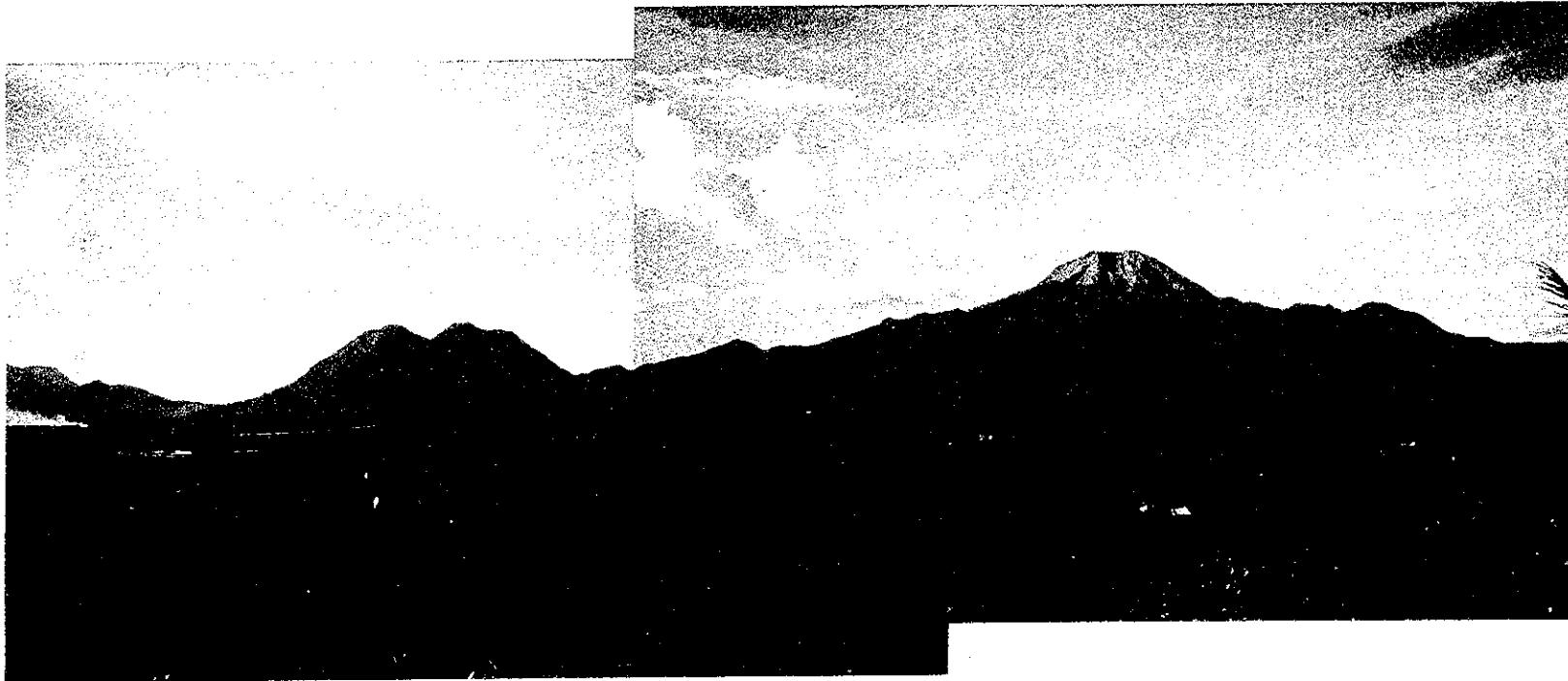
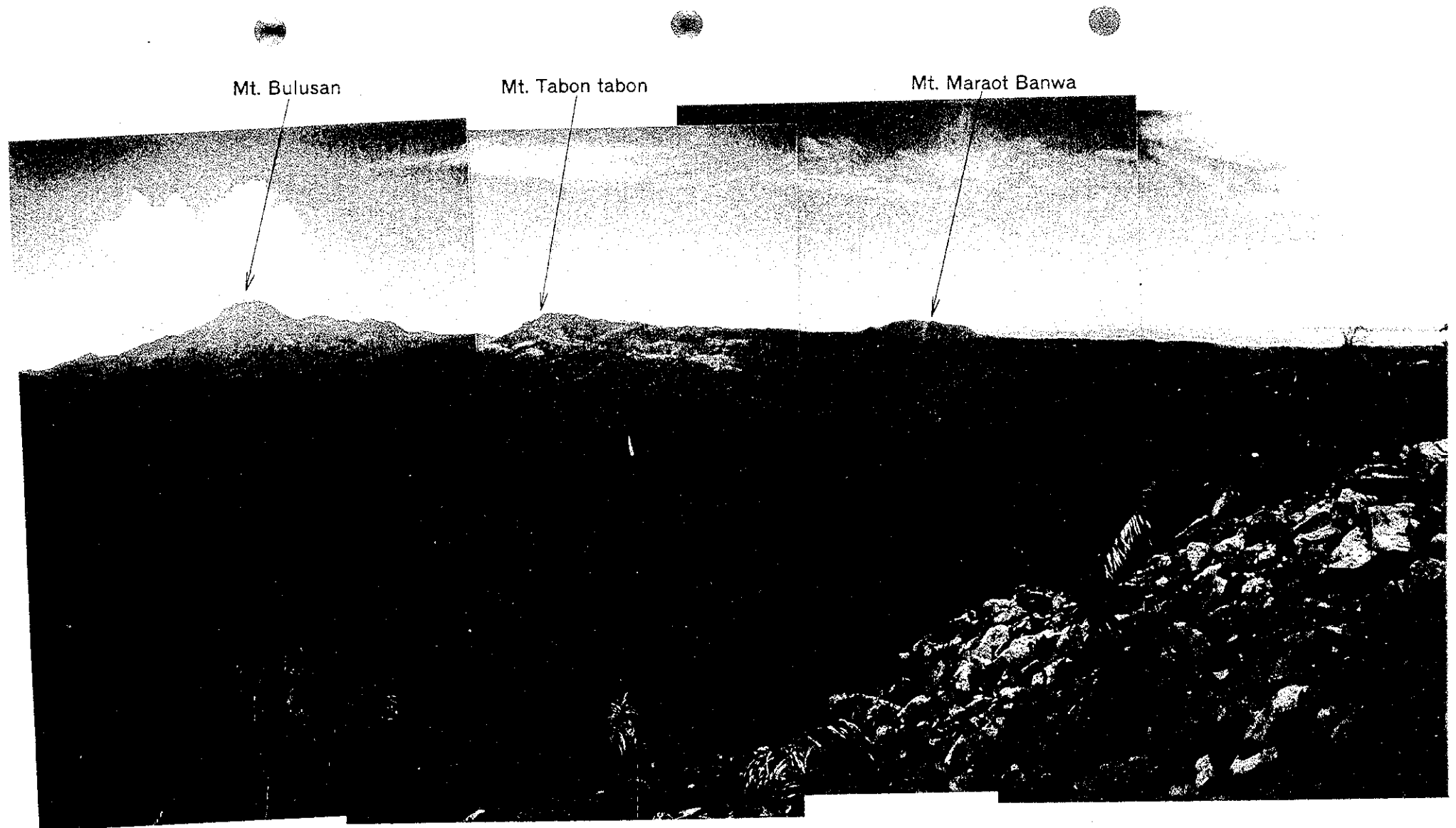


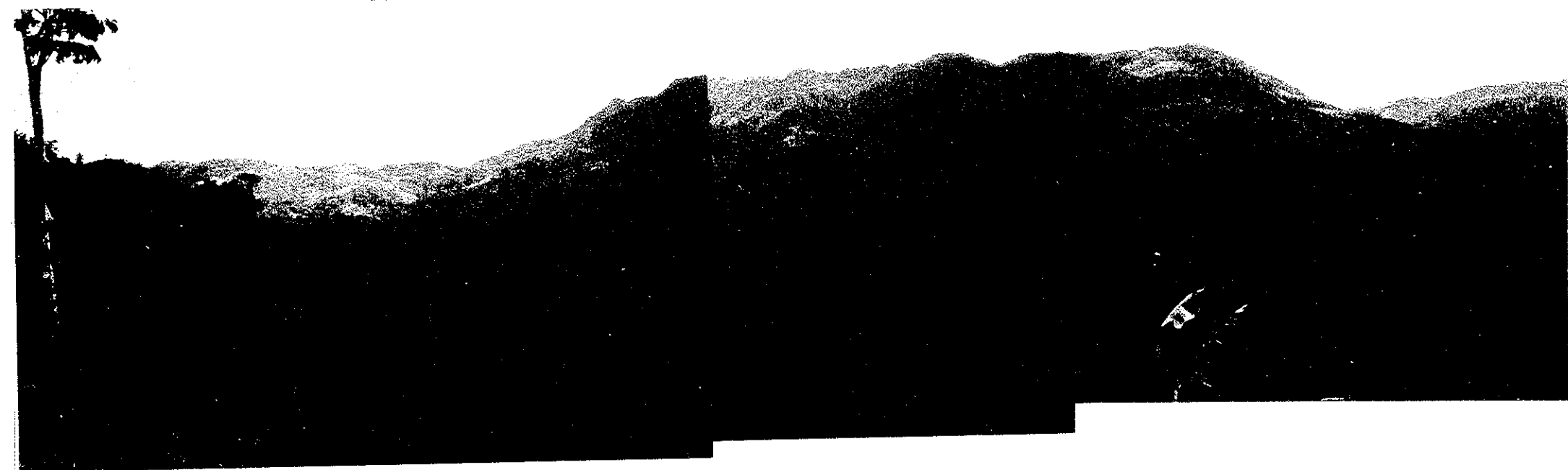
PH01 View of the Bac-Man geothermal production field and the survey area. Looking south. The survey area is located on the right of the photo. The highest dome is Pangas volcano. Bac-Man geothermal energy plant is at near skyline in the center, where we can see steams. Note that the survey area has low relief in comparison to the Bac-Man geothermal field where the volcanic topography is well-preserved..



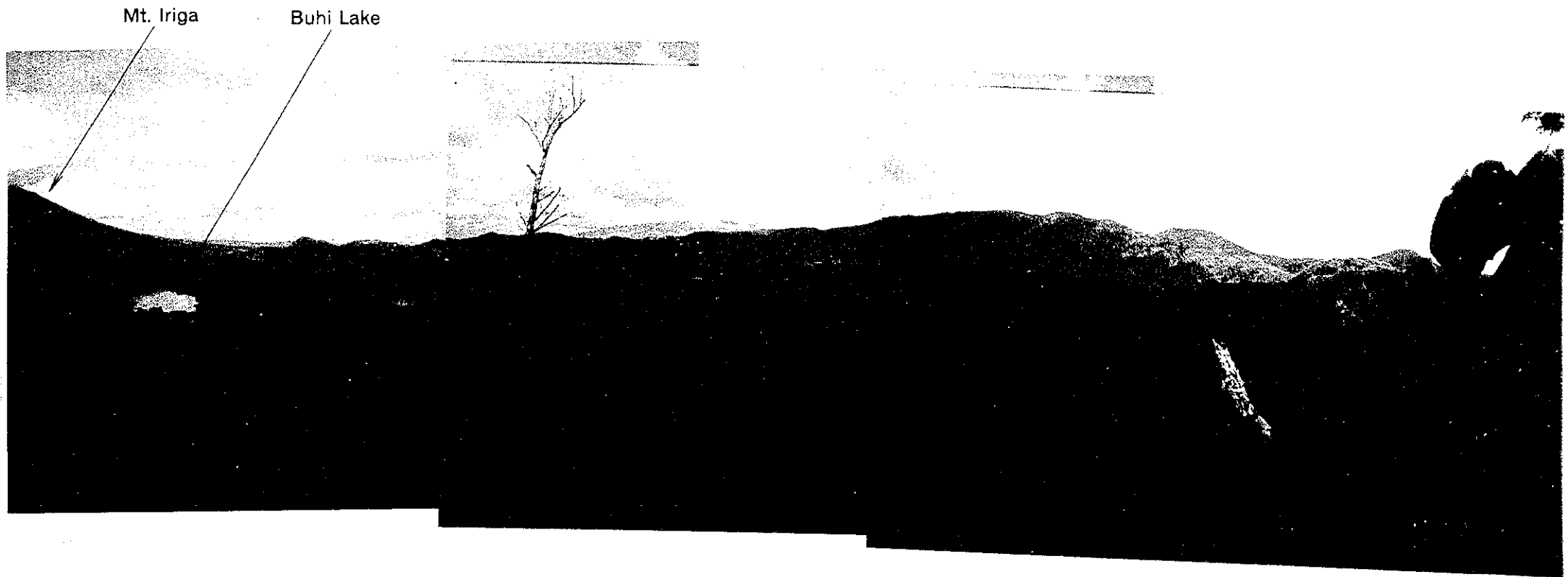
PH05 View of Bulusan volcano and Irosin Caldera from the edge of the caldera rim.
Looking north. The highest mountains is Bulusan Volcano. The steep hill on the
left is Jormajam andesite dome.



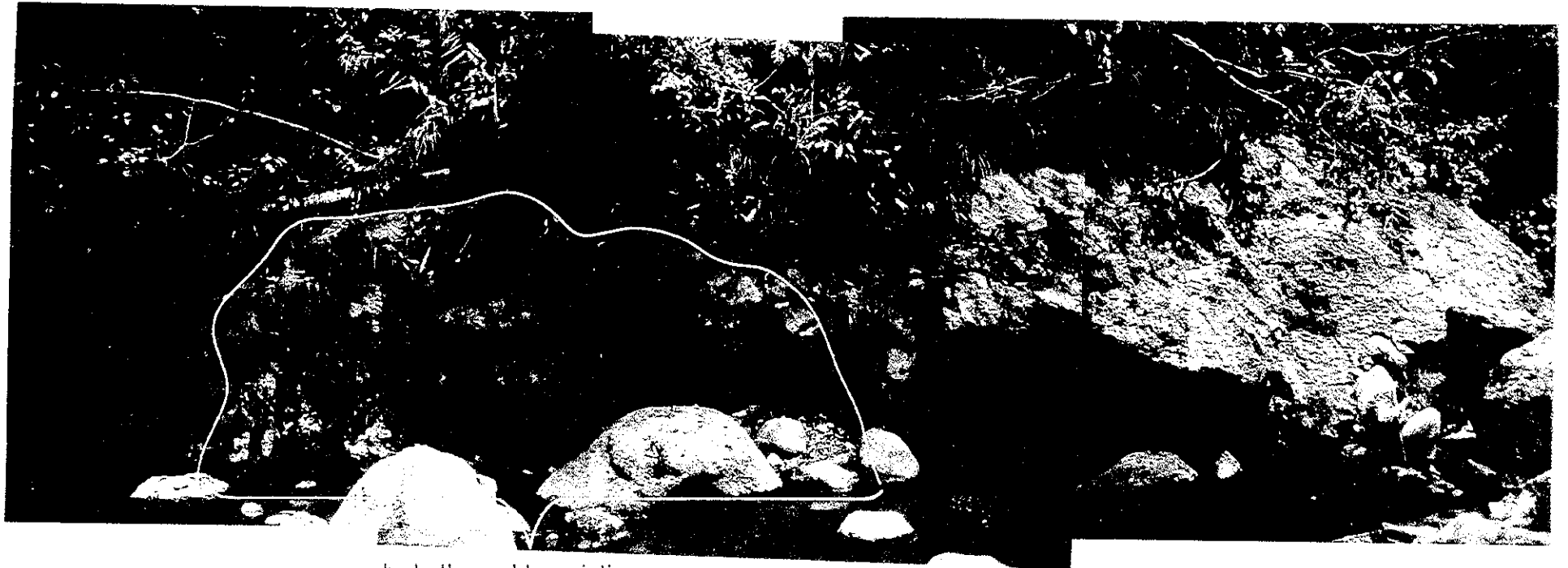
PH06 View of northern part of the Gate Mountains area from a hill in 3km northwest of Tugas. Looking north. The rock of the hill is hornblende-pyroxene andesite. Gently slopes are formed by Pre-Caldera volcanics. Bulusan Volcano and Mt. Tabontabon can be seen in the distance.



PH07 View of western part of the Gate Mountains area from the same hill as the photo 6. Looking south. The hydrothermal alteration zone are distributed in topographic low area. The ridge range NS direction.



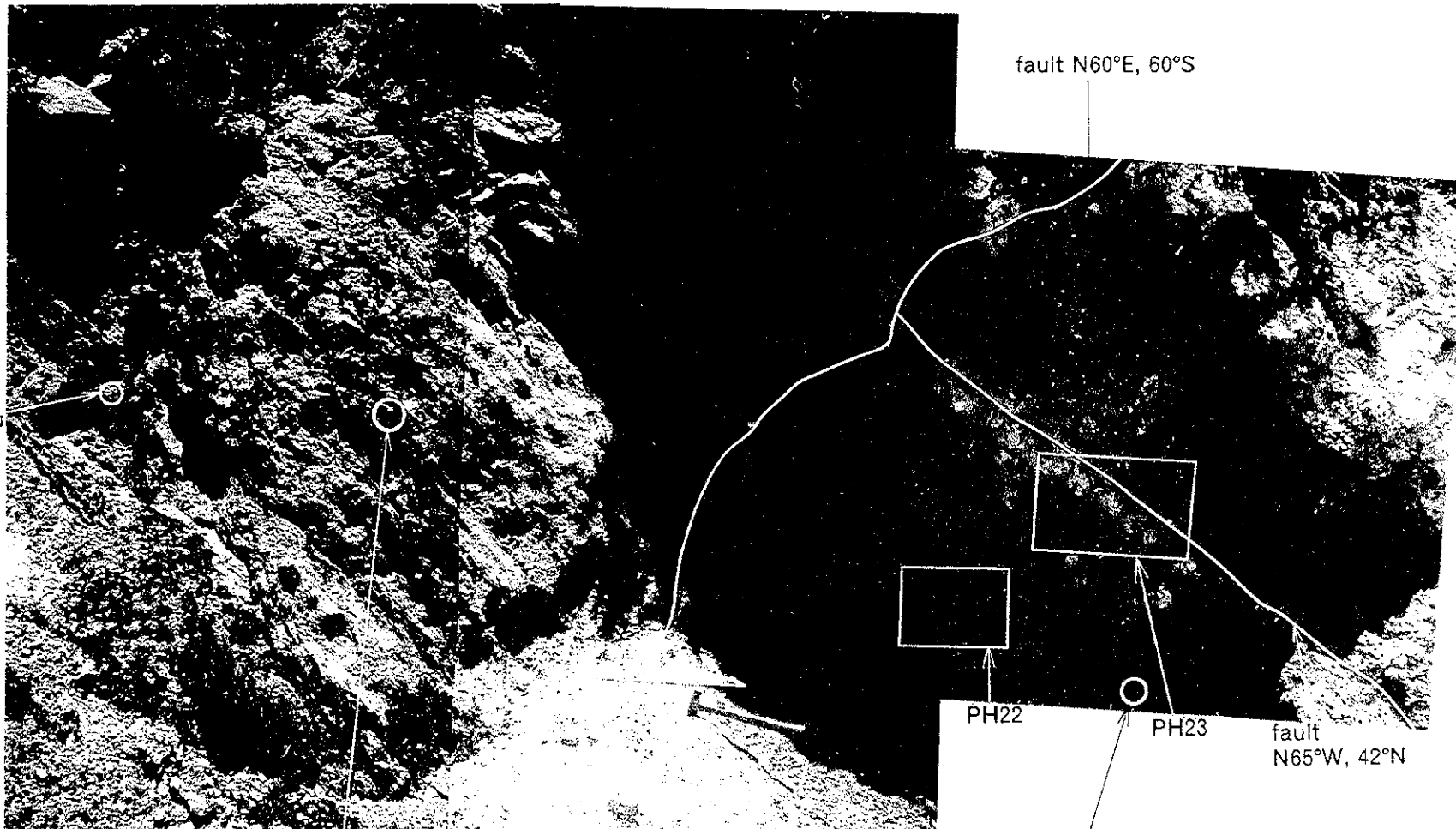
PH09 View of the Northwestern part of Tiwi-Mt. Malinao area. Looking north. Thick vegetation. The ridges and creeks range toward NE direction. Eastern slope of Mt. Iriga and Lake Buhi can be seen on the left. Most front valley is the Cayohoson Creek.



hydrothermal brecciation zone

PH20 Outcrop of highly silicified alteration. Alteration zone is developed horizontally. Hydrothermal brecciation is also observed.

PTH324
 Qtz > Kln ≧ Alu
 Au : 45ppb
 Cu : 860ppm



fault N60°E, 60°S

Black Color chaledonic Qtz vein
 N70 ~ 80°E, 42 ~ 50°N
 PTH325 : Qtz ≫ Py, Rt, Aut, Kln
 Au : 180ppb, Cu : 868ppm, Mo : 34ppm

PH22 PH23 fault N65°W, 42°N

Light gray color vein
 N60°W, 40°S
 PTH326 : Au : 215ppb, Cu : 527ppm

PH21 Outcrop of kaolinite alteration. Two kinds of quartz veins are observed. One is black color veins with 0.5 to 10cm in width. Other is light gay color veins with 0.5 to 3cm in width. Black color quartz veins are chaledonic and have metal contents of Au:180ppb, Cu:828ppm, Mo:34ppm. The black color veins consist of quartz and minor pyrite, rutile, anatase, and kaolinite in X-ray diffraction.



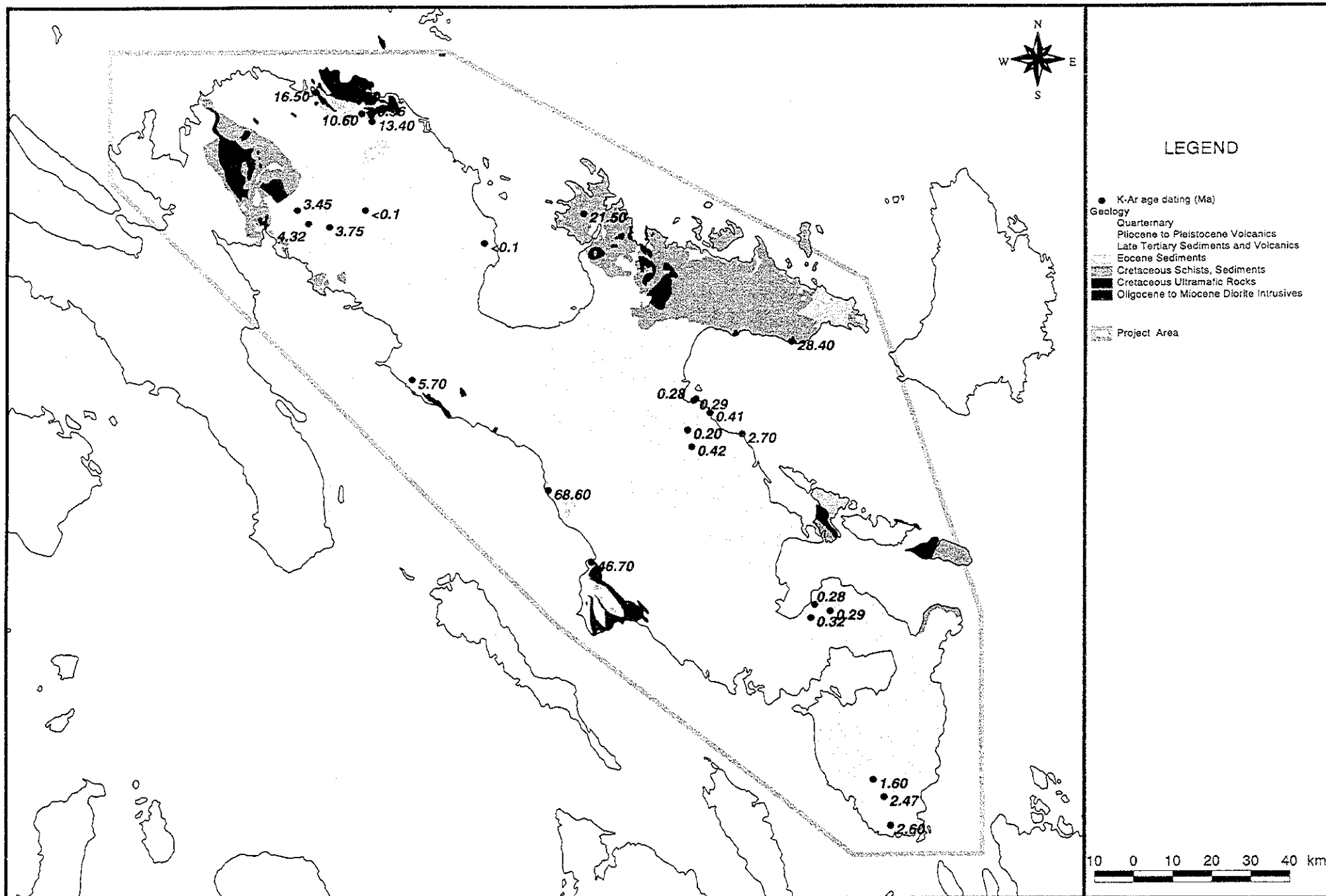
PH30 Open pit of the Benguet mine. Now "Base Metal Mining Corporation" has this mine. Gold bearing quartz veins were in altered the Paracale Trondhjemite. The Pit elongate along the structure of $N40^{\circ}E$ direction of major quartz vein. The town of Jose Panganiban and Larap Mine are seen on the left.

Appendix 15

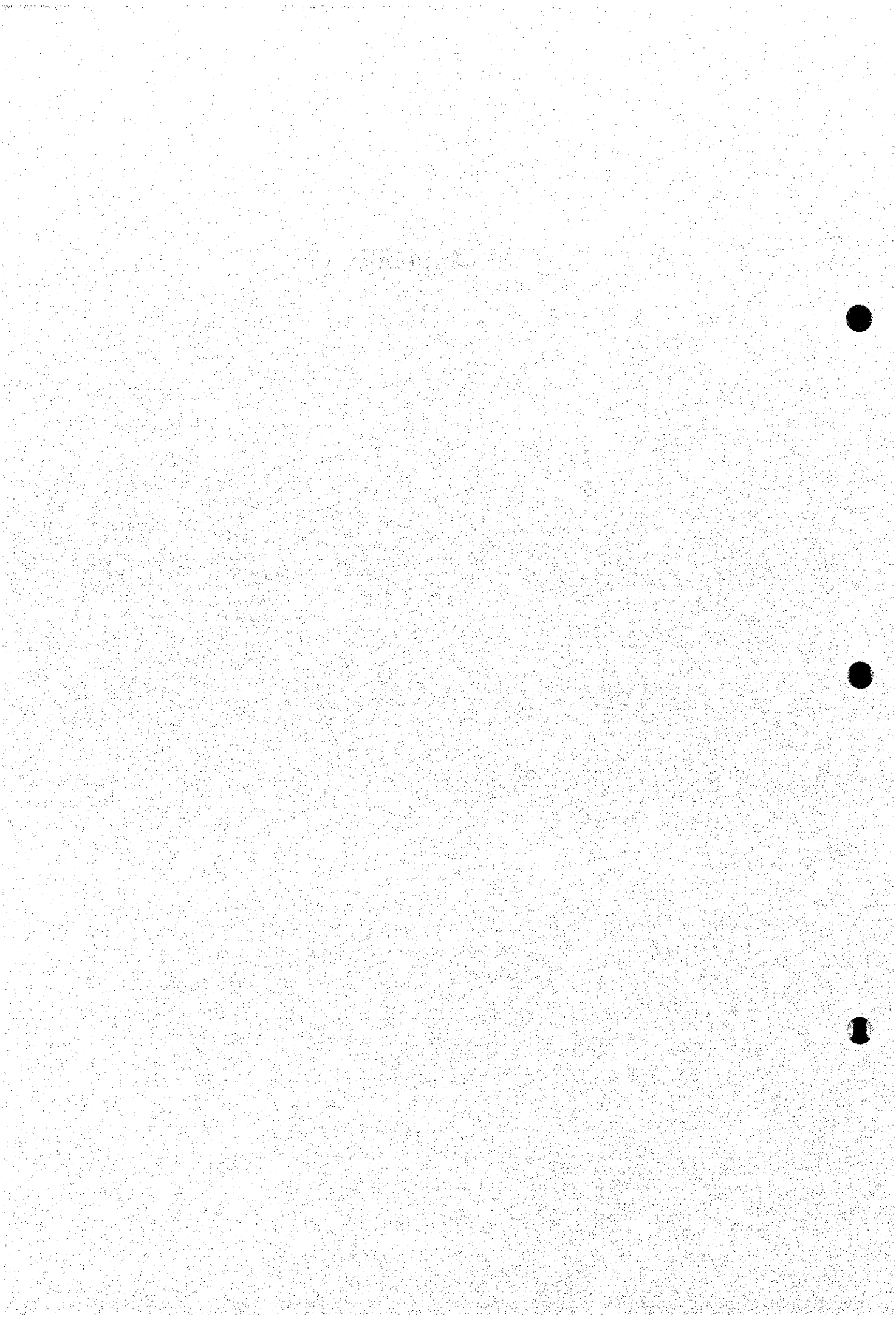
BC97-98sample_KAR

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
TE73	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	-	-
PXY258	Santa Cruz, Buhl, Tiwi-Mt. Malinao area	Px-Hbl andesite	0.42	0.05	64.8
PXY297	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	Napagasan, Babel, Mt. Bagacay area	tonalite to qtz diorite	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



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	basaltic dike	microdiorite	basaltic dike	Px andesite	Px andesite	Px and.	Px and.	andesite	andesite	(Bt)Px ande.	Px? ande.	Px-Hbl and.	Px andesite	Px and.	Hbl/Px and.	dacite	dacite
SIC2	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
TIC2	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
Ti	<.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. area location rock name	PKY297 Kibay S of Susung Bt-Hbl and.	PTH333 Kibay Alawihaw Hbl-Bt dac.	PTH353 Kibay Tonton River Bt dacite	SM98 Mt. Labo Bt-Hbl dac.	PTH367 Bagacay Babel tonalite-gz di?	TH90 Bagacay Hbl and.	PTH382 Larap-Exiban Benguet granodiorite	SM95 Mt. Culasi dacite	SM97 Mt. Culasi Hbl and.	TH63 Sibobo Hbl and.	TH69 Sibobo Px and.	KY29 Pio Duran diorite	SM2 Pio Duran diorite	SM3 Pio Duran diorite	SM4 Pio Duran intrusives	SM73 W.Pasacao Px and.	SM79 Salatan Caorasan 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	16.97	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	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	1.9	4	2.4	5.1	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
Ti	<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. area location rock name	SM59 Gate Mt.	TH43 Gate Mt.	TH54 Gate Mt. Ginablam	TH40 Magallanes	TH41 Bintacan	PKY258 Tiwi-Malinao Santa Cruz	PTH270 Tiwi-Malinao Inalait River	PTH285 Tiwi-Malinao coast	PTH287 Tiwi-Malinao coast	PTH293 Tiwi-Malinao coast	PTH296 Tiwi-Malinao coast	PTH298 Tiwi-Malinao coast	PTH299 Tiwi-Malinao coast	SM28 Tiwi dacite	SM68 Buhí Px and.	PTH314 Caramoan Bulalacan diorite	TH86 Olas green rock
	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				
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	19.98	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	3.1	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	5	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 composition and normative composition of the igneous rocks from the Bicol region

SAMPLE	PBM002	PBM003	PBM004	PKY225	PKY227	PKY241	PKY256	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 ₂ O 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 ₂ O 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	6.68
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 ₂ O	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 ₂ O	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 ₂ O 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	20.67	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	19.56	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	4.18	2.70	4.60	-	-	-	0.08	-	-	-	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	6.68
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	95.98	95.19	98.17	97.59	97.89	96.99	94.84	97.69	98.26	96.27	98.75	98.16

Chemical composition and normative composition 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 ₂ O ₃	17.99	16.78	17.01	17.12	17.96	20.44
Fe ₂ O 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 ₂ O	3.51	3.05	3.87	4.05	4.26	6.41
K ₂ O	1.85	2.5	2.05	2.07	1.23	1.12
P ₂ O 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 composition and normative composition of the igneous rocks from the Bicol region

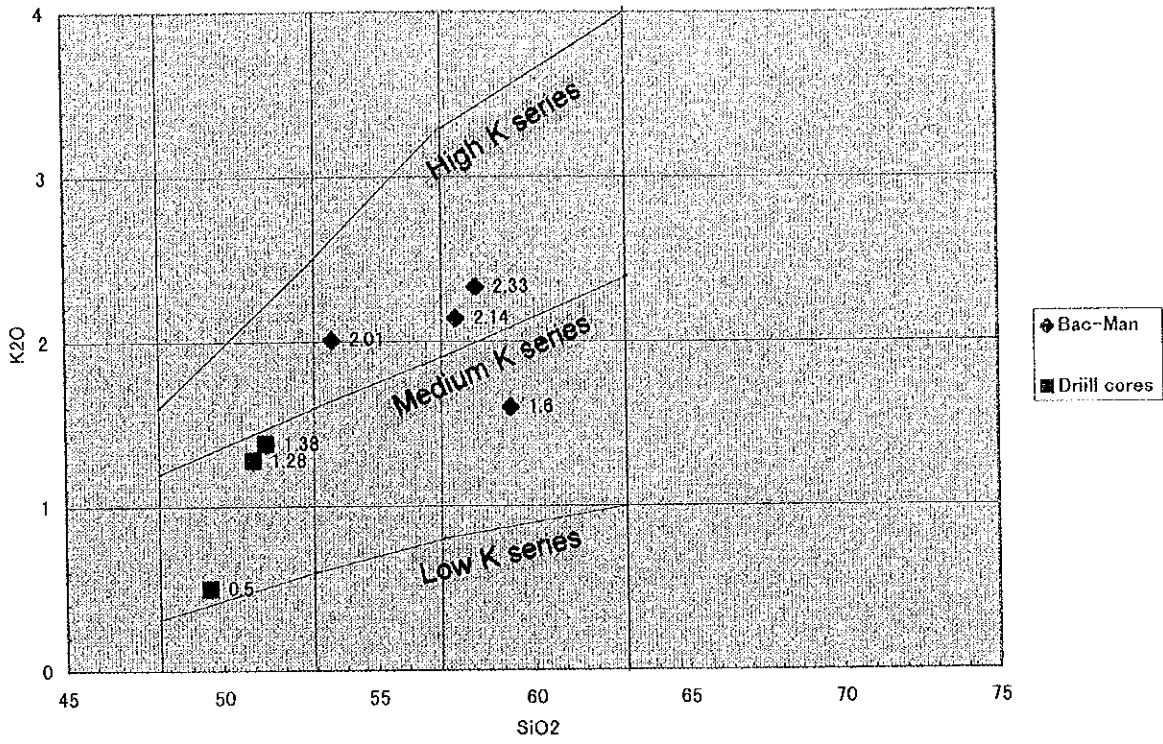
sample No.	KY29	SM2	SM3	SM4	SM28	SM39	SM43	SM46	SM49	SM59	SM88	SM73	SM79	SM95	SM97	SM98	TH06	TH24	TH40
SiO ₂	58.36	52.76	49.69	53.62	61.59	54.27	57.39	71.02	56.4	56.57	56.9	52.82	52.77	67.01	56.22	55.53	56.93	55.72	56.54
no ₂	0.5	0.53	0.6	0.97	0.47	0.66	0.52	0.18	0.53	0.59	0.78	0.87	0.64	0.24	0.58	0.69	0.74	0.65	0.71
Al ₂ O ₃	17.88	16.02	15.85	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 ₂ O 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	5.89	5.22	6.12	7.28	5.78	2.25	5.72	6.58	6.08	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 ₂ O	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 ₂ O	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 ₂ O 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	14.81	11.83	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	10.84	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	33.08	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	21.48	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	-	-	-	0.89	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	0.28	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	95.84	96.74	96.77	97.56	97.45

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

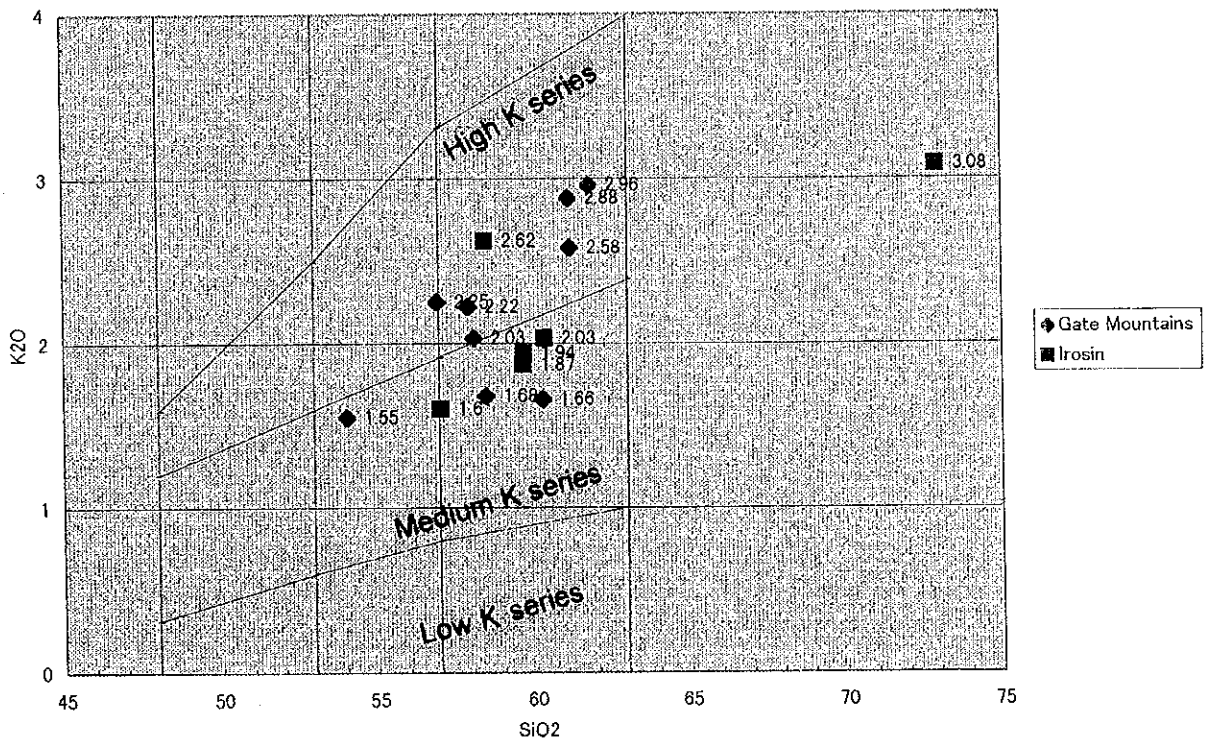
sample No	TH41	TH43	TH54	TH63	TH69	TH86	TH90
SiO2	56.72	56.52	58.55	57.66	58.84	57.05	49.86
TiO2	0.55	0.75	0.56	0.55	0.52	0.81	0.85
Al2O3	18.67	18.69	18	18.69	17.73	14.37	18.22
Fe2O3	6.95	6.94	5.91	5.77	5.9	9.62	9.2
FeO*	6.25	6.24	5.31	5.19	5.31	8.65	8.28
MnO	0.18	0.1	0.12	0.09	0.11	0.17	0.15
MgO	2.17	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	9.15	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
ic	-	-	-	-	-	-	-
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

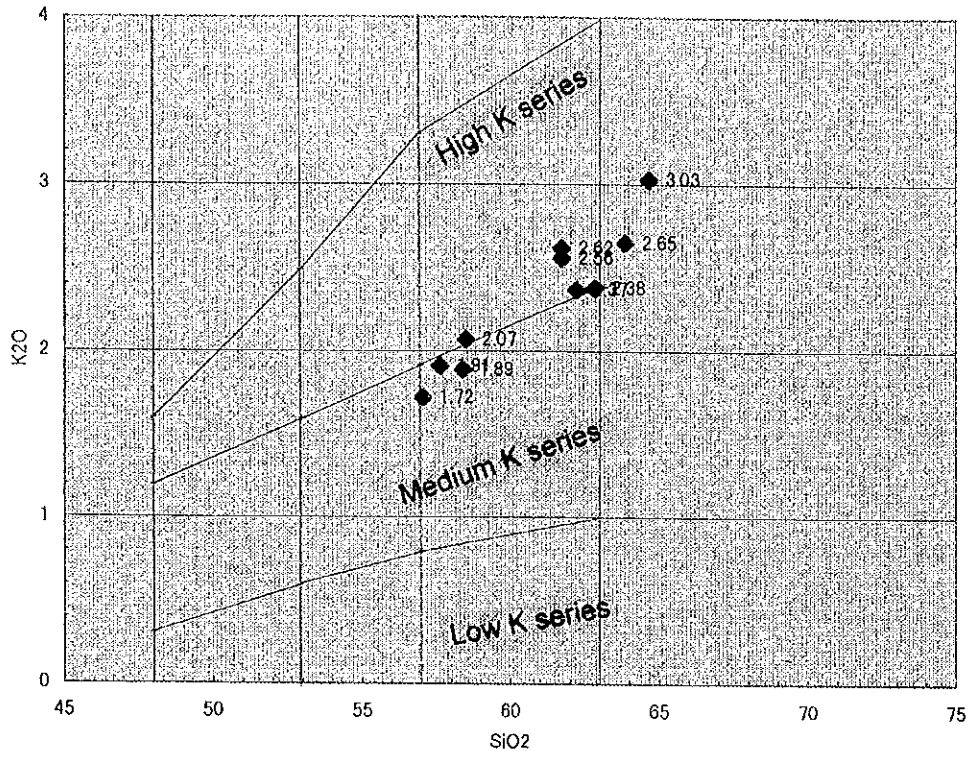
SiO₂ - K₂O (Bac-Man)



SiO₂-K₂O (Gate Mountains/Irosin)

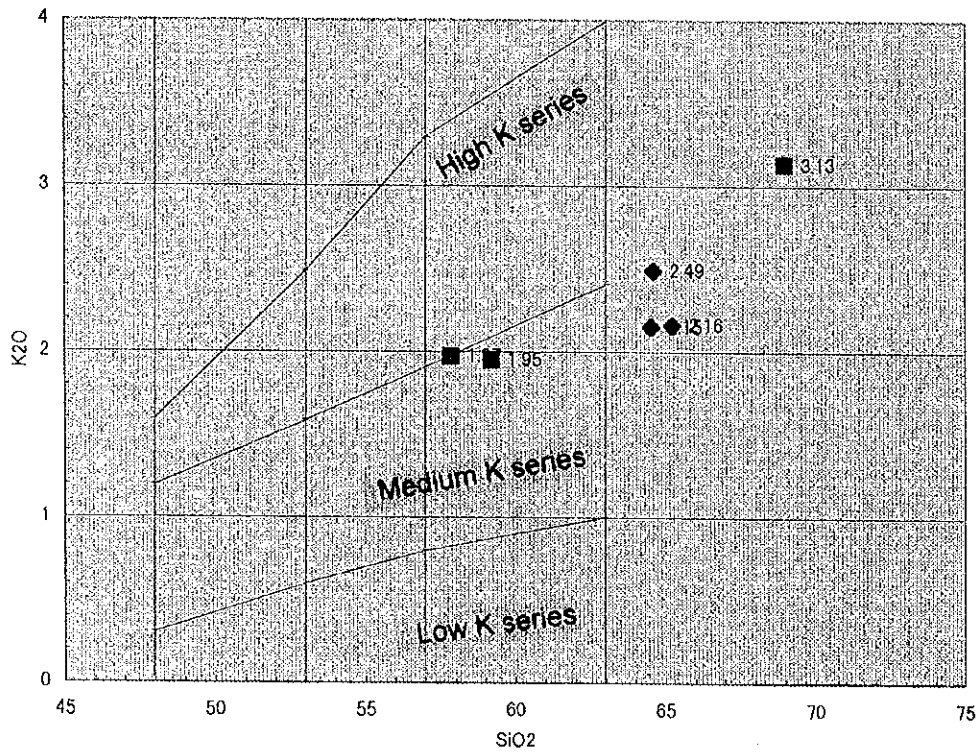


SiO₂-K₂O(NW of Tiwi-Mt. Malinao)



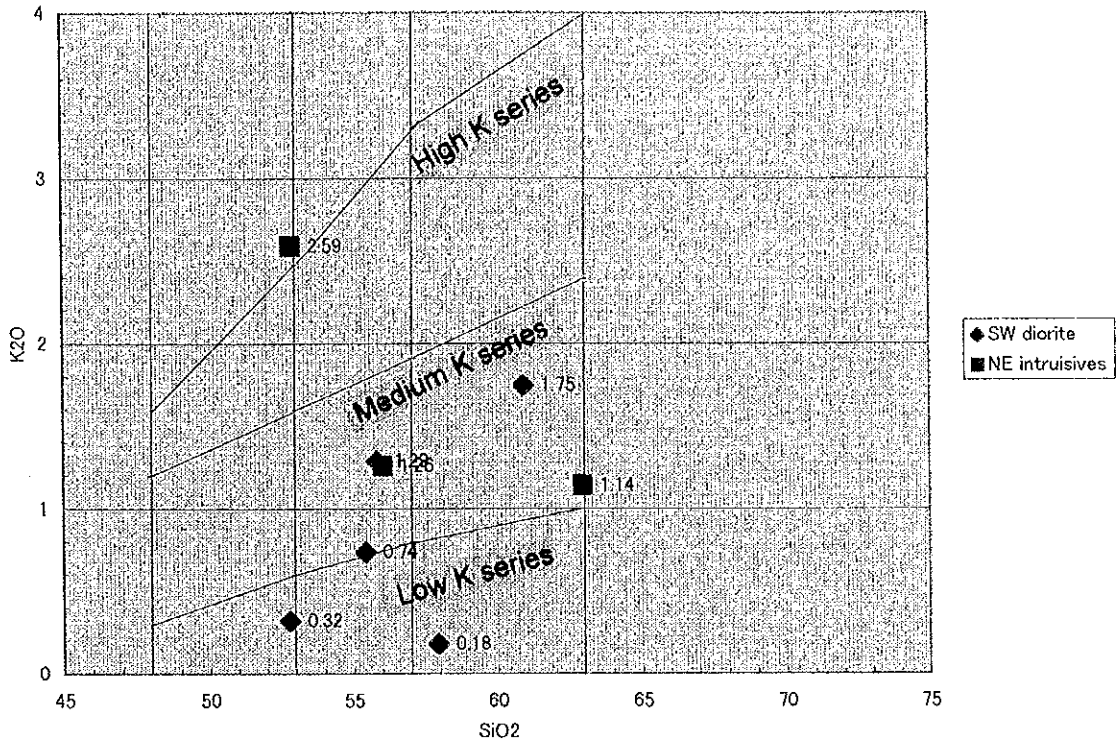
◆ Tiwi

SiO₂ - K₂O(Kilbay-Labo-Culasi)

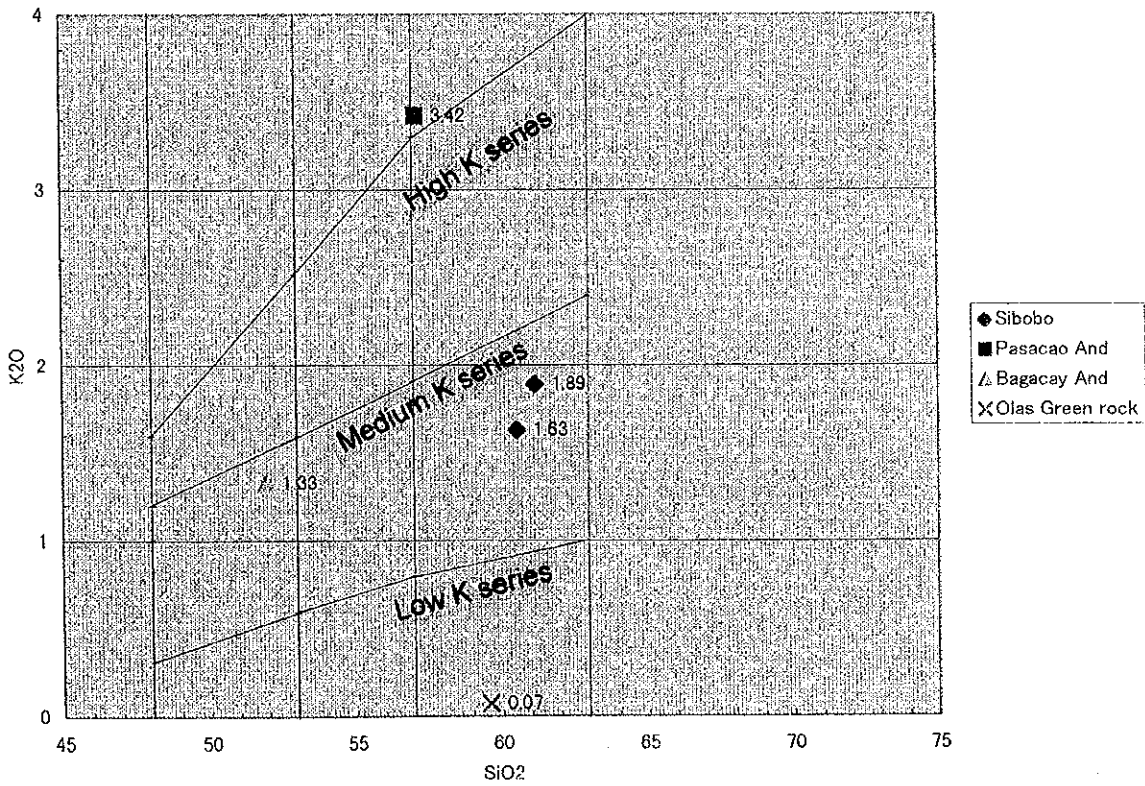


◆ Kilbay
■ Labo-Culasi

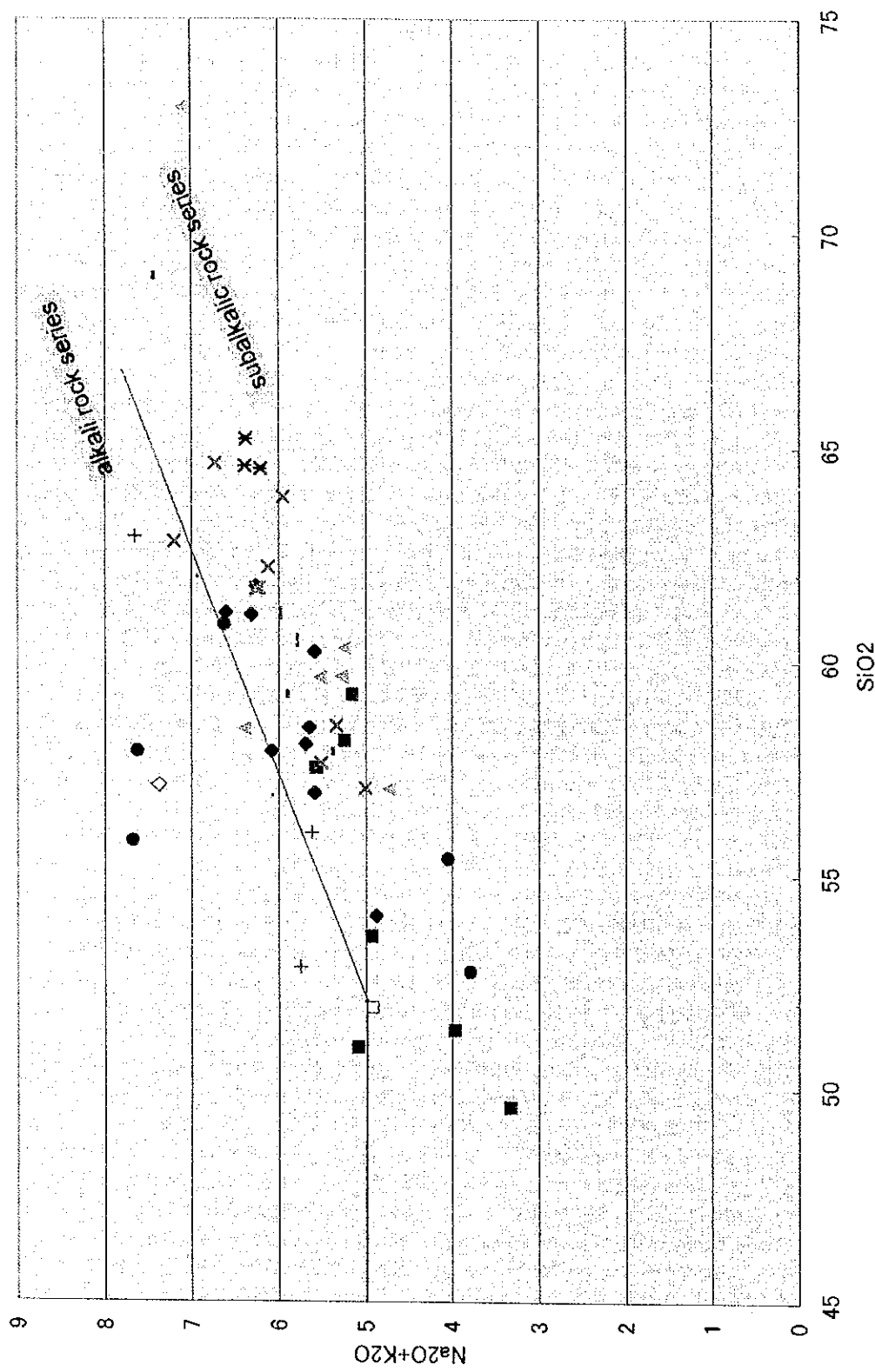
SiO₂ - K₂O(intrusives)



SiO₂ - K₂O(others)



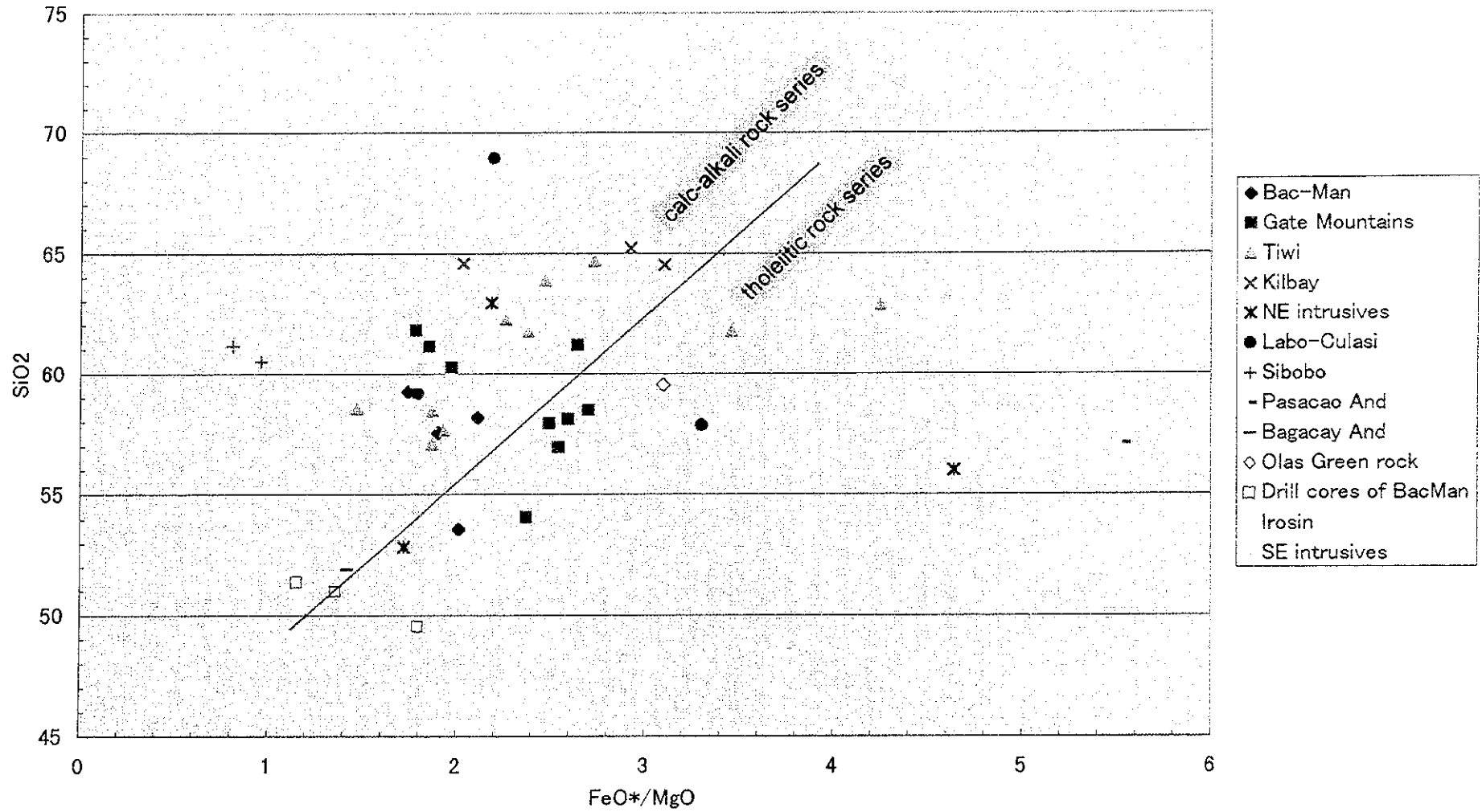
SiO₂-Na₂O+K₂O(whole area)



- Bac-Man
- ◆ Gate Mt.
- △ Irosin
- × Tiwi
- ✕ Kilbay
- SW diorite
- + NE intrusives
- Labo-Culasi
- Sibobo
- ◇ Pasacao And
- Bagacay And
- Olas Green rock

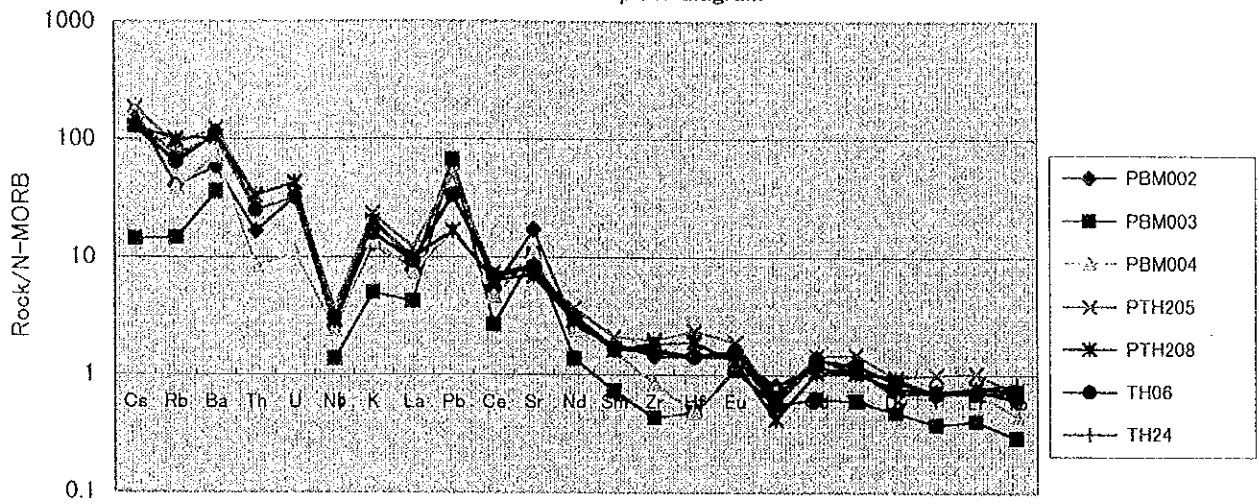
Appendix 19

Miyashiro diagram(whole)

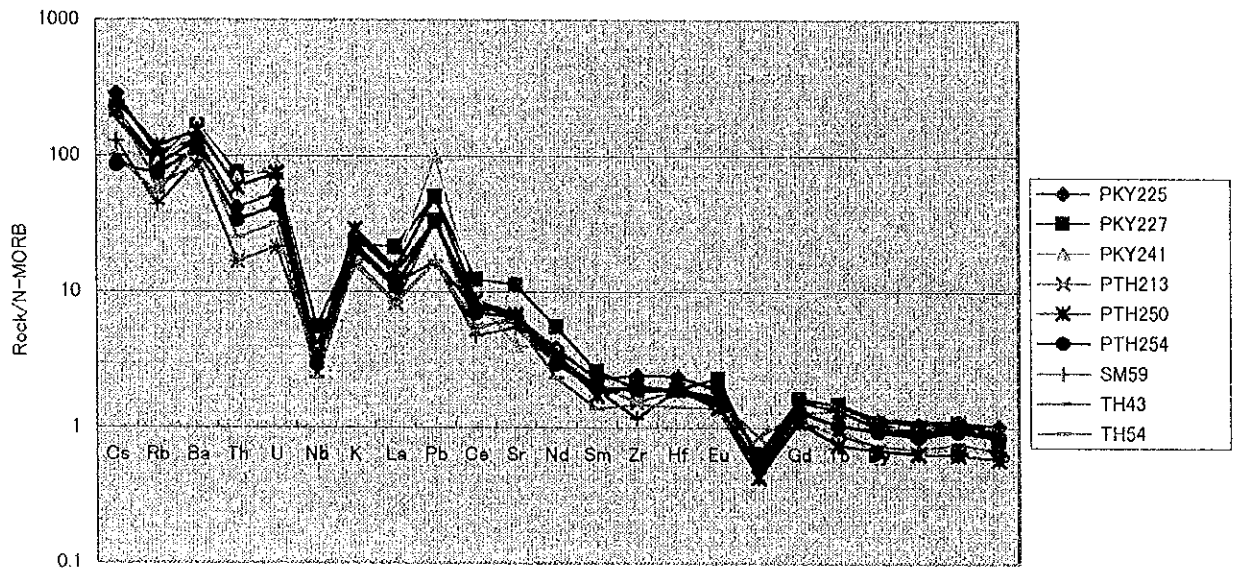


Appendix 20

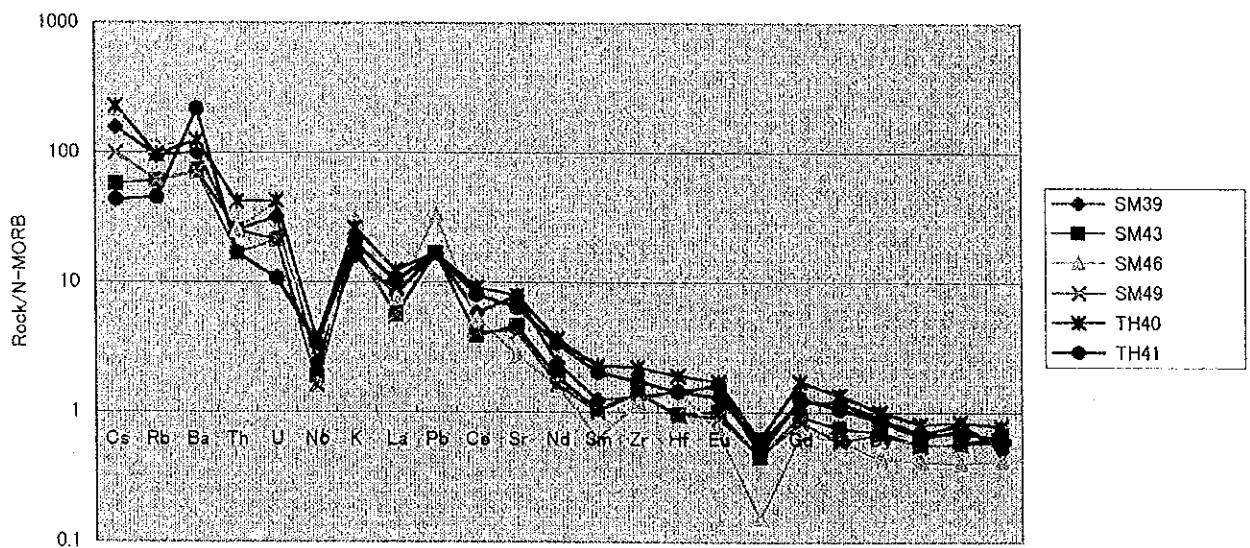
Bac-Man Spider diagram



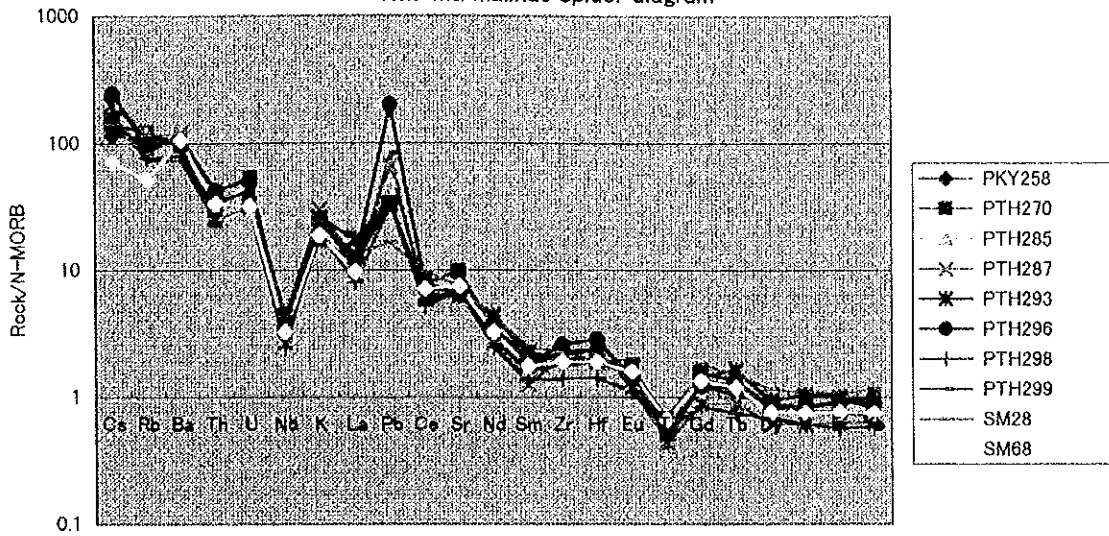
Gate Mountains Spider diagram



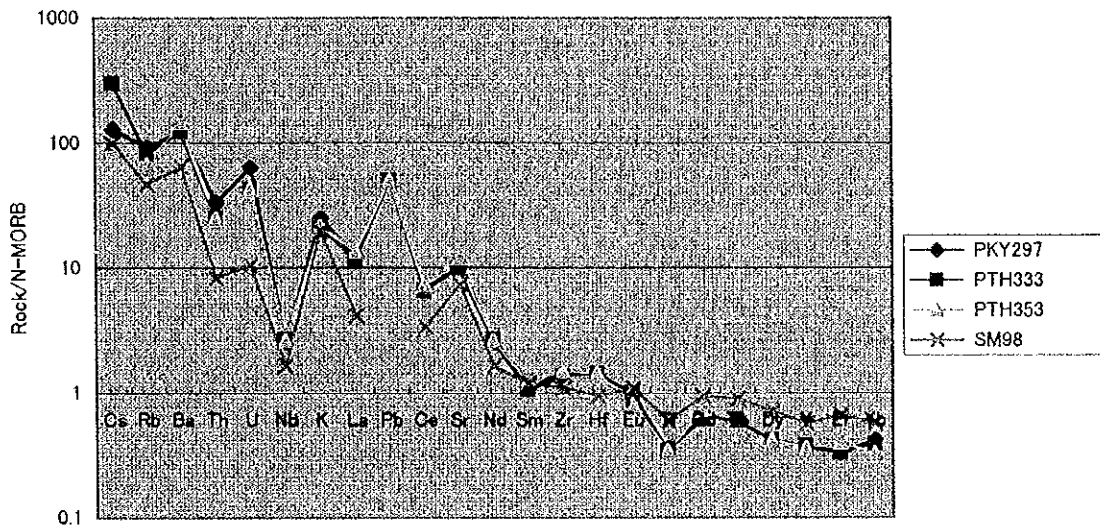
Irosin Spider diagram



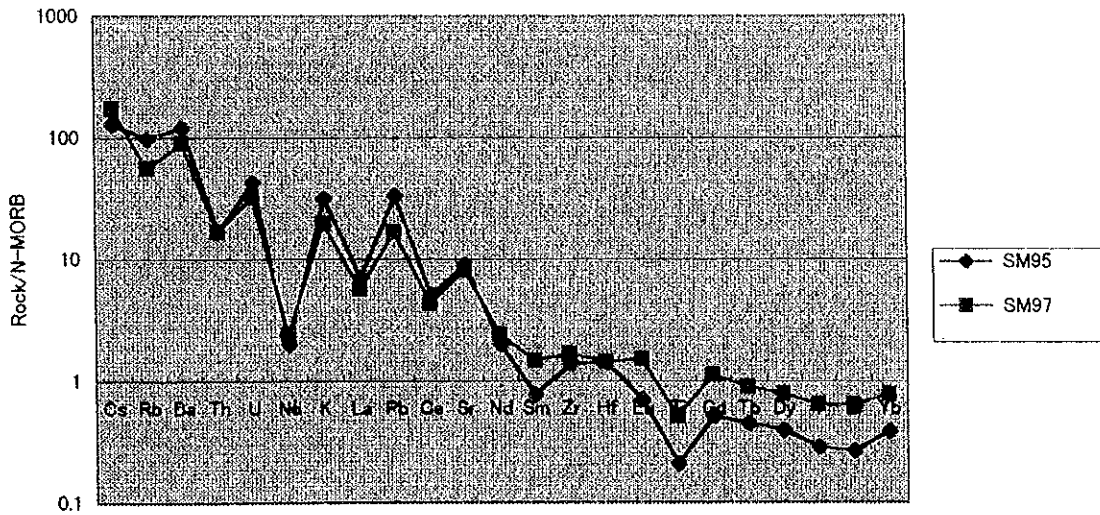
Tiwi-Mt. Malinao spider diagram



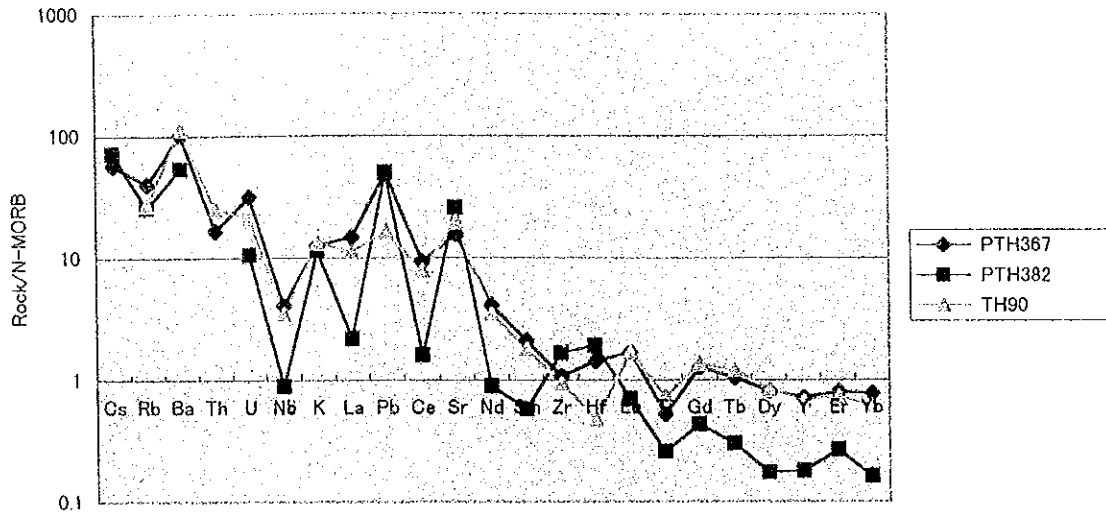
Kilbay spider diagram



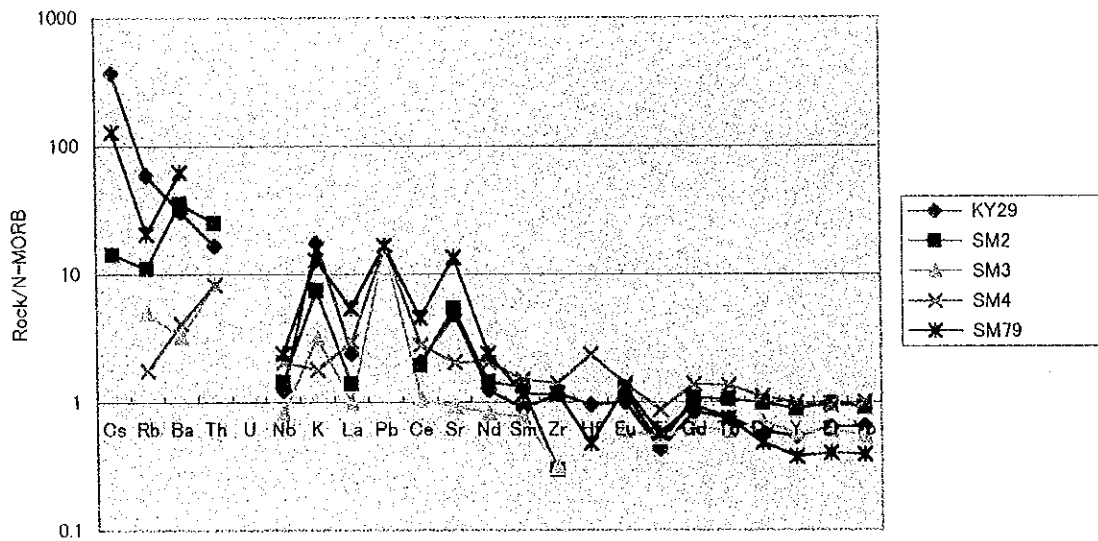
Mt. Culasi spider diagram



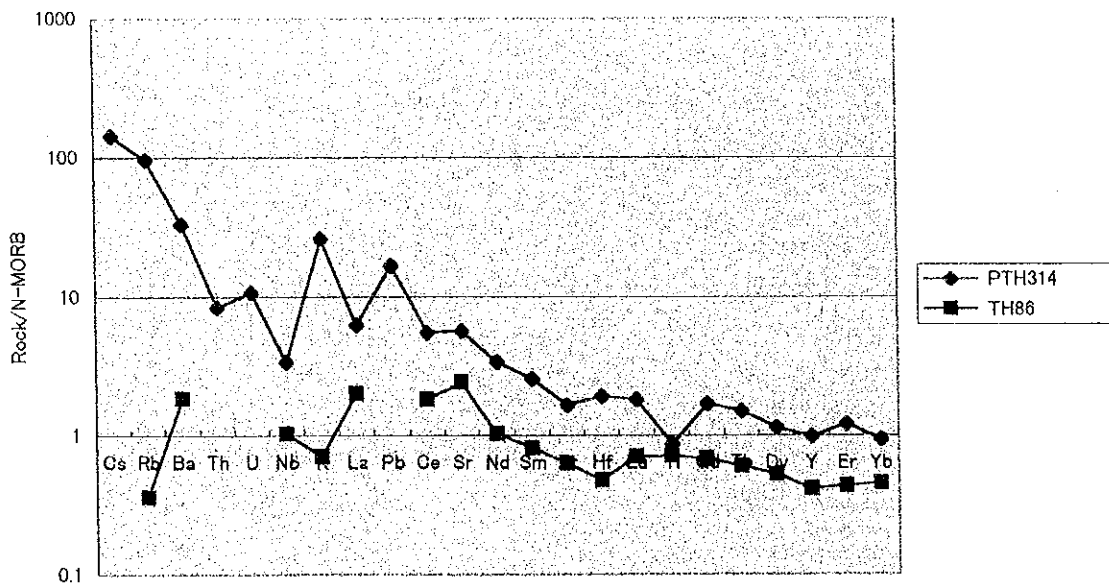
Bagacay spider diagram



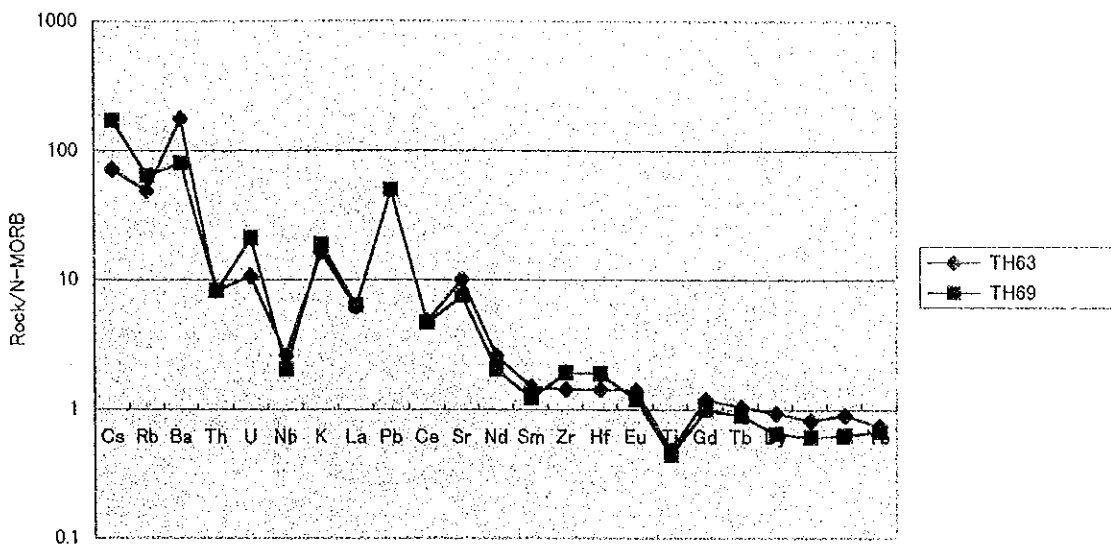
Pio Duran-Balatan spider diagram



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-III 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 consisting of 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
			silicified crystal tuff. Plag fragments totally altered to Ill+Qtz; mafics altered to Fe-oxied+clays, Chl+Ill, in a matrix of	
		780	Ill+abundant Qtz+Anh+Py+minor Cal	
		900	abundant Qtz+Cal vein fragments	
		1150 - 1200	abundant Anh vein fragments and extensive silicification was obtained in vitric/crystal tuffs.	
			close 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	
		1287 - 1662.1	intercalating with altered volcanics.	
			silicified rocks; cuttings totally altered to Qtz+Anh+Py+minor	
		1440	Diaspore	
		1550 - 1560	abundant Anh, Cal, Qtz vein fragments	
9	Pal-5D			120
			Anh crystals also appearing with intensifying Chl. Other minerals	
		1347.9 - 1412.9	are drusy Qtz+Hm+micaceous clay+Cal+Mag+Py	
		1412.9 - 1427.9	microdiorite dyke	
			volcanics. lithic tuff to undifferentiated volcanics with	
		1437.9 - 1482.9	Ep+Chl+Qtz+Py+Cal+Anh+Ill	
			breccia with Chl+Qtz+Ep and pearly white mica flakes at 1712-	
		1712.9 - 1757.9	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. calcining 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+Pri	
	333 - 453	advanced argillic alteration minerals assemblage- Kao+Pri	
	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 (°C)
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: tectographic low permeable zone, sediments with in andesite lava, Illite+Ep, veins; 700 - 850m Au mineralization exist in higher temperature neutral-chloride alteration zone or not?	
20	OP-2D	850		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 hyaloclastite, 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	Highly 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 (°C)
27	CN-1		Notable occurrences of veins and fractures (cores and cuttings)	270
		300 - 305	amorphous silica sometimes drussy type in veins	
		370 - 385	pyrite in veins	
		385 - 395	amorphous silica sometimes drussy type in veins	
		410 - 415	pyrite in veins	
		455 - 465	amorphous silica sometimes drussy type in veins	
		490 - 495	pyrite in veins	
		510 - 525	pyrite in veins	
		530 - 580	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	amorphous 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	Hgily 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+Chi vein	
		1195	cuttings. Mag, Anh+Kfs, Anh, Cal veins	
		1369.45	core. diorite. Act/Tm, 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, intensely silicified lithic crystal tuff. common biotite (cannot be detected if primary or secondary)	
		225 - 270		
		415 - 435	intensely altered rocks, intensely silicified andesitic crystal tuff; matrix silicified, slightly chloritized, intensity of silicification, argillization and pyritization increase with depth. occasional Anh also noted.	
		885 - 1207		
37	IM-1			
		1312 - 1314	core. silicified rock with Qtz-Py-Cal veinlet	
		1522 - 1525	core. Qtz-Adu-IlI vein	
38	Pal-13D			
		682.33-692.33	Qtz +IlI(?) +Anh+Ep, Anh+Qtz+Py, Qtz+Cal veinlets coarsely crystallized white mica probably muscovite was encountered	
		892.3 - 902.3		
		922.3	Adularia was noted replacing Pl.	
			coarsely crystallized white mica probably muscovite was encountered	
		1017.3		
		1077.3	Adularia was noted replacing Pl.	
		1344 - 1349	microdiorite dike/andesitic dike	
39	Pal-16D			
		1300 - 1400	Adu in IlI/Smc zone. Au mineralization exist or not.	
		1500 - 1950	Adu in IlI 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 - highly altered volcanics; lithology not discernible; silicified	
		610.65 - 750.65	volcanics, abundant Py, Qtz veins; weak carbonatized highly altered rocks; Py moderate, generally silicified and chloritization becoming dominant to bottom. abundant mineralogy- Qtz+Py, Illitic clays with minute vugs	
		925.65 - 1030.65		

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. $\angle 20^\circ$ 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. $\angle 55^\circ$ 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 length 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.	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; 5:1578.0-1580.0m	1st 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 interstitially. Ill, Chl altered?; Qtz, Chl, Anh, S/S	G, X