.8081	2.4135	0.6401	0.5250	1.3753	0.8654	2.5303	5.9492	62.0405	1.7614	0.3821	3.1364
managot3	0.5000	0.2419	0.8081	2.3137	0.6401	0.5250	1.3753	0.8562	2.5898	5.5398	36.2708	1.7316	0.3821	3.0665
managot4	0.5000	0.2419	0.8179	2.3336	0.6401	0.5250	1.3850	0.8562	2.7090	6.3686	42.4207	1.8011	0.3821	3.2062
managot5	0.5000	0.2419	0.8081	2.4335	0.6401	0.5250	1.3753	0.8562	2.4708	6.7081	40.7207	1.7614	0.3821	3.0166
R225-150-mz1-1	2.3142	0.2419	0.8276	1.0283	0.6401	0.5250	1.2596	0.7379	1.1937	1.6435	8.3834	6.7630	0.5903	1.6919
R225-150-mz1-2	2.7436	0.2419	0.8374	1.0084	0.6401	0.5250	1.2692	0.7469	1.1937	1.5750	9.4530	6.6530	0.5993	1.5430
R225-150-mz1-3	2.6637	0.2419	0.9356	1.1275	0.6313	0.5250	1.2404	0.7379	1.2419	1.7612	11.8424	8.4824	0.6539	2.0398
R225-150-mz1-4	2.8834	0.2419	0.9257	1.1077	0.6401	0.5250	1.2596	0.7379	1.2033	1.6043	8.2335	7.6126	0.6447	1.7217
R225-150-mz1-5	2.0448	0.2419	0.7495	2.0641	0.6488	0.5250	1.2692	0.7379	1.2419	1.6729	24.4012	5.6435	0.5284	1.5628
R225-150-mz1-6	2.3442	0.2419	0.8766	1.1573	0.6488	0.5250	1.2404	0.7379	1.2130	1.6043	9.3131	6.8029	0.5993	1.7813
R225-150-mz1-7	2.1146	0.2419	0.8179	1.1077	0.6401	0.5250	1.2596	0.7379	1.2323	1.7317	10.2028	6.6530	0.5636	1.8210
R225-150-mz1-8	2.0548	0.2419	0.8179	1.5953	0.6488	0.5250	1.2692	0.7379	1.2033	1.6043	11.3825	6.6130	0.5547	1.7018
R225-150-mz1-9	2.2743	0.2419	0.8570	1.8546	0.6401	0.5250	1.2692	0.7379	1.2130	1.6141	11.0926	8.9622	0.5903	1.7316

Mass percent **Group : mona2004** **Sample : smari071005**

No.	SiO2	P2O5	CaO	Y2O3	La2O3	Ce2O3	Pr2O3	Nd2O3	Sm2O3	Gd2O3	Dy2O3	PbO	ThO2	UO2	Total
managot1	1.9890	27.1800	0.9272	0.1980	14.2600	28.7800	2.9700	9.6300	0.9775	0.4836	0.0509	0.2856	11.6200	0.2119	99.6422
managot2	1.9658	27.2200	0.9316	0.1986	14.2800	28.5200	2.9800	9.4500	0.9402	0.4907	0.0909	0.2875	11.6800	0.1925	99.3066
managot3	1.9996	27.2100	0.9245	0.1936	14.2000	28.7000	2.9900	9.5900	0.9979	0.4230	0.1206	0.2851	11.6300	0.1833	99.5262
managot4	1.9876	27.2900	0.9153	0.2065	14.0800	28.6200	2.9500	9.6500	0.9854	0.4225	0.0533	0.2814	11.7700	0.2123	99.5039
managot5	2.0028	27.3200	0.9155	0.2039	14.1500	28.7000	2.9500	9.5800	0.9971	0.4134	0.1286	0.2966	11.6900	0.2039	99.6307
R226-120-mz1-1	0.1637	30.6700	0.7168	0.5541	14.4700	29.9700	3.4200	12.7400	2.3300	1.5900	0.3582	0.0536	3.2700	0.4360	100.7672
R226-120-mz1-2	0.1437	30.8100	0.7111	0.5732	14.4400	29.8500	3.4000	12.7900	2.2800	1.6100	0.3659	0.0610	3.1700	0.4299	100.6590
R226-120-mz1-3	0.1760	30.5900	0.9006	0.5415	14.2600	29.3900	3.3300	12.6300	2.2400	1.5600	0.3601	0.0702	4.0700	0.4972	100.6456
R226-120-mz1-4	0.1945	30.5300	0.8492	0.5468	14.3900	29.4100	3.2800	12.5800	2.2500	1.6400	0.3038	0.0682	3.9900	0.4363	100.4984
R226-120-mz1-5	0.1335	30.6300	0.6675	0.5113	14.7500	30.2600	3.4500	12.8200	2.2100	1.5700	0.3208	0.0567	3.0200	0.3834	100.8061
R226-120-mz1-6	0.1748	30.5000	0.7977	0.5773	14.5900	29.9600	3.3100	12.7900	2.2400	1.5600	0.3797	0.0594	3.5200	0.4942	100.9796
R226-120-mz1-7	0.1796	30.4200	0.7551	0.5510	14.5200	29.6900	3.3100	12.4800	2.2200	1.5600	0.3767	0.0669	3.5200	0.4359	100.1116

k-ratio errors (1-sigma %)

No.	Si	P	Ca	Y	La	Ce	Pr	Nd	Sm	Gd	Dy	Pb	Th	U
managot1	0.5096	0.2419	0.7983	2.4235	0.6401	0.5250	1.3753	0.8562	2.5105	5.4400	64.1004	1.7813	0.3821	3.0466
managot2	0.5096	0.2419	0.7983	2.4135	0.6401	0.5250	1.3753	0.8654	2.6097	5.3801	36.1308	1.7713	0.3821	3.2761
managot3	0.5000	0.2419	0.7983	2.4734	0.6401	0.5250	1.3753	0.8562	2.4708	6.2287	27.0611	1.7912	0.3821	3.3959
managot4	0.5096	0.2419	0.8081	2.3137	0.6401	0.5250	1.3850	0.8562	2.5006	6.2287	61.3605	1.8011	0.3821	3.0266
managot5	0.5000	0.2419	0.8081	2.3536	0.6401	0.5250	1.3850	0.8654	2.4708	6.3885	25.5011	1.7117	0.3821	3.1264
R226-120-mz1-1	3.2230	0.2419	0.9257	0.9688	0.6313	0.5186	1.2308	0.7379	1.1937	1.8202	9.1232	7.7226	0.6356	1.8707
R226-120-mz1-2	3.6227	0.2419	0.9257	0.9390	0.6313	0.5186	1.2404	0.7379	1.2130	1.7907	8.9132	6.9029	0.6447	1.9006
R226-120-mz1-3	3.0232	0.2419	0.7983	0.9886	0.6401	0.5250	1.2500	0.7379	1.2323	1.8398	9.0432	6.0533	0.5725	1.6621
R226-120-mz1-4	2.7635	0.2419	0.8276	0.9787	0.6313	0.5250	1.2596	0.7379	1.2323	1.7514	10.7627	6.1533	0.5725	1.8608
R226-120-mz1-5	3.8725	0.2419	0.9651	1.0382	0.6313	0.5186	1.2308	0.7290	1.2516	1.8300	10.1228	7.3527	0.6631	2.0896
R226-120-mz1-6	3.0432	0.2419	0.8570	0.9291	0.6313	0.5186	1.2692	0.7379	1.2323	1.8300	8.5934	6.9529	0.6084	1.6720
R226-120-mz1-7	2.9733	0.2419	0.8963	0.9688	0.6313	0.5186	1.2500	0.7469	1.2419	1.8398	8.6533	6.2932	0.6084	1.8608

Appendix C: JCU Sample Collection

JCU Collection Number	Sample Number	JCU Collection Number	Sample Number
	Conanicut		*Scotland Schist*
72398	R117	72437	R10
72399	R119	72438	R36
72400	R121	72439	R39
72401	R122	72440	R40
72402	R124	72441	R41
72403	R125	72442	R43
72404	R126	72443	R44
72405	R127	72444	R45
72406	R219	72445	R46
72407	R220	72446	R49
72408	R222	72447	R50
72409	R223	72448	R54
72410	R224	72449	R56
72411	R225	72450	R57
72412	R226	72451	R66
72413	R227	72452	R69
72414	R228	72453	R74
72415	R230	72454	R75
72416	R231	72455	R76
72417	R232	72456	R77
72418	R233	72457	R79
72419	R234	72458	R83
72420	R235	72459	R84
72421	R236	72460	R86
72422	R237	72461	R93
72423	R238	72462	R94
72424	R240	72463	R95
72425	R241	72464	R96
72426	R242	72465	R97
72427	R243	72466	R98
72428	R244	72467	R100
72429	R245	72468	R101
72430	R246	72469	R103
	Prudence	72470	R107
72431	R200	72471	R108
72432	R202	72472	R109
72433	R203	72473	R110
72434	R209	72474	R112
72435	R211	72475	R113
72436	R212		