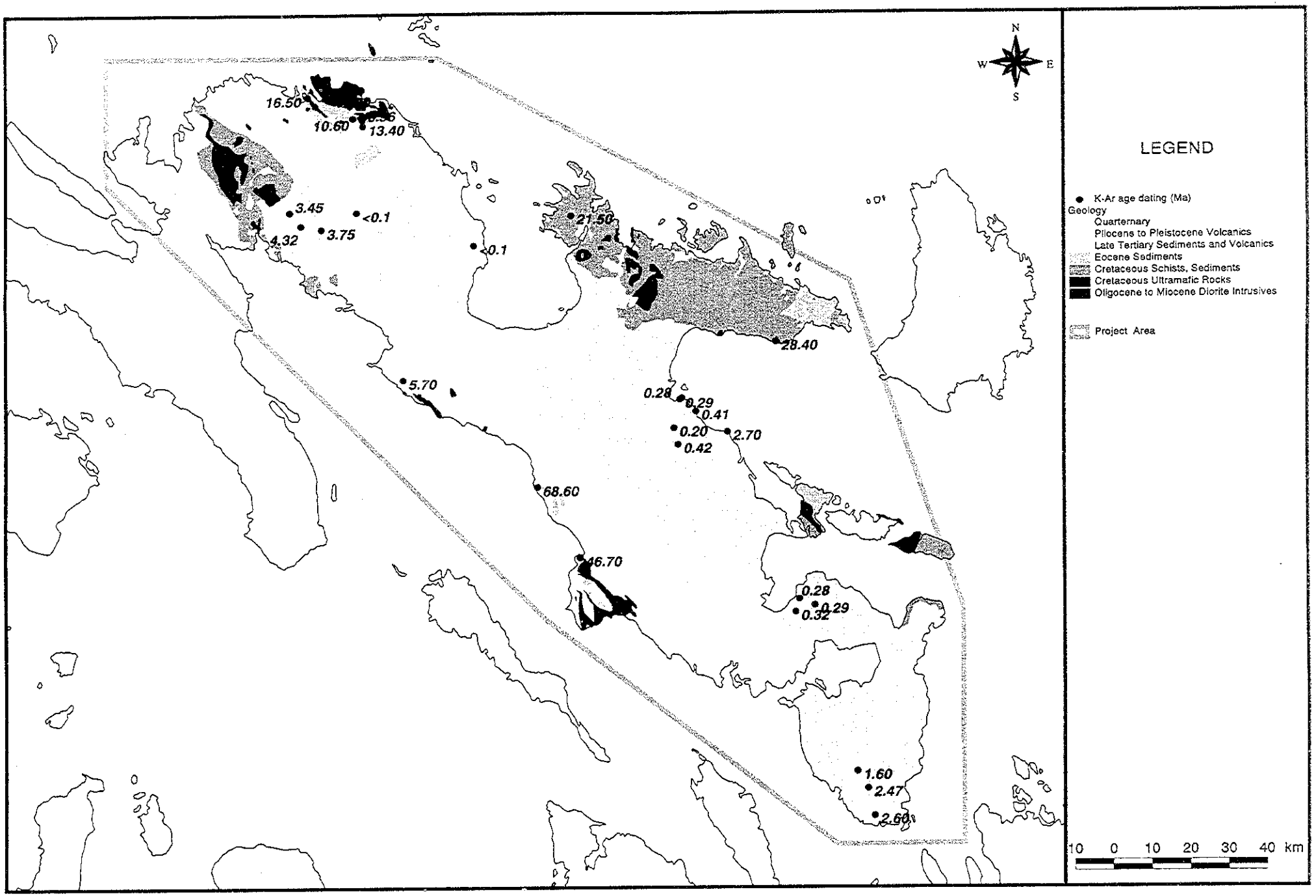
Appendix 15

sample_KAR	locality	rock_type	age_Ma	+/-Ma	air_cont_%	remarks
SM28	Tiwi	dacite	2.70	0.10	84.1	
SM02	Pantao-Nagas-Cabarian	diorite	46.70	6.50	76.4	
SM39	Sisigon	Px andesite	1.60	0.10	89.2	
SM46	San Roque-Mt. Malobago	dacite	-	-	-	
TH54	Ginablam		2.60	0.30	73.8	
TH73	Siruma	Sericite schist	21.50	0.40	6.1	
SM73	Western Pasacao	Px andesite	5.70	0.10	59.4	
SM79	Caorasan, Balatan	alt. andesite	68.60	2.90	37.5	
TH63	Sibobo	alunite	-	-	-	
TH67	Sibobo	alunite	-	-	-	
KY78d	Paracale	clay	-	-	-	
TH108	Bessemar Pit	biotite	16.50	0.30	71.0	
TH90	Mt. Bagacay	Hb andesite	13.40	0.70	90.4	
SM95	Mt. Culasi	dacite	<0.1	-	-	
SM98	Mt. Labo	Bi-Hb dacite	<0.1	-	-	
PKY258	Santa Cruz, Buhi, Tiwi-Mt. Malinao area	Px-Hbl andesite	0.42	0.05	64.8	
PKY297	the south of Susungdalaga Mts., Kilbay ar	Bt-Hbl andesite	4.32	0.48	72.6	Bt, Hbl separation
PTH205	east of Cawayan, Bacon-Manito area	Px andesite	0.32	0.04	76.5	
PTH208	Malobago, Bacon-Manito area	Px andesite	0.28	0.03	67.9	
PTH250	west of Pange, Gate Mountains area	Px-Hbl andesite	2.47	0.28	54.6	
PTH270	Inalait River, Tiwi-Mt. Malinao area	Px andesite	0.20	0.03	96.2	
PTH285	the coast, Tiwi-Mt. Malinao area	(Px) Hbl andesite	0.29	0.03	88.2	
PTH287	the coast, Tiwi-Mt. Malinao area	Hbl andesite	0.28	0.03	96.6	Hbl purify
PTH296	the coast, Tiwi-Mt. Malinao area	Px-Hbl andesite	0.41	0.05	77.1	
PTH314	Bulalacan, Eastern Caramoan area	diorite	28.40	3.20	12.9	
PTH333	Alawihaw creek, Kilbay area	Hbl-Bt andesite	3.75	0.42	25.3	
PTH353	Tonton River, Kilbay area	Bt dacite	3.45	0.39	45.9	
PTH367	Napangasan, Babel, Mt. Bagacay area	tonalite to qtz diorit	6.96	0.76	61.7	Hbl-bt purify
PTH382	Benget Mine, Paracale area	granodiorite	17.20	1.90	34.2	Bt purify
PSM217	Buyo River, Bacon-Manito area	hb andesite	0.29	0.03	70.8	
PSM285	Mt. Bagacay area	diorite	10.60	1.20	14.4	

Appendix 16


N
W
E
S
16.50
10.60
13.40
3.45
<0.1
4.32
3.75
<0.1
21.50
28.40
5.70
0.28
0.29
0.41
0.20
2.70
0.42
68.60
46.70
0.28
0.29
0.32
1.60
2.47
2.60
LEGEND
K-Ar age dating (Ma)
Geology
Quarternary
Pliocene to Pleistocene Volcanics
Late Tertiary Sediments and Volcanics
Eocene Sediments
Cretaceous Schists, Sediments
Cretaceous Ultramafic Rocks
Oligocene to Miocene Diorite Intrusives
Project Area
10 0 10 20 30 40 km

Appendix 17

Sample No.	PBM002	PBM003	PBM004	PTH205	PTH208	TH06	TH24	PKY225	PKY227	PKY241	PTH213	PTH250	PTH254	SM39	SM43	SM46	SM49
area	Bac-Man	Bac-Man	Bac-Man	Bac-Man	Bac-Man	Bac-Man	Bac-Man	Gate Mt.	Gate Mt.	Gate Mt.	Gate Mt.	Gate Mt.	Gate Mt.	Gate Mt.	Gate Mt.	Gate Mt.	Gate Mt.
location	Pal-2D,2396m	Pal-2D,2773m	Pal-3D,1633m	Salvacion	Malobago			E of Sujac	E of Sujac	Tugas,Matnog	W of Sujac	W of Pange	Up of Sua				
rock name	basalitic dike	microdiorite	basaltic dike	Px andesite	Px andesite	Px and.	Px and.	andesite	Px andesite	(Bt)Px ande.	Px? ande.	Px-Hbl and.	Px andesite	Px and.	HblPx and.	dacite	dacite
SiO2	50.99	49.59	51.4	58.17	53.58	59.25	57.54	61.15	56.93	61.77	54.05	61.1	58.07	57.03	59.64	72.95	59.66
TiO2	0.97	0.66	0.85	0.77	0.5	0.77	0.67	0.77	0.68	0.51	1.04	0.52	0.63	0.69	0.54	0.18	0.56
Al2O3	18.43	22.39	17.55	19.45	28.88	18	18.67	17.97	20.29	18.56	19.68	18.35	18.53	19.26	18.42	15.03	18.8
FeO*	8.35	7.86	8.39	7.08	4.72	6.31	6.64	5.52	6.46	4.98	8.13	4.87	7.01	7.06	5.84	1.64	6.02
MnO	0.14	0.12	0.15	0.15	0.12	0.12	0.13	0.15	0.15	0.26	0.16	0.12	0.2	0.15	0.14	0.1	0.14
MgO	6.15	4.38	7.22	3.36	2.35	3.62	3.49	2.09	2.54	2.79	3.43	2.63	2.71	3.45	3.28	0.66	3.3
CaO	9.45	11.54	10.12	5.44	4.68	6.59	6.94	5.35	7.02	4.59	8.31	5.86	6.79	7.39	6.44	2.23	6.05
Na2O	3.81	2.83	2.59	2.92	2.92	3.56	3.43	4.02	3.34	3.3	3.33	3.43	3.66	3.12	3.65	4.02	3.34
K2O	1.28	0.5	1.38	2.33	2.01	1.6	2.14	2.58	2.25	2.96	1.55	2.88	2.03	1.6	1.87	3.08	1.94
P2O5	0.42	0.13	0.36	0.32	0.25	0.18	0.35	0.4	0.32	0.3	0.32	0.23	0.37	0.25	0.18	0.11	0.19
TOTAL	99.99	100	100.01	99.99	100.01	100	100	100	99.98	100.02	100	99.99	100	100	100	100	100
Na2O+K2O	5.09	3.33	3.97	5.25	4.93	5.16	5.57	6.6	5.59	6.26	4.88	6.31	5.69	4.72	5.52	7.1	5.28
FeO*/MgO	1.36	1.79	1.16	2.11	2.01	1.74	1.9	2.64	2.54	1.78	2.37	1.85	2.59	2.05	1.78	2.48	1.82
Ag	<1	<1	<1	<1	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Ba	368	225	459	775	657	702	645	823	1050	1065	539	962	710	629	452	772	446
Ce	40	20	35	55	47.5	51.5	53.5	60.5	92	65.5	39.5	64.5	52	43.5	29	39.5	31
Co	25.5	28	33	20	14.5	20	21	10.5	18.5	11.5	23	14.5	15.5	21	17.5	10.5	17
Cs	1.2	0.1	0.9	1.3	0.9	0.9	1	2	1.5	0.8	1.6	1.8	0.6	1.1	0.4	1.5	0.7
Cu	55	30	140	80	60	85	60	20	60	35	40	25	15	35	30	5	40
Dy	3.2	2.2	2.9	4.4	3.5	4	4.3	5.2	5	2.8	4.7	3.1	4.3	4.1	3.2	2	3.1
Er	2.2	1.2	2.1	3.1	2.3	2.1	2.3	3.3	3.2	2.1	3.3	1.9	2.8	2.4	1.7	1.2	1.7
Eu	1.4	1.1	1.3	1.9	1.3	1.6	1.5	1.9	2.3	1.4	1.6	1.4	1.5	1.3	1	0.7	0.9
Ga	18	20	17	19	17	16	16	19	19	17	20	17	19	18	16	12	16
Gd	4.3	2.3	3.9	5.4	3.9	5	5.2	5.9	6	4.3	4.8	4.1	4.8	4.4	3.4	2.5	3.1
Hf	3	1	1	5	4	3	3	5	4	4	4	4	4	3	2	3	2
Ho	0.8	0.5	0.7	0.9	0.8	0.8	0.8	1	0.9	0.7	1	0.7	0.9	0.8	0.6	0.4	0.6
La	19.5	10.5	18.5	30.5	25	23.5	23.5	34	53	37.5	20.5	36.5	27	20.5	14	19	14
Lu	0.3	0.1	0.3	0.4	0.4	0.4	0.4	0.5	0.3	0.3	0.4	0.3	0.4	0.4	0.3	0.3	0.3
Nb	6	1	3	6	5	6	6	6	6	6	4	5	5	4	4	7	4
Nd	19	10	17.5	27	21	22	23.5	28	40	26	22	24.5	21.5	17.5	13.5	11.5	12
Ni	40	15	45	10	5	<5	<5	5	5	5	5	5	<5	<5	5	<5	15
Pb	20	20	5	15	5	10	<5	10	15	30	10	15	10	5	5	10	<5
Pr	4.9	2.3	4.3	6.6	5.3	5.8	6.1	7.1	10.3	7	5.1	6.5	5.8	4.6	3.2	3.9	3.5
Rb	22.8	8.2	21.8	51.8	55.8	35.8	42.2	58.8	50.8	47.6	34.2	66.2	41.4	53.2	33.8	61.8	34
Sm	4.8	1.9	4.1	5.5	4.3	4.3	4.5	5.9	6.8	4.9	5.4	4.5	5.1	3.2	2.7	1.6	2.6
Sn	1	<1	<1	1	1	3	3	1	1	<1	1	<1	1	3	4	3	3
Sr	1555	945	957	627	620	740	772	584	1000	360	591	608	578	700	412	242	373
Ta	<.5	<.5	<.5	0.5	0.5	1.5	1.5	0.5	0.5	0.5	<.5	<.5	<.5	0.5	2	2	1.5
Tb	0.7	0.4	0.7	1	0.7	0.8	0.7	1	1	0.7	0.9	0.5	0.7	0.8	0.5	0.4	0.4
Th	2	<1	1	4	4	3	3	5	9	8	2	7	4	3	3	3	2
Tl	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	0.5	<.5
Tm	0.3	0.1	0.2	0.4	0.3	0.3	0.4	0.5	0.4	0.3	0.4	0.2	0.4	0.3	0.3	0.2	0.3
U	1.5	<.5	0.5	2	2	1.5	1.5	2.5	3.5	4	1	3.5	2	1.5	1	2	1
V	255	250	280	175	130	205	165	80	150	100	235	125	105	180	155	20	160
W	<1	<1	<1	<1	<1	7	11	1	<1	<1	<1	<1	<1	4	10	9	8
Y	19.5	10.5	18	28	20	19.5	19.5	29.5	25	18.5	27	18	24	19	15.5	11.5	15.5
Yb	1.9	0.9	1.4	2.2	2.3	2.2	2.6	3.2	2.5	2	2.9	1.8	2.6	1.6	1.8	1.3	2.1
Zn	80	90	75	85	75	65	65	85	90	145	85	70	85	80	60	40	60
Zr	106.5	32	62.5	147	135.5	117	124	180.5	143.5	151	114	150	141.5	97.5	103	88	104.5

Sample No.	PKY297	PTH333	PTH353	SM98	PTH367	TH90	PTH382	SM95	SM97	TH63	TH69	KY29	SM2	SM3	SM4	SM73	SM79
area	Kilbay	Kilbay	Kilbay	Mt. Labo	Bagacay	Bagacay	Larap-Exiban	Mt. Culasi	Mt. Culasi	Sibobo	Sibobo	Pio Duran	Pio Duran	Pio Duran	Pio Duran	W.Pasacao	Balatan
location	S of Susung	Alawihaw	Tonton River		Babel		Benguet										Caorasan
rock name	Bt-Hbl and.	Hbl-Bt dac.	Bt dacite	BiHbl dac.	tonalite-qz.di?	Hbl and.	granodiorite	dacite	Hbl and.	Hbl and.	Px and.	diorite	diorite	diorite	intrusives	Px and.	alt. syenite
SiO2	64.58	64.52	65.21	57.84	55.99	51.9	62.92	68.95	59.18	60.5	61.13	60.89	55.41	52.76	57.92	57.1	55.81
TiO2	0.43	0.41	0.41	0.72	0.63	0.88	0.31	0.25	0.61	0.58	0.54	0.52	0.56	0.64	1.05	0.94	0.68
Al2O3	18.24	17.83	17.83	19.01	18.39	18.97	20.8	17.52	19.72	19.61	18.42	18.65	16.83	16.62	18.2	19.39	20.22
FeO*	4.38	4.11	4.07	6.85	6.71	8.62	2.17	2.32	6.02	5.45	5.52	6	6.95	5.75	8.37	7.87	6.11
MnO	0.05	0.06	0.04	0.15	0.16	0.16	0.04	0.1	0.09	0.09	0.11	0.17	0.22	0.12	0.15	0.13	0.12
MgO	1.5	1.79	1.3	3.09	3.61	6.05	1.26	0.5	2.76	1.65	2.52	3.36	7.24	7.07	1.86	1.42	3.08
CaO	4.23	4.81	4.52	6.6	8.46	8.08	4.75	2.81	5.53	6.04	5.54	3.61	8.68	13.23	4.6	5.15	5.99
Na2O	3.9	4.06	4.22	3.41	4.36	3.58	6.52	4.31	3.94	4.15	4.08	4.87	3.31	3.47	7.45	3.97	6.39
K2O	2.49	2.15	2.16	1.97	1.26	1.33	1.14	3.13	1.95	1.63	1.89	1.75	0.74	0.32	0.18	3.42	1.29
P2O5	0.2	0.26	0.25	0.35	0.42	0.44	0.08	0.11	0.21	0.3	0.24	0.18	0.07	0.03	0.21	0.62	0.32
TOTAL	100	100	100.01	99.99	99.99	100.01	99.99	100	100.01	100	99.99	100	100.01	100.01	99.99	100.01	100.01
Na2O+K2O	6.39	6.21	6.38	5.38	5.62	4.91	7.66	7.44	5.89	5.78	5.97	6.62	4.05	3.79	7.63	7.39	7.68
FeO*/MgO	2.92	2.3	3.13	2.22	1.86	1.42	1.72	4.64	2.18	3.3	2.19	1.79	0.96	0.81	4.5	5.54	1.98
Ag	<1	<1	<1	<1	<1	16	<1	<1	<1	<1	<1	1	<1	1	1	2	<1
Ba	789	775	915	406	642	706	338	752	556	1115	509	194.5	225	20.5	26	1040	394
Ce	50.5	49.5	55.5	25.5	70	59	12	38	32.5	36.5	35.5	15.5	14.5	8	21	70	34
Co	13.5	11	10.5	17	17	28.5	5.5	3.5	16	18	12	14	24.5	28	22	18.5	16.5
Cs	0.9	2.1	0.6	0.7	0.4	<.1	0.5	0.9	1.2	0.5	1.2	2.6	0.1	<.1	<.1	1.6	0.9
Cu	30	30	35	20	75	175	80	5	65	60	50	45	45	15	100	30	55
Dy	1.9	1.9	1.9	3.3	3.7	3.8	0.8	1.8	3.6	4.3	3	2.7	4.5	3.2	5.1	4.7	2.2
Er	1	1	1.2	2	2.4	2.2	0.8	0.8	1.9	2.7	1.9	1.9	2.9	1.8	2.8	2.2	1.2
Eu	0.8	1	0.8	1.1	1.7	1.7	0.7	0.7	1.5	1.4	1.2	1	1.2	0.6	1.4	2.1	1.3
Ga	17	16	16	16	18	17	17	15	17	18	16	16	14	13	19	20	18
Gd	2.4	2.3	2.7	3.5	4.7	5	1.6	1.9	4.1	4.4	3.7	3.1	4	2.4	5.1	5.8	3.5
Hf	3	3	3	2	3	1	4	3	3	3	4	2	<1	<1	5	6	1
Ho	0.4	0.4	0.3	0.7	0.8	0.8	0.1	0.3	0.7	0.8	0.6	0.7	1	0.6	1	0.6	0.4
La	30.5	29.5	34	10.5	37	28	5.5	17.5	14	15.5	16	6	3.5	2.5	7.5	35	13.5
Lu	0.1	0.1	0.1	0.3	0.4	0.3	<.1	0.1	0.4	0.5	0.4	0.4	0.5	0.3	0.5	0.2	0.1
Nb	6	5	5	3	6	6	1	6	4	5	6	4	2	2	5	9	3
Nd	18.5	19.5	19	12	30	25.5	6.5	14.5	17.5	19	15	9	10.5	6	15	32.5	17.5
Ni	30	20	30	10	5	<5	15	<5	<5	<5	<5	<5	110	35	<5	5	<5
Pb	15	15	15	<5	15	5	15	10	5	<5	15	<5	<5	5	5	10	5
Pr	5	5.1	5.5	2.9	7.8	6.4	1.6	3.9	3.9	4.4	3.9	2	2.2	1.2	3.2	9	4
Rb	51.8	46.2	37.4	26.2	22.6	15.2	14.4	54.8	31	27.2	36	33.4	6.2	2.8	1	64.6	11.6
Sm	2.8	2.8	3.3	3.1	5.5	4.7	1.5	2	3.8	3.9	3.2	2.3	3.4	2	3.9	5.9	3
Sn	<1	<1	<1	3	<1	4	<1	3	3	3	3	5	6	4	7	4	3
Sr	916	896	1075	661	1405	1745	2300	805	733	906	681	434	483	83.3	185	821	1210
Ta	0.5	<.5	<.5	1	<.5	0.5	<.5	2	1	1	0.5	0.5	<.5	<.5	0.5	2	0.5
Tb	0.4	0.4	0.3	0.6	0.7	0.8	0.2	0.3	0.6	0.7	0.6	0.5	0.7	0.4	0.9	0.8	0.5
Th	4	3	3	1	2	3	<1	2	2	1	1	2	3	1	1	4	<1
Tl	<.5	<.5	<.5	<.5	<.5	0.5	<.5	<.5	<.5	<.5	0.5	0.5	<.5	<.5	0.5	0.5	<.5
Tm	0.1	0.2	0.1	0.3	0.3	0.3	<.1	0.1	0.3	0.4	0.3	0.3	0.5	0.3	0.4	0.3	0.1
U	3	2	2	0.5	1.5	1	0.5	2	1.5	0.5	1	<.5	<.5	<.5	<.5	2	<.5
V	80	85	70	200	225	330	55	25	175	145	120	140	195	260	260	220	165
W	<1	<1	<1	6	<1	2	<1	10	7	1	1	3	1	1	3	10	9
Y	10	10.5	10	16	20	19	5	8	18	23	17	15	24.5	16	27.5	19	10.5
Yb	1.3	1.2	1	1.8	2.4	1.9	0.5	1.2	2.4	2.3	2.1	2	2.8	1.7	3.1	1.6	1.2
Zn	55	55	45	60	65	55	35	45	70	95	60	70	75	30	70	75	65
Zr	107.5	100	111.5	81.5	79.5	69.5	123.5	102	122.5	105.5	143.5	85.5	22	23	104.5	134	86

Sample No.	SM59	TH43	TH54	TH40	TH41	PKY258	PTH270	PTH285	PTH287	PTH293	PTH296	PTH298	PTH299	SM28	SM68	PTH314	TH86
area	Gate Mt.	Gate Mt.	Gate Mt. Ginabiam	Magallanes	Bintacan	Tiwi-Malinao Santa Cruz	Tiwi-Malinao Inalait River	Tiwi-Malinao coast	Tiwi-Malinao coast	Tiwi-Malinao coast	Tiwi-Malinao coast	Tiwi-Malinao coast	Tiwi-Malinao coast	Tiwi	Buhi	Caramoan Bulalacan	Olas
location																	
rock name	Px and.	Px and.	Px and.	Px and.	PxHbl and.	Px-Hbl and.	Px andesite	(Px)-Hbl dac.	Hbl dacite	Hbl andesite	Px-Hbl ande.	Px andesite	Px andesite	dacite	Px and.	diorite	green rock
SiO2	58.46	57.9	60.24	58.43	60.32	61.72	57.04	63.85	64.65	61.72	62.21	58.5	57.63	62.81	58.4	52.84	59.56
TiO2	0.61	0.77	0.58	0.73	0.58	0.63	0.81	0.58	0.53	0.63	0.62	0.68	0.78	0.48	0.8	1.03	0.85
Al2O3	20.56	19.15	18.52	17.86	19.86	17.62	19.07	17.48	16.84	18.74	17.99	17.69	18.53	18.22	18.98	17.38	15
FeO*	5.39	6.39	5.46	6.32	6.65	5.54	6.69	5.32	4.7	6.09	5.21	6.16	6.69	4.93	6.28	9.77	9.03
MnO	0.12	0.1	0.12	0.14	0.19	0.13	0.15	0.12	0.11	0.14	0.13	0.13	0.12	0.18	0.14	0.18	0.18
MgO	2	2.57	2.77	3.26	2.31	2.33	3.58	2.15	1.72	1.76	2.31	4.19	3.47	1.16	3.35	4.82	2.91
CaO	6.89	6.81	6.52	6.46	4.46	5.52	7.3	4.35	4.51	4.49	5.17	7.07	7.01	4.57	6.28	7.89	11.84
Na2O	3.97	3.86	3.93	3.76	3.21	3.64	3.29	3.3	3.7	3.67	3.75	3.28	3.61	4.83	3.62	3.16	0.32
K2O	1.68	2.22	1.66	2.62	2.03	2.62	1.72	2.65	3.03	2.56	2.37	2.07	1.91	2.38	1.89	2.59	0.07
P2O5	0.3	0.23	0.21	0.41	0.39	0.24	0.35	0.22	0.2	0.21	0.22	0.23	0.25	0.44	0.26	0.35	0.24
TOTAL	99.98	100	100.01	99.99	100	99.99	100	100.02	99.99	100.01	99.98	100	100	100	100	100.01	100
Na2O+K2O	5.65	6.08	5.59	6.38	5.24	6.26	5.01	5.95	6.73	6.23	6.12	5.35	5.52	7.21	5.51	5.75	0.39
FeO*/MgO	2.7	2.49	1.97	1.94	2.88	2.38	1.87	2.47	2.73	3.46	2.26	1.47	1.93	4.25	1.87	2.03	3.1
Ag	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Ba	576	815	803	775	1360	606	613	753	753	679	666	499	469	763	670	208	11.5
Ce	35.5	56	42	68	59.5	52	58	47.5	49	46.5	59	39	43	72	53.5	41	13.5
Co	13	18.5	14.5	16.5	16	15	16.5	14.5	12	17	13.5	20.5	18	8.5	18.5	29.5	8
Cs	0.9	1.3	0.7	1.6	0.3	0.8	1	1.5	1.4	0.9	1.7	1.2	1.2	1	0.5	1	<.1
Cu	45	35	40	35	35	65	50	60	45	85	65	60	90	10	80	230	40
Dy	4.6	5.4	3.4	4.6	3.9	4.1	3.9	3.1	2.8	4.3	3.7	3.1	4.1	5.3	3.5	5.2	2.4
Er	3	3.4	2.3	2.5	2.1	2.8	2.7	2.2	1.9	3	2.7	1.7	2.3	3.2	2.3	3.6	1.3
Eu	1.5	1.7	1.4	1.7	1.6	1.2	1.7	1.3	1.2	1.7	1.4	1.1	1.5	2	1.6	1.8	0.7
Ga	17	17	16	17	17	18	17	16	16	18	17	16	17	17	17	18	10
Gd	5.8	6	4.2	6.3	4.7	4.5	5.6	4.1	3.3	5.3	4.5	3.1	5.2	6.7	5	6.2	2.5
Hf	4	4	3	4	3	5	4	4	5	4	6	3	4	4	4	4	1
Ho	0.9	1.2	0.7	0.9	0.7	0.9	0.9	0.8	0.7	1	0.8	0.7	0.9	1.1	0.8	1.1	0.5
La	21	29	20.5	31	25.5	25.5	29	29.5	29	44	30.5	20	20.5	34	24.5	15.5	5
Lu	0.4	0.5	0.4	0.4	0.4	0.5	0.3	0.3	0.4	0.5	0.4	0.3	0.4	0.5	0.4	0.4	0.2
Nb	4	5	4	7	6	6	6	5	5	5	7	4	5	8	8	2	<1
Nd	22	24	17	26.5	24.5	23.5	26	22.5	19.5	32	25.5	18	21	31.5	24	24.5	7.5
Ni	15	<5	<5	<5	<5	5	5	5	5	15	5	25	10	<5	10	20	<5
Pb	5	5	5	5	5	15	10	15	20	10	60	10	25	5	<5	5	<5
Pr	5.4	6	4.4	7.2	6.4	5.7	6.9	6	5.6	8.6	6.6	4.6	5.3	8.6	5.9	5.4	1.8
Rb	24.6	48.2	29.4	54.2	25.2	63.6	68.2	65.6	65.6	53.6	53	43	41	46.4	29.2	53.6	0.2
Sm	5	5.2	3.6	5.9	5.2	4.5	5.5	4.3	3.3	5.8	4.7	3.6	4.2	6.5	4.6	6.6	2.1
Sn	3	3	2	3	3	1	<1	1	1	<1	1	<1	1	8	4	1	3
Sr	491	638	540	707	569	631	887	534	567	567	586	629	634	675	674	505	214
Ta	1	0.5	0.5	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	<.5	<.5	1.5	1.5	<.5	0.5
Tb	0.9	1	0.6	0.9	0.7	0.7	0.9	0.6	0.6	1.1	0.8	0.5	0.8	1	0.8	1	0.4
Th	2	5	3	5	2	4	3	4	5	4	5	3	3	3	4	1	<1
Tl	0.5	0.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5
Tm	0.5	0.4	0.4	0.4	0.3	0.4	0.4	0.3	0.3	0.5	0.4	0.3	0.3	0.5	0.4	0.5	0.2
U	1	2.5	1.5	2	0.5	2.5	1.5	2.5	2.5	2	2.5	1.5	1.5	1.5	1.5	0.5	<.5
V	110	185	135	165	115	135	165	125	105	145	115	170	185	80	180	270	185
W	6	4	1	6	6	<1	<1	<1	<1	<1	<1	<1	<1	2	9	<1	7
Y	24	31.5	19.5	22.5	18	23	23	18	17	29	23.5	17	22	30.5	21	27.5	11.5
Yb	2.7	2.7	2.1	2.4	1.9	2.6	2.8	2	2	2.5	3.1	1.8	2.2	3.6	2.3	2.9	1.4
Zn	60	65	65	80	80	70	75	65	65	70	75	75	85	90	65	110	40
Zr	86.5	135.5	110	163	127.5	166.5	145	130	154.5	149.5	192.5	103	131.5	168	141	121.5	46

Chemical compositon and normative compositon of the igneous rocks from the Bicol region

SAMPLE	PBM002	PBM003	PBM004	PKY225	PKY227	PKY241	PKY258	PKY297	PTH205	PTH208	PTH213	PTH250	PTH254	PTH270	PTH285	PTH287	PTH293	PTH296	PTH298
SiO_2	49.35	48.41	49.09	59.6	54.87	57.35	59.68	61.67	54.94	52.32	52.27	59.49	55.88	53.7	62	63.2	59.02	61.08	57.03
TiO_2	0.94	0.64	0.81	0.75	0.66	0.47	0.61	0.41	0.73	0.49	1.01	0.51	0.61	0.76	0.56	0.52	0.6	0.61	0.66
Al_2O_3	17.84	21.86	16.76	17.52	19.56	17.23	17.04	17.42	18.37	28.2	19.03	17.87	17.83	17.95	16.97	16.46	17.92	17.66	17.25
Fe_2O_3	8.98	8.53	8.91	5.98	6.93	5.14	5.96	4.65	7.44	5.13	8.74	5.27	7.51	7	5.75	5.1	6.47	5.69	6.88
MnO	0.14	0.12	0.14	0.15	0.14	0.24	0.13	0.05	0.14	0.12	0.15	0.12	0.19	0.14	0.12	0.11	0.13	0.13	0.13
MgO	5.95	4.28	6.9	2.04	2.45	2.59	2.25	1.43	3.17	2.29	3.32	2.56	2.61	3.37	2.09	1.68	1.68	2.27	4.08
CaO	9.15	11.27	9.67	5.21	6.77	4.26	5.34	4.04	5.14	4.57	8.04	5.71	6.53	6.87	4.22	4.41	4.29	5.08	6.89
Na_2O	3.69	2.76	2.47	3.92	3.22	3.06	3.52	3.72	2.76	2.85	3.22	3.34	3.52	3.1	3.2	3.62	3.51	3.68	3.2
K_2O	1.24	0.49	1.32	2.51	2.17	2.75	2.53	2.38	2.2	1.96	1.5	2.8	1.95	1.62	2.57	2.96	2.45	2.33	2.02
P_2O_5	0.41	0.13	0.34	0.39	0.31	0.28	0.23	0.19	0.3	0.24	0.31	0.22	0.36	0.33	0.21	0.2	0.2	0.22	0.22
LOI	2.02	1.47	2.14	0.84	2.11	5.97	1.03	2.82	3.58	1.54	1.17	1.55	1.57	3.36	1.98	1.09	3.03	1.07	1.37
TOTAL	99.71	99.96	98.55	98.91	99.19	99.34	98.32	98.78	98.77	99.71	98.76	99.44	98.56	98.21	99.67	99.35	99.3	99.82	99.53
normative composition																			
Q	–	2.31	2.88	14.20	10.55	16.83	15.78	20.87	15.57	15.71	7.54	14.22	11.71	11.01	21.98	19.57	18.09	17.11	11.76
C	–	–	–	–	0.35	2.14	0.00	1.83	2.82	13.66	–	–	–	–	1.75	–	2.17	0.37	–
or	7.33	2.90	7.80	14.83	12.82	16.25	14.95	14.07	13.00	11.58	8.86	16.55	11.52	9.57	15.19	17.49	14.48	13.77	11.94
ab	31.22	23.35	20.90	33.17	27.25	25.89	29.79	31.48	23.35	24.12	27.25	28.26	29.79	26.23	27.08	30.63	29.70	31.14	27.08
an	28.45	45.81	30.75	22.80	31.56	19.30	23.22	18.80	23.54	21.10	33.04	25.50	27.09	30.28	19.58	19.92	19.98	23.76	26.74
lc	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
ne	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
kp	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
di	8.98	5.83	9.91	–	–	–	0.12	–	–	–	1.47	0.07	1.23	–	–	–	–	–	3.28
wo	4.82	3.13	5.32	–	–	–	0.06	–	–	–	0.79	0.04	0.66	–	–	–	–	–	1.76
en	4.16	2.70	4.60	–	–	–	0.06	–	–	–	0.68	0.03	0.57	–	–	–	–	–	1.52
fs	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
hy	6.98	7.96	12.59	5.08	6.10	6.45	5.55	3.56	7.90	5.70	7.59	6.34	5.93	8.39	5.21	4.18	4.18	5.65	8.64
en	6.98	7.96	12.59	5.08	6.10	6.45	5.55	3.56	7.90	5.70	7.59	6.34	5.93	8.39	5.21	4.18	4.18	5.65	8.64
fs	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
ol	2.57	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
fo	2.57	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
fa	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
mt	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
il	0.30	0.26	0.30	0.32	0.30	0.51	0.28	0.11	0.30	0.26	0.32	0.26	0.40	0.30	0.26	0.23	0.28	0.28	0.28
hm	8.98	8.53	8.91	5.98	6.93	5.14	5.96	4.65	7.44	5.13	8.74	5.27	7.51	7.00	5.75	5.10	6.47	5.69	6.88
tn	1.92	1.24	1.60	0.35	–	–	1.14	–	–	–	2.06	0.92	0.97	1.16	–	0.46	–	–	1.26
ru	–	–	–	0.44	0.50	0.20	–	0.35	0.57	0.35	–	–	–	0.13	0.42	0.21	0.45	0.46	–
ap	0.95	0.30	0.79	0.90	0.72	0.65	0.53	0.44	0.70	0.56	0.72	0.51	0.83	0.76	0.49	0.46	0.46	0.51	0.51
TOTAL	97.69	98.49	96.41	98.07	97.08	93.37	97.29	95.96	95.19	98.17	97.59	97.89	96.99	94.84	97.69	98.26	98.27	98.75	98.16

Chemical compositon and normative compositon of the igneous rocks from the Bicol region

SAMPLE	PTH299	PTH314	PTH333	PTH353	PTH367	PTH382
SiO_2	55.96	51.01	61.55	62.61	54.69	61.83
TiO_2	0.76	0.99	0.39	0.39	0.62	0.3
Al_2O_3	17.99	16.76	17.01	17.12	17.96	20.44
Fe_2O_3	7.23	10.48	4.36	4.35	7.28	2.37
MnO	0.12	0.17	0.06	0.04	0.16	0.04
MgO	3.37	4.65	1.71	1.25	3.53	1.24
CaO	6.81	7.62	4.59	4.34	8.26	4.67
Na_2O	3.51	3.05	3.87	4.05	4.26	6.41
K_2O	1.85	2.5	2.05	2.07	1.23	1.12
P_2O_5	0.24	0.34	0.25	0.24	0.41	0.08
LOI	1.01	2.08	2.76	2.62	0.54	0.61
TOTAL	98.85	99.67	98.6	99.08	98.94	99.11
normative composition						
Q	10.46	3.75	19.51	20.64	6.00	8.63
C	–	–	0.68	0.90	–	0.38
or	10.93	14.77	12.11	12.23	7.27	6.62
ab	29.70	25.81	32.75	34.27	36.05	54.24
an	27.87	24.71	21.14	19.96	26.25	22.65
lc	–	–	–	–	–	–
ne	–	–	–	–	–	–
kp	–	–	–	–	–	–
di	1.69	6.30	–	–	8.19	–
wo	0.91	3.38	–	–	4.39	–
en	0.78	2.92	–	–	3.80	–
fs	–	–	–	–	–	–
hy	7.61	8.66	4.26	3.11	5.00	3.09
en	7.61	8.66	4.26	3.11	5.00	3.09
fs	–	–	–	–	–	–
ol	–	–	–	–	–	–
fo	–	–	–	–	–	–
fa	–	–	–	–	–	–
mt	–	–	–	–	–	–
il	0.26	0.36	0.13	0.09	0.34	0.09
hm	7.23	10.48	4.36	4.35	7.28	2.37
tn	1.53	1.96	–	–	1.08	0.00
ru	–	–	0.32	0.34	–	0.25
ap	0.56	0.79	0.58	0.56	0.95	0.19
TOTAL	97.84	97.59	95.84	96.46	98.40	98.50

Chemical compositon and normative compositon of the igneous rocks from the Bicol region

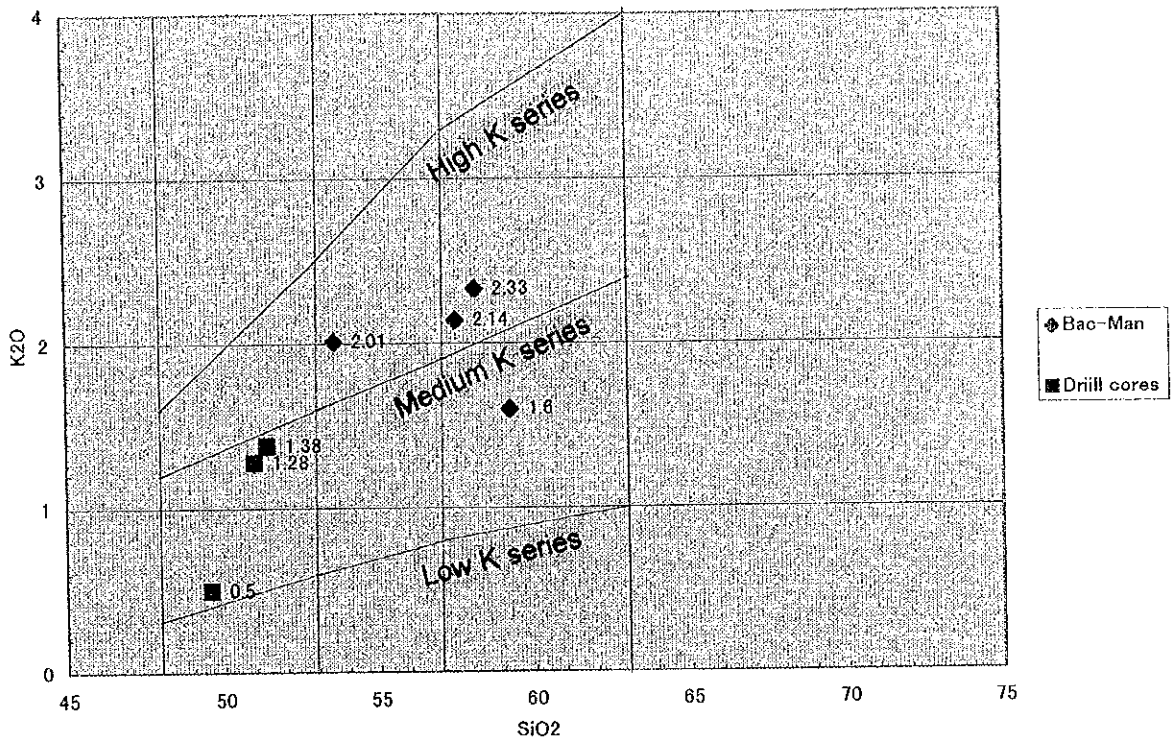
sample No.	KY29	SM2	SM3	SM4	SM28	SM39	SM43	SM46	SM49	SM59	SM68	SM73	SM79	SM95	SM97	SM98	TH06	TH24	TH40
SiO_2	58.36	52.78	49.69	53.62	61.59	54.27	57.39	71.02	56.4	56.57	56.9	52.82	52.77	67.01	56.22	55.53	56.93	55.72	56.54
TiO2	0.5	0.53	0.6	0.97	0.47	0.66	0.52	0.18	0.53	0.59	0.78	0.87	0.64	0.24	0.58	0.69	0.74	0.65	0.71
Al_2O_3	17.88	16.02	15.65	16.85	17.87	18.33	17.72	14.63	17.77	19.9	18.49	17.94	19.12	17.03	18.73	18.25	17.3	18.08	17.28
Fe_2O_3	6.39	7.36	6.03	8.62	5.37	7.47	6.25	1.78	6.33	5.8	6.81	8.09	6.43	2.51	6.36	7.32	6.74	7.15	6.8
FeO*	5.75	6.62	5.42	7.75	4.83	6.72	5.62	1.6	5.69	5.22	6.12	7.28	5.78	2.25	5.72	6.58	6.06	6.43	6.12
MnO	0.16	0.21	0.11	0.14	0.18	0.14	0.13	0.1	0.13	0.12	0.14	0.12	0.11	0.1	0.09	0.14	0.12	0.13	0.14
MgO	3.22	6.89	6.66	1.72	1.14	3.28	3.16	0.64	3.12	1.94	3.26	1.31	2.91	0.49	2.62	2.97	3.48	3.38	3.15
CaO	3.46	8.26	12.46	4.26	4.48	7.03	6.2	2.17	5.72	6.67	6.12	4.76	5.66	2.73	5.25	6.34	6.33	6.72	6.25
Na_2O	4.67	3.15	3.27	6.9	4.74	2.97	3.51	3.91	3.16	3.84	3.53	3.67	6.04	4.19	3.74	3.27	3.42	3.32	3.64
K_2O	1.68	0.7	0.3	0.17	2.33	1.52	1.8	3	1.83	1.63	1.84	3.16	1.22	3.04	1.85	1.89	1.54	2.07	2.54
P_2O_5	0.17	0.07	0.03	0.19	0.43	0.24	0.17	0.11	0.18	0.29	0.25	0.57	0.3	0.11	0.2	0.34	0.17	0.34	0.4
LOI	2.74	3.02	4.63	5.53	1.33	3.04	1.64	2.09	3.77	1.66	1.85	5.64	3.37	1.41	3.44	2.39	2.28	1.29	0.98
TOTAL	98.59	98.23	98.82	98.1	99.39	98.2	97.86	99.45	98.3	98.43	99.28	98.14	97.92	98.6	98.44	98.39	98.37	98.13	97.75
normative composition																			
Q	13.03	6.80	0.42	2.84	15.02	12.14	13.08	31.50	14.61	11.63	12.06	8.83	–	24.73	12.79	12.22	13.52	10.61	9.78
C	2.50	–	–	–	0.43	–	–	1.27	0.62	0.39	0.16	1.19	–	2.15	1.51	0.11	–	–	–
or	9.93	4.14	1.77	1.00	13.77	8.98	10.64	17.73	10.81	9.63	10.87	18.67	7.21	17.97	10.93	11.17	9.10	12.23	15.01
ab	39.52	26.65	27.67	58.39	40.11	25.13	29.70	33.09	26.74	32.49	29.87	31.05	51.11	35.45	31.65	27.67	28.94	28.09	30.80
an	16.05	27.50	27.14	14.50	19.42	32.19	27.28	10.05	27.20	31.20	28.73	19.89	21.46	12.82	24.74	29.23	27.30	28.32	23.31
lc	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
ne	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
kp	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
di	–	9.34	25.55	1.99	–	–	0.83	–	–	–	–	–	2.23	–	–	–	0.69	0.81	2.46
wo	–	5.01	13.70	1.07	–	–	0.45	–	–	–	–	–	1.20	–	–	–	0.37	0.44	1.32
en	–	4.33	11.84	0.92	–	–	0.39	–	–	–	–	–	1.03	–	–	–	0.32	0.38	1.14
fs	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
hy	8.02	12.83	4.75	3.36	2.84	8.17	7.49	1.59	7.77	4.83	8.12	3.26	0.72	1.22	6.53	7.40	8.35	8.04	6.71
en	8.02	12.83	4.75	3.36	2.84	8.17	7.49	1.59	7.77	4.83	8.12	3.26	0.72	1.22	6.53	7.40	8.35	8.04	6.71
fs	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
ol	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
fo	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
fa	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
mt	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
il	0.34	0.45	0.23	0.30	0.38	0.30	0.28	0.21	0.28	0.26	0.30	0.26	0.23	0.21	0.19	0.30	0.26	0.28	0.30
hm	6.39	7.36	6.03	8.62	5.37	7.47	6.25	1.78	6.33	5.80	6.81	8.09	6.43	2.51	6.36	7.32	6.74	7.15	6.80
tn	–	0.72	1.17	1.99	–	0.79	0.92	–	–	–	–	–	1.27	–	–	–	1.48	1.24	1.36
ru	0.32	–	–	–	0.27	0.18	–	0.07	0.38	0.45	0.62	0.73	–	0.13	0.48	0.53	–	–	–
ap	0.39	0.16	0.07	0.44	1.00	0.56	0.39	0.25	0.42	0.67	0.58	1.32	0.70	0.25	0.46	0.79	0.39	0.79	0.93
TOTAL	96.49	95.95	94.8	93.44	98.6	95.91	96.85	97.54	95.17	97.35	98.12	93.31	91.34877	97.45	95.64	96.74	96.77	97.56	97.45

Chemical compositon and normative compositon of the igneous rocks from the Bicol region

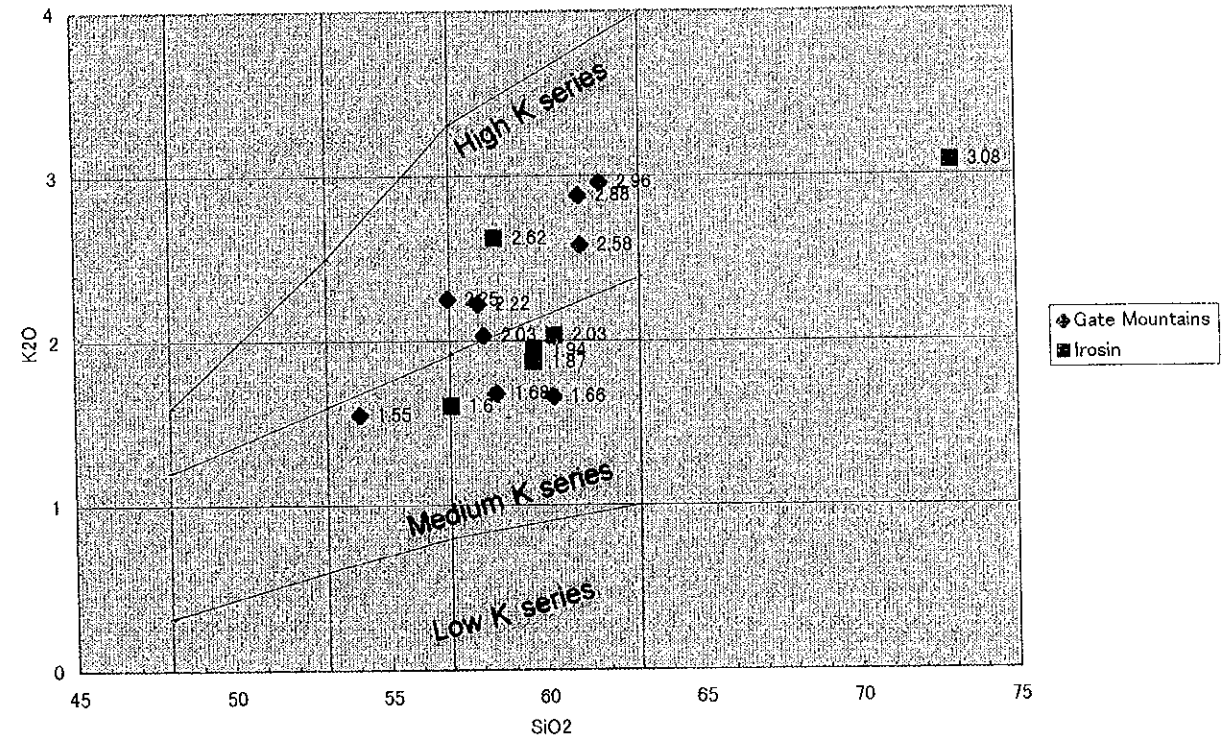
sample No.	TH41	TH43	TH54	TH63	TH69	TH86	TH90
SiO2	56.72	56.52	58.55	57.66	58.34	57.05	49.86
TiO2	0.55	0.75	0.56	0.55	0.52	0.81	0.85
Al2O3	18.67	18.69	18	18.69	17.73	14.37	18.22
Fe2O3	6.95	6.94	5.91	5.77	5.9	9.62	9.2
FeO*	6.25	6.24	5.31	5.19	5.31	8.65	8.28
MnO	0.18	0.1	0.12	0.09	0.11	0.17	0.15
MgO	2.17	2.51	2.69	1.57	2.43	2.79	5.81
CaO	4.19	6.65	6.34	5.76	5.33	11.34	7.76
Na2O	3.02	3.77	3.82	3.96	3.93	0.31	3.44
K2O	1.91	2.17	1.61	1.55	1.82	0.07	1.28
P2O5	0.37	0.22	0.2	0.29	0.23	0.23	0.42
LOI	4.38	1.59	0.95	2.96	1.72	2.55	2.74
Total	98.41	99.21	98.15	98.27	97.97	98.34	98.81
Q	20.67	9.75	13.77	14.83	14.62	30.87	–
C	4.90	–	–	0.72	0.15	–	–
or	11.29	12.82	9.51	9.16	10.76	0.41	7.56
ab	25.55	31.90	32.32	33.51	33.25	2.62	29.11
an	18.37	27.67	27.21	26.68	24.94	37.61	30.49
lc	–	–	–	–	–	–	–
ne	–	–	–	–	–	–	–
kp	–	–	–	–	–	–	–
di	–	1.30	1.13	–	–	11.67	2.25
wo	–	0.70	0.61	–	–	6.26	1.21
en	–	0.60	0.52	–	–	5.41	1.04
fs	–	–	–	–	–	0.00	0.00
hy	5.41	5.65	6.18	3.91	6.05	1.54	13.43
en	5.41	5.65	6.18	3.91	6.05	1.54	13.43
fs	–	–	–	–	–	–	–
ol	–	–	–	–	–	–	–
fo	–	–	–	–	–	–	–
fa	–	–	–	–	–	–	–
mt	–	–	–	–	–	–	–
il	0.38	0.21	0.26	0.19	0.23	0.36	0.32
hm	6.95	6.94	5.91	5.77	5.90	9.62	9.20
tn	–	1.56	1.04	–	–	1.52	1.67
ru	0.35	–	–	0.45	0.40	–	–
ap	0.86	0.51	0.46	0.67	0.53	0.53	0.97
TOTAL	94.73	98.32	97.8	95.89	96.84	96.76	95.00699

Appendix 18

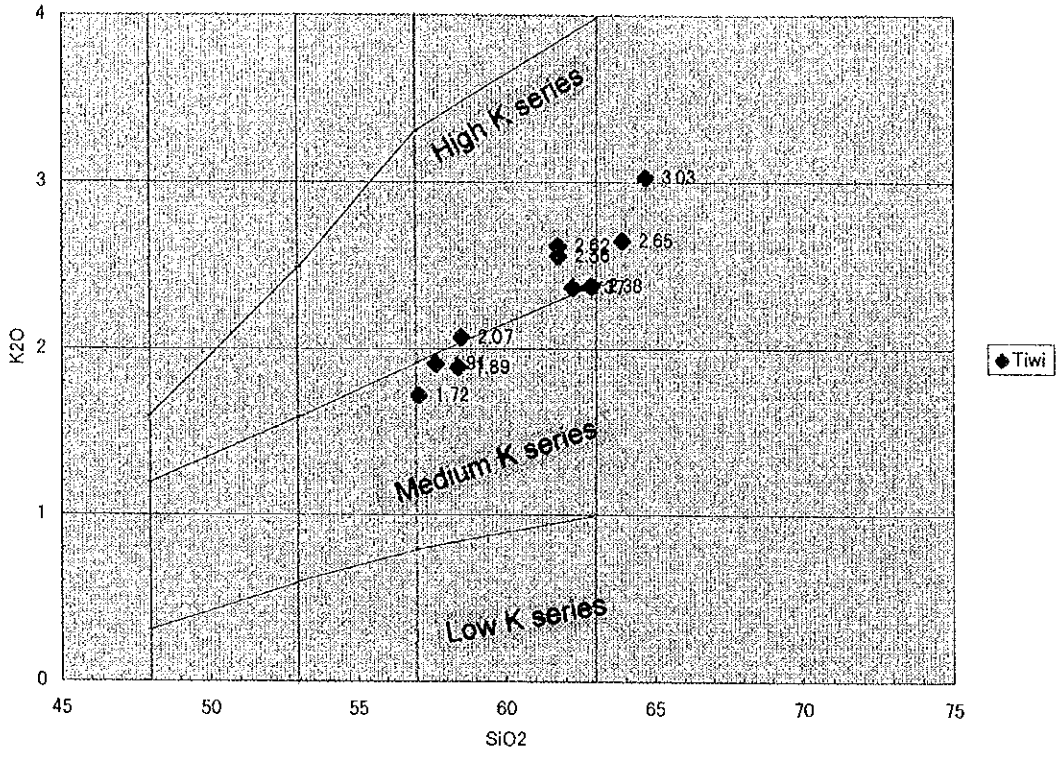
SiO2 - K2O (Bac-Man)



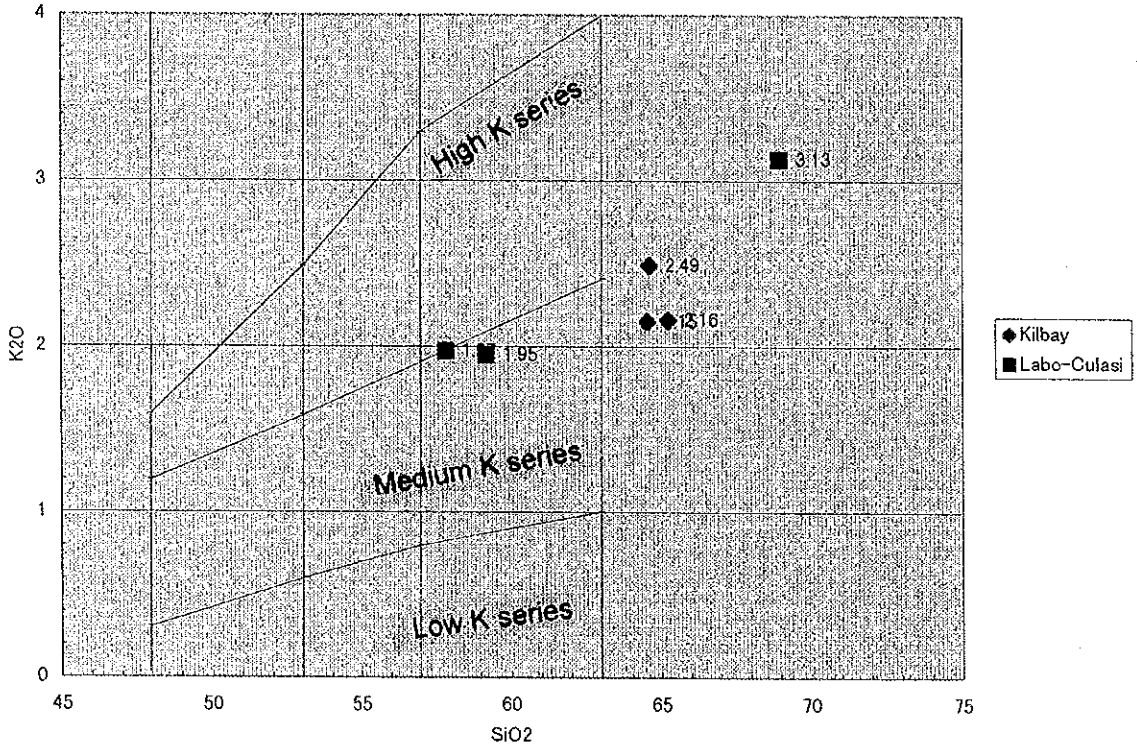
SiO2-K2O (Gate Mountains/Irosin)



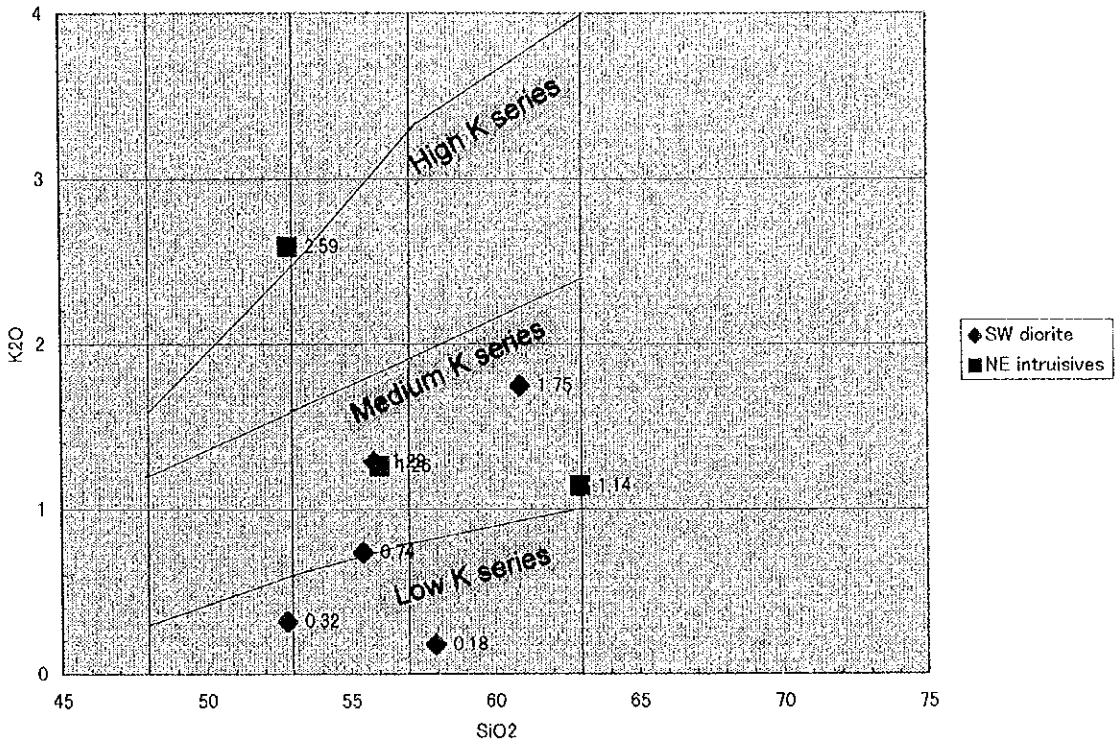
SiO2-K2O(NW of Tiwi-Mt. Malinao)



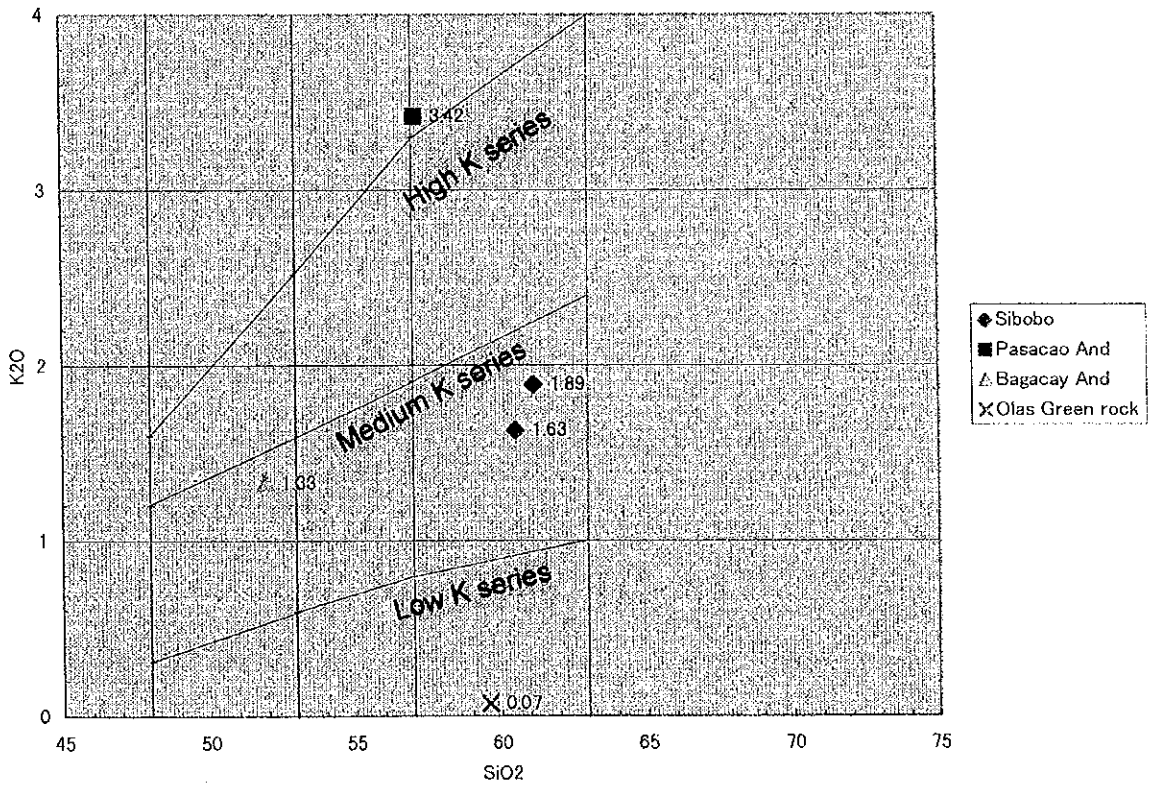
SiO2 - K2O(Kilbay-Labo-Culasi)

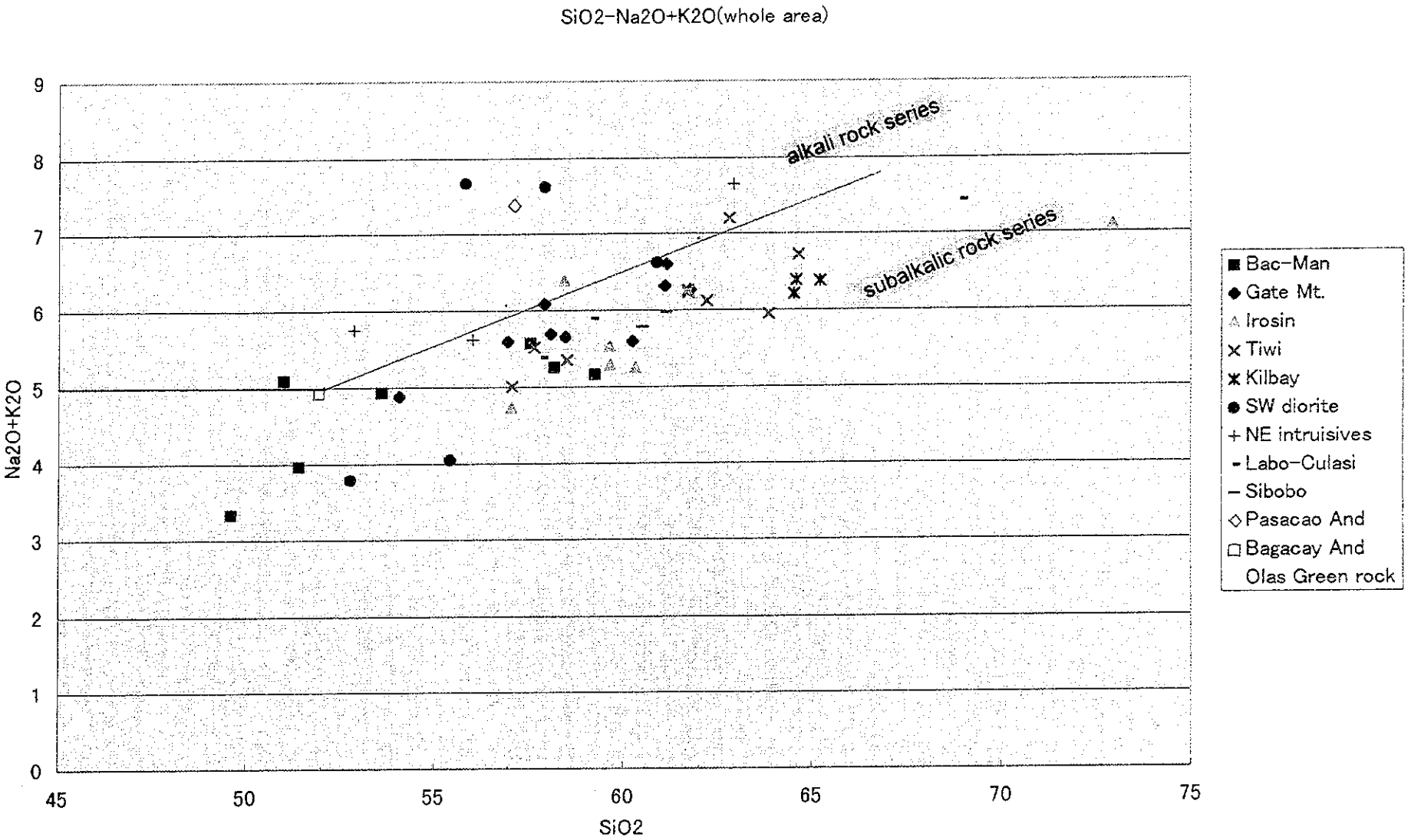


SiO2 – K2O(intrusives)

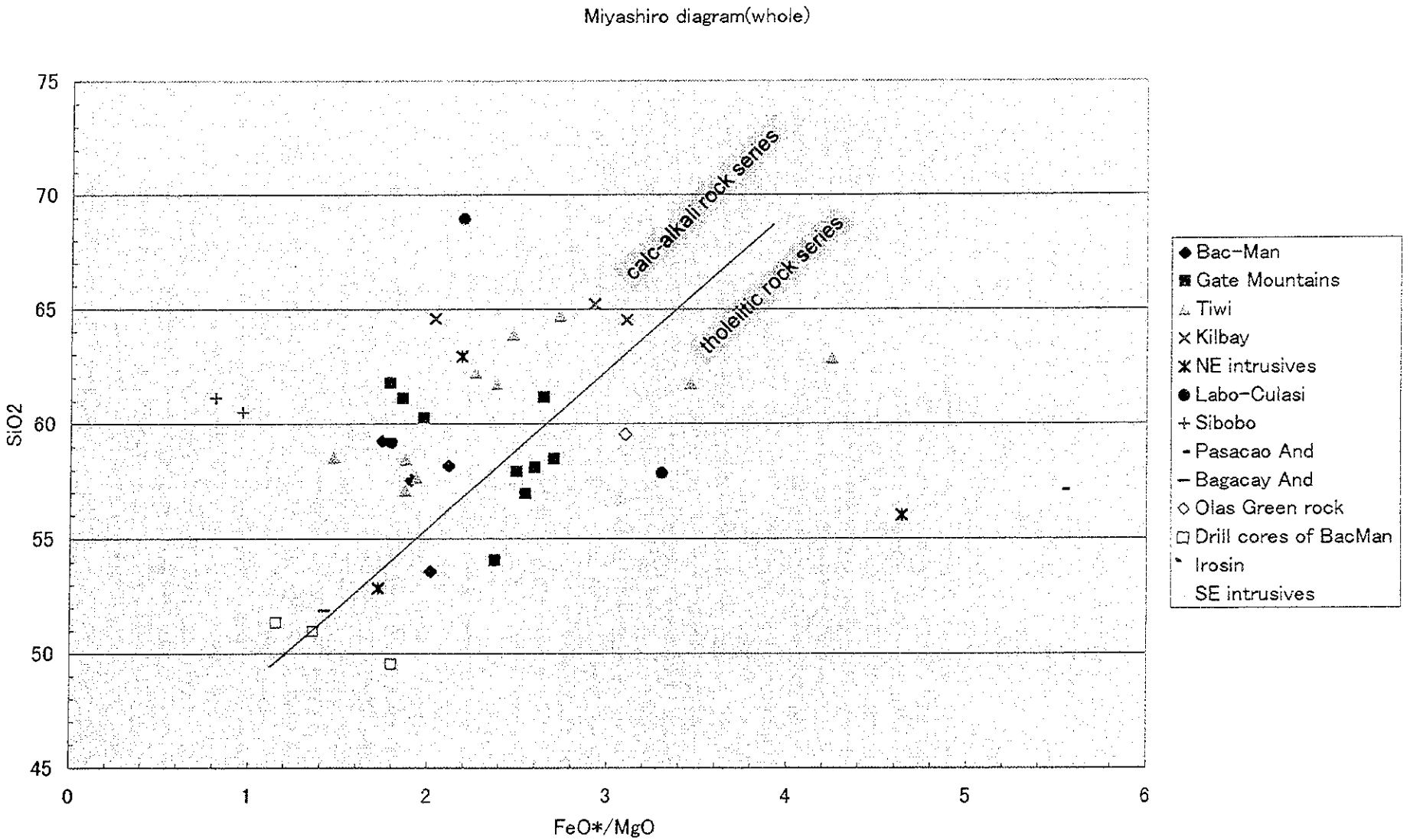


SiO2 – K2O(others)



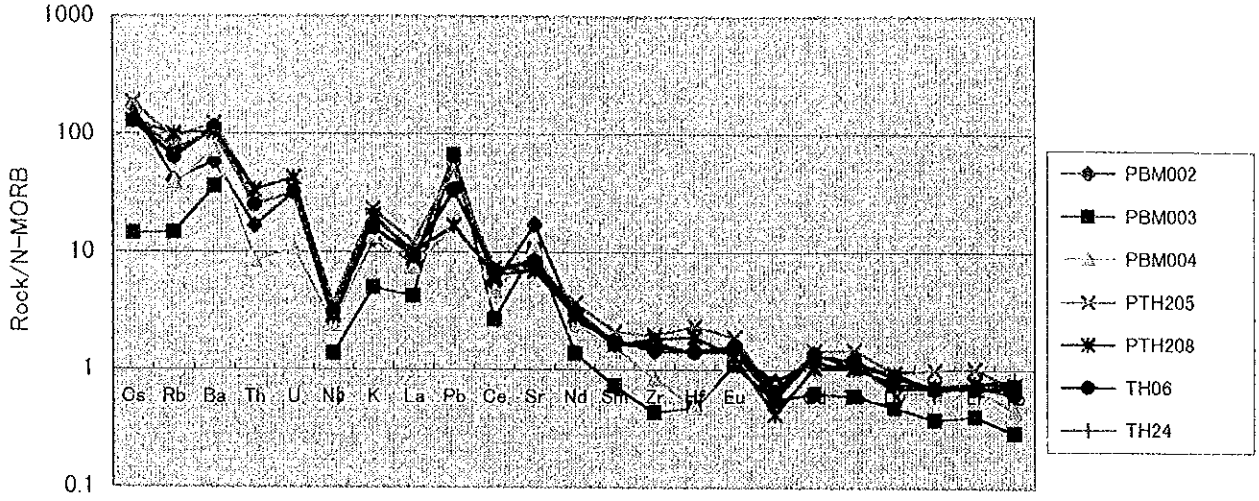

SiO2-Na2O+K2O(whole area)
alkali rock series
subalkalic rock series
Na2O+K2O
SiO2
0
1
2
3
4
5
6
7
8
9
45
50
55
60
65
70
75
Bac-Man
Gate Mt.
Irosin
Tiwi
Kilbay
SW diorite
NE intruisives
Labo-Culasi
Sibobo
Pasacao And
Bagacay And
Olas Green rock

Appendix 19

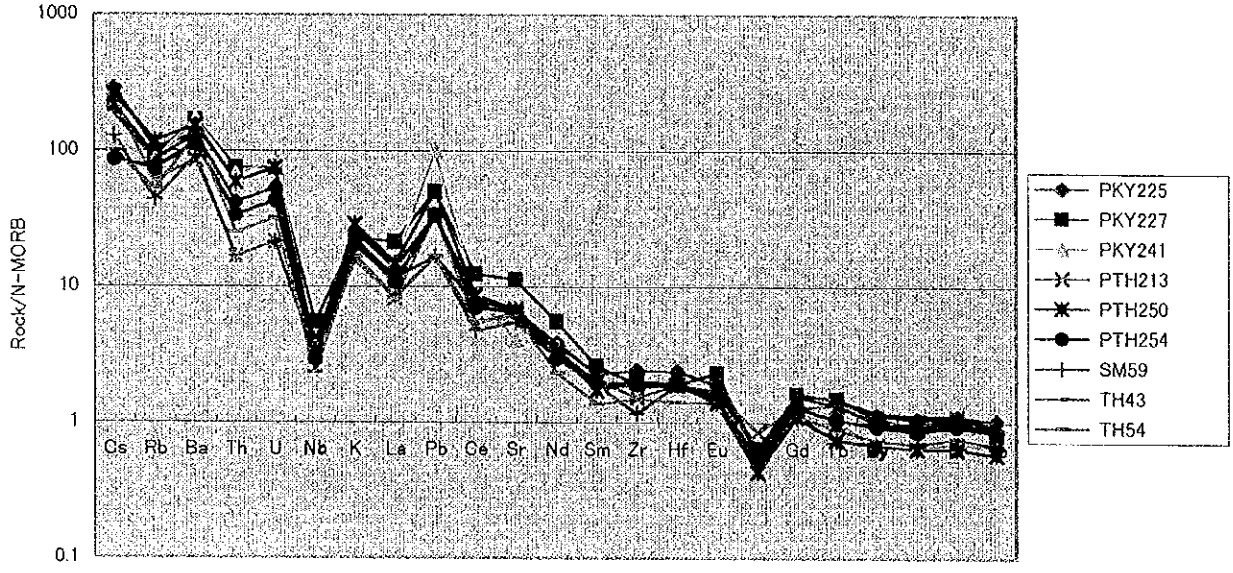

Miyashiro diagram(whole)
SiO2
FeO*/MgO
75
70
65
60
55
50
45
0
1
2
3
4
5
6
calc-alkali rock series
tholeiitic rock series
Bac-Man
Gate Mountains
Tiwi
Kilbay
NE intrusives
Labo-Culasi
Sibobo
Pasacao And
Bagacay And
Olas Green rock
Drill cores of BacMan
Irosin
SE intrusives

Appendix 20

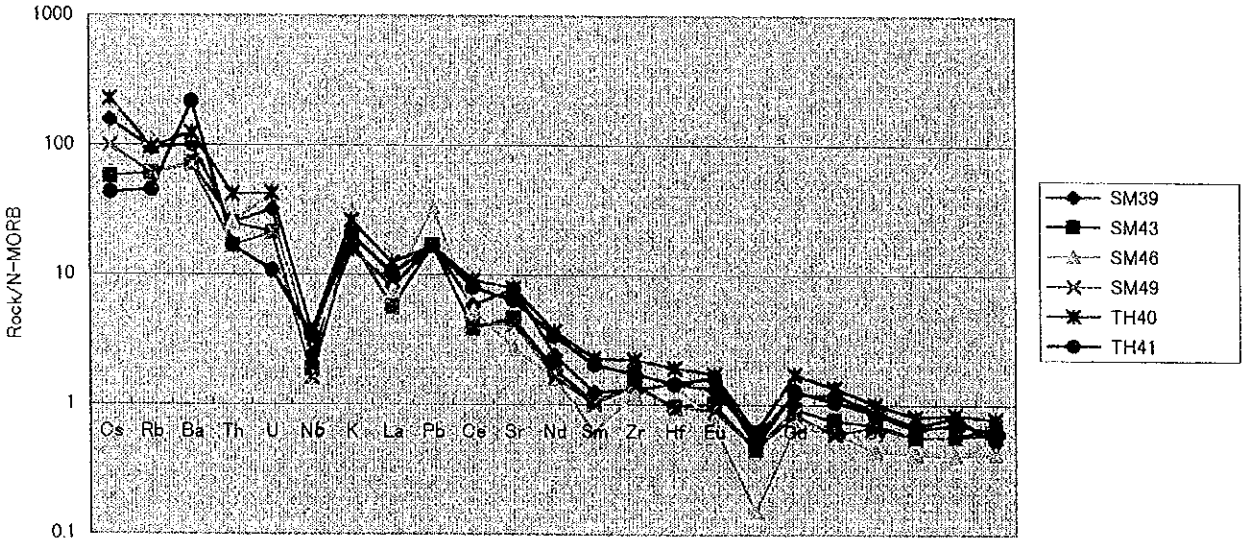
Bac-Man Spider diagram



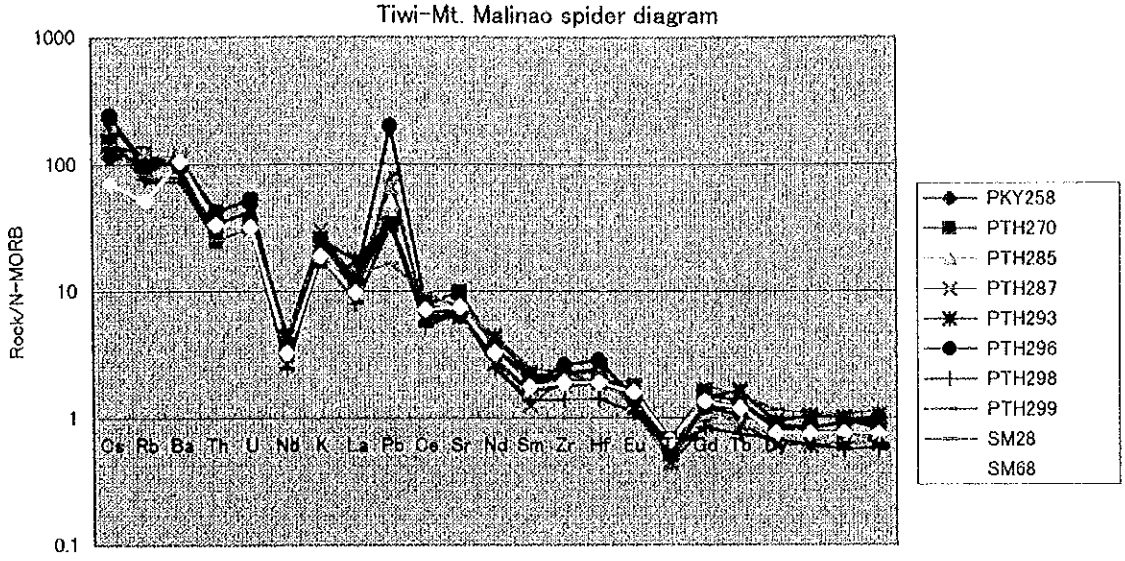
Gate Mountains Spider diagram



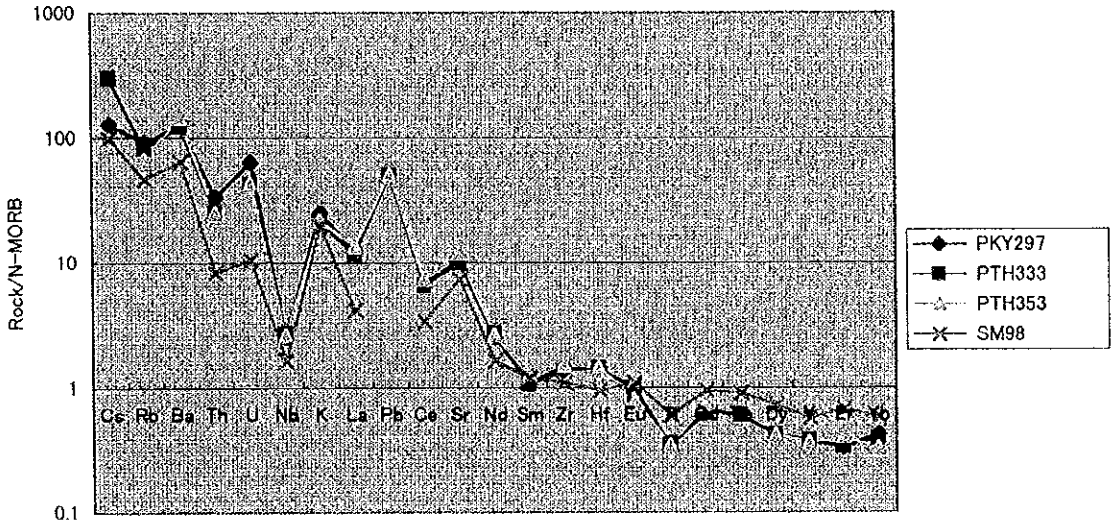
Irosin Spider diagram



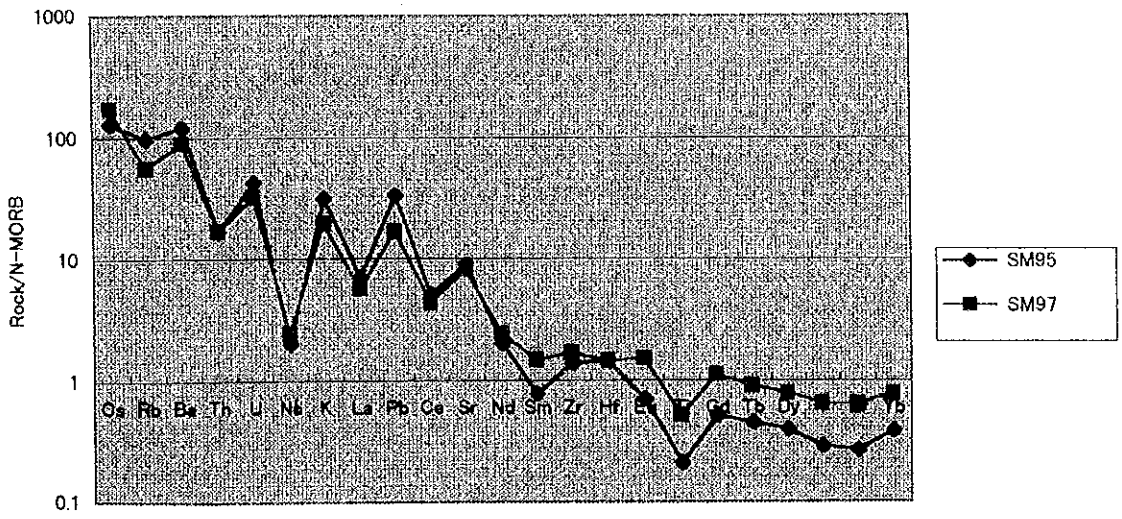
Tiwi-Mt. Malinao spider diagram



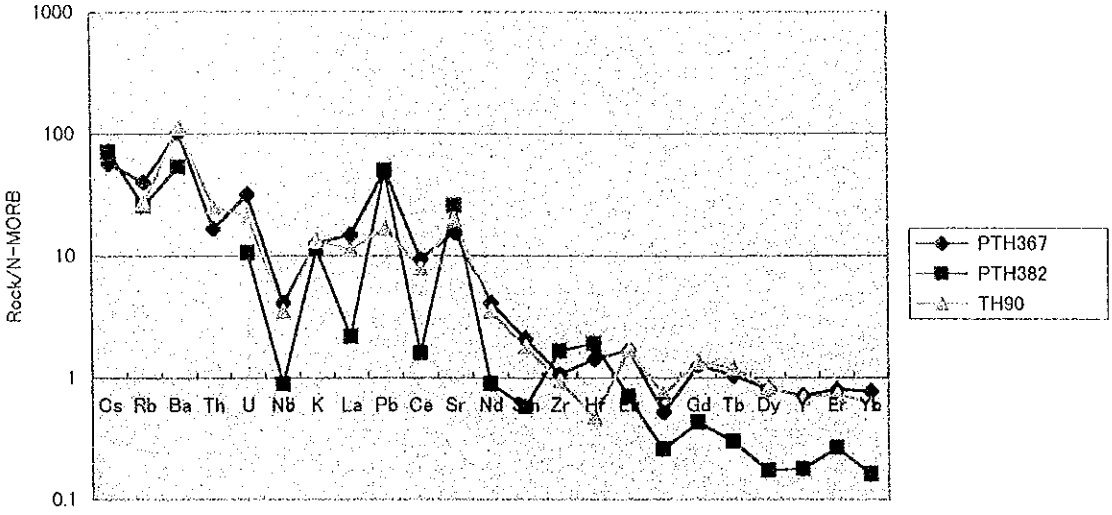
Kilbay spider diagram



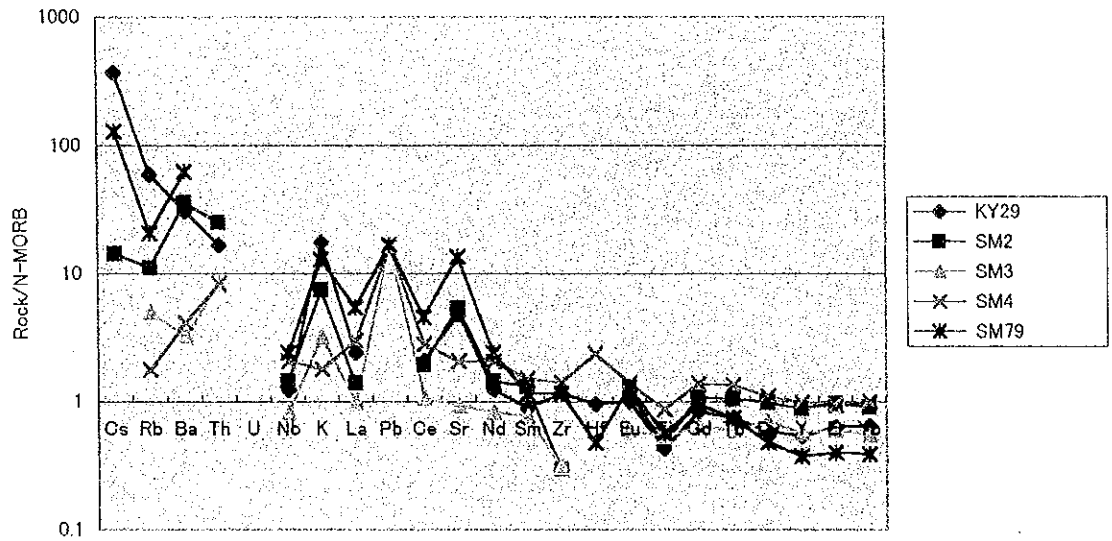
Mt. Culasi spider diagram



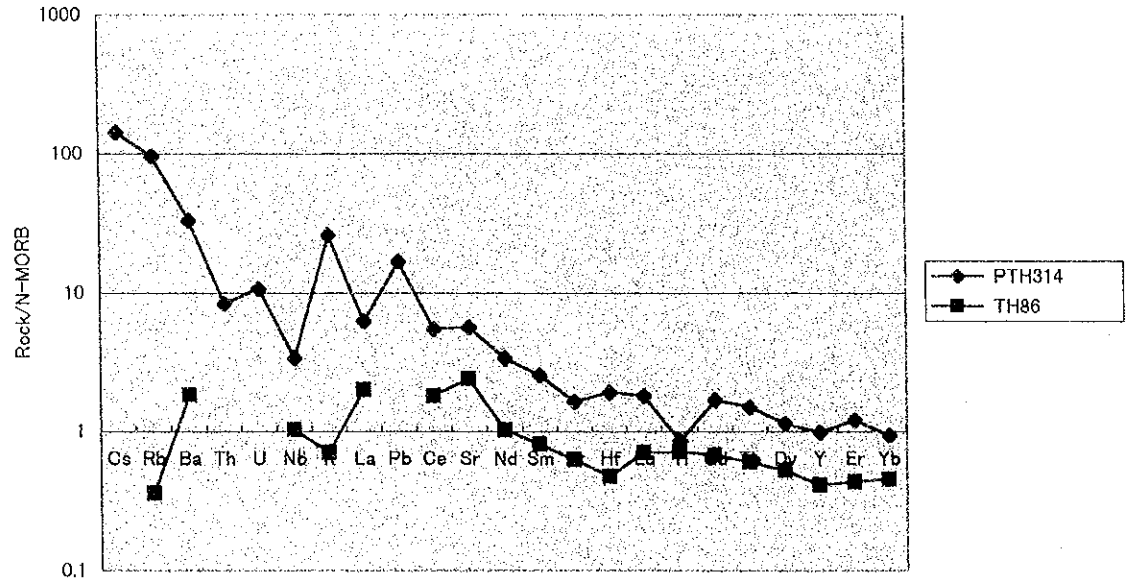
Bagacay spider diagram



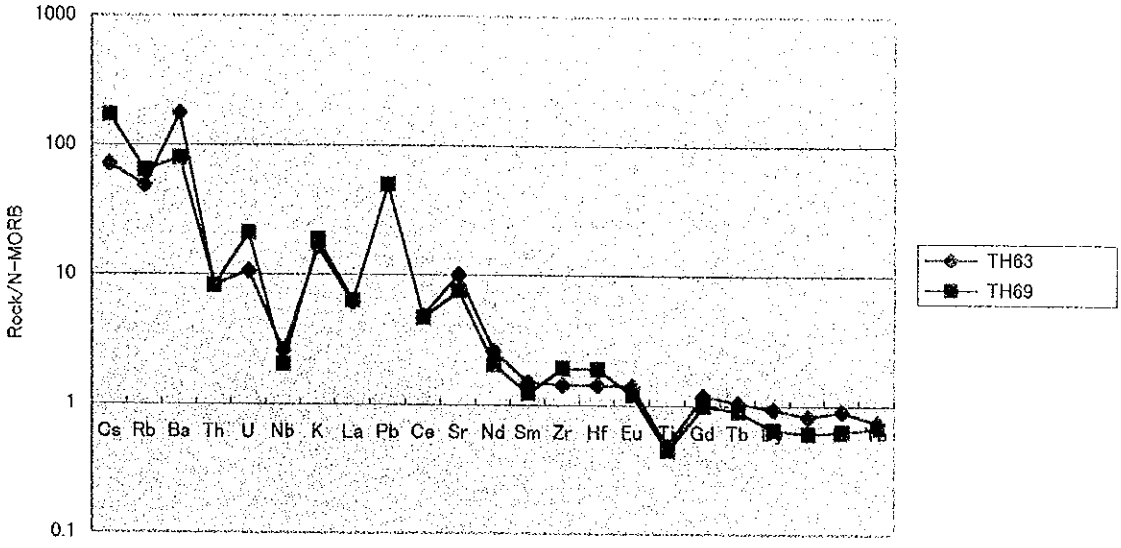
Pio Duran-Balatan spider diagram



Caramoan spider diagram



Sibobo spider diagram



Appendix 21

	Drilling No	depth (m)	logging points	Temp. of bottom (°C)
1	Pal-1			210
		550 - 600	andesitic tuff. Generally intensely altered but still discernible tuffaceous rock almost recrystallized to Cal+Qtz+Chl±Sph+Py	
		1180 – 1185	cuttings. Qtz vein	
		1572 - 1574	core. Qtz-Cal-Ep vein	
2	Pal-2RD			185
		1095	Qtz+Chl+Cal vein in stibnite bearing altered andesite	
		1845	Cal+Qtz+Hm vein	
3	Pal-3RD			210
		0 - 400	acid alteration	
		850 - 1300		
		2000 - 2100		
4	Pal-1RD			215
		763 - 768	cuttings. Qtz vein with Cal	
		949 - 976	cuttings. Qtz-Py-Ill vein	
		1017 - 1018	core. Qtz vein with clay+Py	
		1623 - 1628	cuttings. Qtz stockwork vein	
5	Pal-4RD			230
		1457 - 1622		
		1787 - 1979		
6	Pal-3D			260
		124.3 – 184.3	Qtz+Py vein	
		1332 - 1334	intensely altered volcanics. bleached	
		1550	hornfelsic contact assemblage cosisting fo Cpx+Pl+Mag	
		1632 - 1633.5	porphyritic dyke, microdiorite dyke	
		1699	massive Qtz+Py+Mag+Ep	
		1870 - 1872	core. biotite diorite	
		1900 -2030	microdiorite dyke	
7	Pal-4D			260
		1725 - 1782	cuttings. Qtz-Adu-Cal vein	
		1819 - 1821	core. Metal sulfide+Qtz+micaceous clay vein	
		2085 - 2086	core. massive Qtz with Anh	
8	Pal-9D			240
		780	silicified crystal tuff. Plag fragments totally altered to Ill+Qtz; mafics alteted to Fe-oxied+clays, Chl+Ill; in a matrix of Ill+abundant qtz+Anh+Py+minor Cal	
		900	abundant Qtz+Cal vein fragments	
		1150 - 1200	abundant Anh vein fragments and extensive silisification was obtained in vitric/crystal tuffs.	
		1287 - 1662.1	closey spaced micro quartz diorite, micro diorite, Hbl diorite, Cpx diorite (Cawayan Intrusive is in the form of series of microdiorite to diorite). intrusive dikes emplaced as intercalating with altered volcanics.	
		1440	silicified rocks; cuttings totally altered to Qtz+Anh+Py+minor Diaspore	
		1550 - 1560	abundant Anh, Cal, Qtz vein fragments	
9	Pal-5D			120
		1347.9 - 1412.9	Anh crystals also appearing with intensifing Chl. Other minerals are drusy Qtz+Hm+micaceous clay+Cal+Mag+Py	
		1412.9 - 1427.9	microdiorite dyke	
		1437.9 - 1482.9	volcanics. lithic tuff to undifferentiated volcanics with Ep+Chl+Qtz+Py+Cal+Anh+Ill	
		1712.9 - 1757.9	breccia with Chl+Qtz+Ep and pearly white mica flakes at 1712-1727.9	

	Drilling No	depth (m)	logging points	Temp. of bottom (°C)
10	Pal-6D			280
		329 - 345		
		529 - 574		
		1689 - 1694		
		1899 - 1924		
		2799 - 2889		
11	Pal-2D			250
		200 - 600	altered andesitic breccia recrystallized to Qtz+Py. Pyritized volcanics and silicified breccia. alterations: Qtz, Adu, Py, Anh, leux, Smc. highly recrystallized to Qtz, Py. Ill/Smc, Cal, Anh. veins: Anh±Cal±Py	
		600 - 1100	generally basaltic andesite with lavas of altered andesitic breccia. calciting is strong. alterations: Chl, Anh, Ill/Smc, Qtz, Ab, Py, Ap. veins: Anh, Py, Qtz, Adu	
12	Pal-7D			270
		490	vuggy silicified rock; argillic propyritic andesite	
		685	Cal+Qtz+Adu vein, Qtz+Adu vein	
		1173	Cal+Qtz+Adu vein	
		1195	Adu as secondary mineral. Au mineralization in Qtz+Adu vein	
		1605	acidic alteration, Diaspore. hypogene or not (drain back?)	
		1620	acidic alteration, Pyrophyllite. hypogene or not (drain back?)	
		1645 - 1680	acidic alteration, Diaspore. hypogene or not (drain back?)	
		1680 - 1700	acidic alteration, Pyrophyllite. hypogene or not (drain back?)	
		2052 - 2162.6	hydrothermal alteration zonation, potassic alteration zone characterized by Bt	
13	Pal-8D			300
		860 - 875	cuttings. fault with Qtz vein	
		1358 – 1477	cuttings. fault with Qtz vein	
		2104 – 2106	core.	
		2106	core.	
		2637 - 2638	core. Qtz+metal sulfide vein	
14	Pal-10D			310:326
		95 - 120	volcanic breccia with minor Qtz veinlets infills (anhedral)	
		225	tuff with Qtz vein infillings	
		300 - 320	volcanic tuff with coarse rock fragments of mosaic Qtz intergrowth	
		465	silicified rock that is intensely pyritized with suitable smoky Qtz vein material and moderate to abundant Cal	
		695 - 750	mosaic intergrowth with accicular length of Alu, Kao(?)+minor Py	
		2646	core.	
15	Pal-15D			310
		500 - 600	veins. Au mineralization exist or not.	
		800	hydrothermal alteration zonation. Pyrophyllite+Diaspore. acid alteration is hypogene or not (drain back?)	
16	Pal-11D			260
		198 - 208	advanced argillic alteration minerals assemblage- Kao+Prl	
		333 - 453	advanced argillic alteration minerals assemblage- Kao+Prl	
		298	relict of potassic alteration- Ill+Bt(?) in phyllic alteration zone: potassic alteration overprinted by phyllic alteration	
		438 - 443	relict of potassic alteration- Ill+Bt(?) in phyllic alteration zone: potassic alteration overprinted by phyllic alteration	
17	Pal-12D			300
		197 - 252	Qtz+Alu+Py+Pyrophyllite rock	
		347 - 372	Alunite silica rock	
		470 - 590	Qtz+Anh vein	
		967 - 982	silicified argillized rock	
		987 - 1052	Qtz-Adu=Cal vein	

	Drilling No	depth (m)	logging points	Temp. of bottom (℃)
18	Pal-14D			235
		684 - 704	Fine grained to white to light gray, highly altered vitric tuff with drusy bull Qtz +Cal. at depth, Qtz vein intensely increases.	
19	OP-1D	-	Neutral chloride	220
			Hydrothermal alteration. lithographic low permeable zone, sediments with in andesite lava, Illite+Ep, veins: 700 - 850m Au mineralization exist in higher temperature neutral-chloride	
20	OP-2D	850	alteration zone or not?	220
21	OP-3D			290
		2347 - 2459	Highly altered sedimentary breccia; Silicified and noted drusy Qtz crystals in vein with Hm, Py noted.	
22	OP-4D			310
		1464 - 1494	Mod. to highly altered andesite. hyaloclastite, matrix and phenocrysts are altered to chlorite and Qtz+Cal si abundant, interstitial and associated with chlorite and Qtz in tight veins with mylonites	
		1548 - 1569	Volcano-sedimentary breccia; highly altered mixture of andesite hyalocalstite, carboniferous siltstone and sedimentary breccia. chloritized, silicified and slightly to moderate argillized with abundant calcite with Qtz veins (Genong Formation)	
		1713 - 1749	Microdiorite matrix altered to smectite, chlorite and vermiculite. Vein minerals composed of calcite, quartz, siderite, ankerite, apatite, and vermiculite.	
		1998 - 2001	Higly altered andesite hyaloclastite. Generally chloritized and silicified with drusy Qtz, Ep, Cal veins.	
23	OP-5D			310
		988.4 - 1003.4	Silicified andesite lava with Qtz vein, Chl, Py	
		1432.4 - 1400.4	Tuff breccia. greenish, silicified, minor Py in Qtz	
		1864	Andesite dike	
		2653 - 2677	Sedimentary breccia, matrix altered to Chl with Py disseminations.	
		2785 - 2803	Microdiorite	
		2845 - 2923	Silicified dike materials with Py	
24	OP-6D			255
		270 -330	Gabbro (Cawayan Intrusive Complex)	
		801 - 848	Garnet associated with microdiorite dike	
		810 - 860	microdiorite	
		1252 - 1320	Py disseminations with Cal, Qtz, Chl	
		1798.76	Cal, Anh+Qtz vein with Chl±Mag±Py disseminations	
25	PB-1A			245
		600	silicified andesite, propyritic microdiorite. mode of occurrence of microdiorite	
		650 - 900	Qtz±Kfs or Qtz+Adu vein. Au mineralization in Qtz+Adu (Kfs) vein?	
		2505	"silica veins common: minute Mag minerals disseminated common to abundant". mode of occurrence of silica vein zone	
26	MAN-2			220
		2000 - 2010 feet	Cal, Qtz+Muscovite+Anh+Leux+Py+Cal, Qtz veins in Px diabase. Au mineralization of veins	

	Drilling No	depth (m)	logging points	Temp. of bottom (℃)
27	CN-1	Notable occurrences of veins and fractures (cores and cuttings)		270
		300 - 305	amorpous silica sometimes drussy type in veins	
		370 - 385	pyrite in veins	
		385 - 395	amorpous silica sometimes drussy type in veins	
		410 - 415	pyrite in veins	
		455 - 465	amorpous silica sometimes drussy type in veins	
		490 - 495	pyrite in veins	
		510 - 525	pyrite in veins	
		530 - 560	Qtz and Py in veins	
		730 - 735	pyrite in veins	
		800 - 825	pyrite in veins, secondary Bt?	
		1410.4 - 1413.4	Qtz associated with Anh in veins	
		1590.2 - 1591.8	Qtz, Adu and Anh in veins	
		2201.5 - 2202.4	Qtz associated with Anh in veins. Ep, Qtz, Adu in veins	
		2437 - 2440	amorpous silica sometimes drussy type in veins, secondary Bt?	
28	CN-2D			230
		130 - 145	Silicified veins	
		215 -220	Silicified andesite	
		275 - 395	Sil/Qtz veins common	
		665 - 755	Intensely altered volcanic breccia with Qtz and Hm veinlets	
			at 700m: Qtz+Anh+Py+Cal+Ill+Mag+Leux+Rutile	
			veins:Qtz+Anh+Adu+Py	
			at 745m: Py veinlets	
29	CN-3D(CN-1RD)			265
		1519 - 1738	alteration mineral assemblage	
30	CN-4D			240
		650 - 700	Higly altered volcanic rock. Gray white in color, Mineralogy: Qtz and Py abundant, moderate clays. veins: Qtz+Py	
31	CN-2RD			250
		550 - 625	Qtz, Py veins in Ill/Smc zone	
		1000 - 1090	Qtz, Py, Anh veins in Ill zone	
32	CN-3RD			245
		610 - 680	Qtz-Py vein in intensely altered rock with poor permeability	
		690 - 840	Qtz-Py vein in intensely altered rock with poor permeability	
		850 - 1035	Qtz-Py vein in intensely altered rock with poor permeability	
		1165 - 1385	Qtz-Py vein in intensely altered rock with poor permeability	
		1440 - 1505	Qtz-Py vein in intensely altered rock with poor permeability	
		1649 - 1770	Qtz-Py vein in intensely altered rock with poor permeability	
		1770 - 1890	Qtz-Py vein in intensely altered rock with poor permeability	
		2175 - 2225	Qtz-Py vein in intensely altered rock with poor permeability	
33	MAN-1			210
		491	cuttings. Qtz+Adu+Anh vein	
		597	cuttings. Anh, Anh+Py, Qtz veinlets, Ill+Chl vein	
		1195	cuttings. Mag, Anh+Kfs, Anh , Cal veins	
		1369.45 -	core. diorite. Act/Trm, Qtz, Chl, Ab, Kfs, Cal , Bt, Leux, Anh	
34	MO-1			200:216
		520 - 600		
		652.2 - 654.5	core.	
		600 - 900		
		1300 - 1573		
		1,267		
		1578 - 1580	core. Kfs. Cu-sulfide	

	Drilling No	depth (m)	logging points	Temp. of bottom (°C)
35	MO-2			210
		800 - 900	evidence of sedimentary layering and deposition were noted among the volcaniclastic sequences. (not encountered in MO-1 and MO-3) Evidences: 1. observed laminations in some chips as defined by hematite and parallelism of plagioclase fragments 2. occurrence of secondary apatite which appear to occur in sedimentary layers in Tongonan, Biliran and Daklan.	
		800-1000	Qtz occur in appreciable amounts as alteration of the primary components of the rocks as vug and vein fills and strongly argillic.	
36	MO-3			220
		35 - 90	intensely altered volcanics, intensely silicified, argillized,	
		225 - 270	intensely silicified lithic crystal tuff. common biotite (cannot be detected if primary or secondary)	
		415 - 435	intensely altered rocks, intensely silidified	
		885 - 1207	andesitic crystal tuff; matrix silicified, slightly chloritized, intensity of silicification, argillization and pyritization increase with depth. occassional Anh also noted.	
37	IM-1			
		1312 - 1314	core. silicified rock with Qtz-Py-Cal veinlet	
		1522 - 1525	core. Qtz-Adu-Ill vein	
38	Pal-13D			
		682.33-692.33	Qtz +Ill(?)+Anh+Ep, Anh+Qtz+Py, Qtz+Cal veinlets	
		892.3 - 902.3	coarsely crystallized white mica probably muscovite was encountered	
		922.3	Adularia was noted replacing Pl.	
		1017.3	coarsely crystallized white mica probably muscovite was encountered	
		1077.3	Adularia was noted replacing Pl.	
		1344 – 1349	microdiorite dike/andesitic dike	
39	Pal-16D			
		1300 - 1400	Adu in Ill/Smc zone. Au mineralization exist or not.	
		1500 - 1950	Adu in Ill zone. Au mineralization exist or not.	
40	Pal-19			
		450.65 - 530.65	andesite tuff breccia(?) generally silicified. some chips chloritized with Cal, clays, Mag, Py; more alteration at 470.65 -	
		610.65 - 750.65	higly altered volcanics; lithology not discernible; silicified volcanics, abundant Py, Qtz veins; weak carbonatized	
		925.65 - 1030.65	higly altered rocks; Py moderate, generally silicified and chloritization becoming dominant to bottom. abundant mineralogy- Qtz+Py, Illitic clays with minute vugs	

Appendix 22

Sample Description of Bac-Man geothermal drill cores/cuttings

Sample	hole	core #	depth (m)	rock	alteration/mineralization	test
PBM001	Pal-1	2	1572 - 1574	wk-sil andesite w/ Hm thin streak	Qtz v. 5mm wd. ∠20° clear white coarse-medium grained Qtz w/ Hm thin rimb. Subtle epidote, euhedral Py diss. sparsely; Quratz+S/S	G, X
PBM002	Pal-2D	8	2395.0 -2396.5	black porphyritic basalt dike (?) (Cawayan Intrusive Complex)	Chl+Ep+Mag+Bt(?)+Py; SiO2=50.99%	T, W,
PBM003	Pal-2D	10	2773.0 - 2773.1	microdiorite (Cawayan Intrusive Complex)	mafic minerals are completely altered to Chl, Ep. felsic minerals are altered Ill? or Pl?. Py diss. ; SiO2=49.59%	T, W,
PBM004	Pal-3D	2	5th column 1632 - 1633.5	basaltic dike (Cawayan Intrusive Complex)	black in color, Px: 2-3 mm in diameter, Py diss. SiO2=51.4%	T, W,
PBM005	Pal -4D		1745	cuttings	silica (Qtz) fragment +alt. andesite w/ Py dissem. Quartz+S/S	G, X
PBM006	Pal -4D	?	2091 - 2092	propyritic alt. andesite w/ intensely Py dissem.	vein 30mm wd. ∠55°dominantly Cal. w/ patchy white~clean Qtz. Py diss. corresponding shear zone. Pl,Qtz, Kf, Chl/Smc	G, X
PBM007	Pal-8D	4	3rd column 1500	volcanic breccia	Clasts are 3-4 cm in lenth and 2-3 cm in diameter. - The clasts are andesitic tuff in composition. The interstitial vein is a dark glassy mineral. - It is slightly chloritized with disseminated Py. - There are more Py on the clasts, but Py also exist along the glassy vein. - Rounded black to dark blue mineral (?) exist. Qtz, Py, Pl, S/S, Chl/Smc	T, G, X
PBM008	Pal 1RD		1625	cuttings	cuttings mainley consists of gray fine grained quartz with subtle epidote, hematite. Qtz frag. +oxidized sulfide (prob. Py, flaky); Qtz, Ab, Kf, S/S	G, X
PBM009	MO-1	1	#1: 279.5-281.3m 279.9m	andesite	white to reddish gray in color. moderate to highly silicified with Py diss. acid alteration (alunite?); Qtz, Kln, Dic	G, X
PBM010	MO-1	4 or 5?	4:1256.7-1258.8m; 5:1578.0-1580.0m1st column	tuff	Molybdenite (?) in Qtz veinlet stockwork: 1-2mm width. in w-sil. Ill alteration. Py diss. Anh veinlet stockwork (frature filling); Qtz, Anh, Py, S/S Chl/Smc; Au:65ppb, Mo:1655ppm	G, X
PBM011	PB-1A	4	2262.8	Qtz vein	w=3cm gray to white in color. very fine grained Qtz with a little Py and very fine grained black mineral. host rock: bleached andestite; silicified/Py diss. Qtz, Anh, Ser	G, X
PBM012	Pal-5D	6	2247.8	argillized rock	fine grained andesite? anhydrite veinlets, Anh fill interstitialy. Ill, Chl altered?; Qtz, Chl, Anh, S/S	G, X