4-2 Statistical Analysis of Geochemical Results in Palawan V (Busuanga) Area

4-2-1 Basic Statistical Data

1) Statistical data in each rock code

Country rocks are divided into 3 populations (rock codes) according to the geochemical features of each rock.

Rock code	Contents	Number of Samples
LF1·MF	sandstone, siltstone, chert, limestone.	136
LF2	chert	478
Qal	Quaternary sediments	81
Subtotal		695
Duplicate Samples		18

Statistical data of each rock code are as follows (These values were calculated by logarithmic base then transformed to normal value):

Rock Code LF1·MF: Normal Sediments 136 Samples

Unit: ppm (Except Sb, Hg)

	Cu	Pb	Ag	Zn	Mn	As	Sb (ppb)	Hg (ppb)	Sn	W	Remark
$\bar{x}$	8.5	5.0	0.5	17.8	186	3.8	176	23.0	0.5	1.5	
1.0σ value	11.1	5.15	-	23.3	279	5.09	246	26.7	0.56	-	
1.5σ value	12.7	5.23	-	26.7	342	5.89	292	28.7	0.59	-	Threshold Value
2.0σ value	14.6	5.30	-	30.5	419	6.82	345	30.9	0.63	-	
Maximum	75	10	0.5	108	4,910	31.0	1,500	100	6.0	1.5	
Minimum	2.0	5.0	0.5	1.0	25	0.3	25	20	0.5	1.5	

Rock Code LF2: Chert 478 Samples

Unit: ppm (Except Sb, Hg)

	Cu	Pb	Ag	Zn	Mn	As	Sb (ppb)	Hg (ppb)	Sn	W	Remark
$\bar{x}$	12.5	5.1	0.5	20.1	223	3.7	236	30	0.5	1.5	
1.0σ value	16.8	5.13	-	28.1	363	5.14	330	39	0.58	1.55	
1.5σ value	19.4	5.49	-	33.3	464	6.06	391	44	0.62	1.57	Threshold Value
2.0σ value	22.4	5.62	-	39.4	592	7.15	463	51	0.66	1.59	
Maximum	173	19.0	0.5	410	15,000	65	4,200	1,700	4.0	3.0	
Minimum	2.0	5.0	0.5	1.0	10	0.3	25	20	0.5	1.5	

Rock Code Qal: Quaternary Sediments 81 Samples

Unit: ppm (Except Sb, Hg)

	Cu	Pb	Ag	Zn	Mn	As	Sb (ppb)	Hg (ppb)	Sn	W	Remark
$\bar{x}$	10.6	5.4	0.5	17.5	178	3.4	232	32	0.5	1.5	
1.0σ value	13.8	5.9	-	25.2	274	4.9	341	45	0.57	-	
1.5σ value	15.7	6.2	-	30.2	340	5.9	413	54	0.60	-	Threshold Value
2.0σ value	17.9	6.5	-	36.3	422	7.1	501	64	0.64	-	
Maximum	39	15	0.5	82	1,790	53	5,500	1,700	2.0	1.5	
Minimum	2.0	5.0	0.5	1.0	25	0.3	25	20	0.5	1.5	

2) Histogram

Histograms for each detected element in each lithological code are made by logarithmic scale with standard deviation unit as shown in Appendix 8-1.

The hitogram features for each element are as follows:

Cu: Histograms for each code show almost logarithmic normal distribution, but in codes LF2 and LF1·MF, low grade side are not enough. Maximum content 8,173 ppm 19 sample is included in code LF2.

Pb: Histograms do not show logarithmic normal distribution as samples are almostly under detection limit. Maximum content (19 ppm) sample is included in code LF2.

Ag: All samples fall under the detection limit, therefore each histogram do not show normal logarithmic distribution.

Zn: Histograms for each code show almost logarithmic normal distribution, but in codes Qal and LF1·MF, low grade sides of mean value are not enough. Maximum content (410 ppm) sample is included in code LF2.

Mn: Histograms for each code show almost logarithmic normal distribution, but in all codes, low grade sides of mean value are not enough. Maximum content (15,000 ppm) sample is included in code LF2.

As: Histograms for each code show almost logarithmic normal distribution, but in code Qal, high grade side of mean value is not enough. Maximum content (65 ppm) sample is included in code LF2.

Sb: Histograms for each code show almost logarithmic normal distribution, but in codes Qal and LF1·MF, low grade sides of mean value are not enough,

while in code LF1·MF high grade side of mean value is not enough. Maximum content (5,500 ppb) sample is included in code Qal.

Hg: Histograms do not show logarithmic normal distribution as over 70% samples are under detection limit. Maximum content (1,700 ppb) sample is included in code Qal and LF2.

Sn: Histograms do not show logarithmic normal distribution as over 90% samples are under detection limit. Maximum content (4 ppm) sample is included in code LF2.

W: Histograms do not show logarithmic normal distribution as over 95% samples are under detection limit. Maximum content (3 ppm) sample is included in code LF2.

3) Cumulative Frequency Curves

Cumulative frequency curves corresponding to the abovementioned histograms are shown in Appendix 8-1. Many of them have a transition point over M+2σ value in each code. This seems to indicate the weak mineralization at this area.
The feature of the cumulative frequency curve for each element are as follows:

Cu: Transition points are observed near M+1.5σ value in code LF and Qal, near M+2.0σ value in code LF2.

Pb, Ag: Over 90% samples are under the detection limit content, therefore transition points are not clear.

Zn: Transition points are observed near M+0.5σ value in code Qal, near M+1.5σ value in codes LF1·MF and LF2.

Mn: Transition points are observed near M+2.5σ value in all codes.

As: Transition points are observed near M+1.0σ value in all codes.

Sb: Transition points are observed near M+1.0σ to 1.5σ value in all codes.

Hg: Over 70% samples are under detection limit content, therefore transition points are not clear.

Sn: Over 90% samples are under the detection limit content, therefore transition points are not clear.

W: Over 95% samples are under the detection limit content, therefore transition points are not clear.

4) Correlation Coefficient

Correlation coefficient between elements for all samples are shown in Table-6.
High correlations are observed between Cu and Zn, Mn, As, Sb; Zn and Mn; Mn and As; As and Sb.

Table-6 Correlation Coefficient between Each Detected Element in Palawan V Area

	Cu	Pb	Ag	Zn	Mn	As	Sb	Hg	Sn	W
Cu	1.000									
Pb	0.133	1.000								
Ag	-	-	-							
Zn	0.668	0.125	-	1.000						
Mn	0.730	0.130	-	0.708	1.000					
As	0.590	0.145	-	0.480	0.521	1.000				
Sb	0.542	0.135	-	0.456	0.489	0.596	1.000			
Hg	0.460	0.228	-	0.298	0.351	0.304	0.346	1.000		
Sn	-0.041	-0.040	-	-0.043	-0.045	-0.006	-0.020	0.011	1.000	
W	0.063	0.077	-	0.091	0.088	0.099	0.095	-0.005	0.051	1.000

4-2-2 Analysis for Heavy Mineral Samples

1) Analytical method

A total of 56 heavy mineral samples were collected in Palawan V (Busuanga) Area by panning. Statistical analysis was carried out on the microchemical analysis results. These samples were taken from the downstream side of stream junctions. They were reduced from 3 kg to 20 grams by panning in each place. On these samples, microchemical analysis for Au, Ag, and Ga were carried out by atomic absorption method at PETROLAB. The results of this are shown in Appendix 10-1. These microchemical analysis results are assumed to show logarithmic normal distribution. Mean value and standard deviation values were calculated similar to the stream sediment samples analyses. M+1.5σ value is estimated as threshold value and the results were classified based on this value. The statistical values are shown in Table 7.

Table-7 Statistical Values of Heavy Mineral Samples in Palawan V (Busuanga) Area

	$\bar{x}$	M+1.0σ	M+1.5σ	M+2.0σ	Maximum	Minimum
Au (ppb)	10	10	10	10	10	10
Ag (ppb)	50	50	50	50	50	50
Ga (ppm)	1.08	1.48	1.61	1.85	3.8	2.3

2) Separation test of heavy mineral samples

Constituent minerals of heavy mineral samples were identified by binocular microscope on 10 specimens randomly selected.

Table-8 Constituent Mineals of Heavy Mineral Samples in Palawan V Area

	Pl	Qz	K-Fel	Horn	Fe-Oxide
Range (%)	5–98	1–96	1–25	1–13	1–5
Average (%)	51	41	6	1.3	0.7

Pl: Plagioclase Qz: Quartz K-Fel: K-Feldspar
Horn: Hornblende

4-2-3 Local Distribution of Anomalous Values

1) Univariate analysis for stream sediment samples

Anomalous values in each lithological code are classified in the following range limit.

These classified anomalous values were plotted in a 1:250,000 scale sample locality map with symbols ●, ▲ and ■.

Analytical Value (Z)	Symbol	Grade
$M+1.0\sigma \leqq Z < M+1.5\sigma$	●	Possibly anomalous value
$M+1.5\sigma \leqq Z < M+2.0\sigma$	▲	Probably anomalous value
$M+2.0\sigma \leqq Z$	■	Highly anomalous value

Local features of anomalous values in each element are shown in the attached maps with the above symbols (Ref. PL-6). Their detailed descriptions are as follows:

Cu: In Busuanga Is., over 10 highly anomalous values are located in the LC Formation at 2-10 km east and 10 km northeast of San Nicolas. This anomalous zone overlaps that of Zn, Mn and Sb. At 6 km northwest of San Nicolas, around Bintuan in the southeastern part in the south side of Minuit in the north coast and north to northeast of Salvacion in the west coast, 5-6 highly anomalous values are observed.

In Culion Is., 5-10 highly anomalous values are located northeast of Mt. Maus in the southern part and around Dracabaito in the southernmost part.

Pb: Five highly anomalous values are located at the northeastern part of Coron Is. This anomalous zone is overlapped to that of Cu, Zn, As, Mn and Sb. Several anomalous values are scattered in Busuanga Is. and Culion Is.

Ag: Anomalous values were not extracted as all samples are under detection limit.

Zn: In Busuanga Is., anomalous values are overlapped to the Cu anomalous zone. In Coron Is., anomalous values are overlapped to that of Pb, Cu, As, Mn and Sb.

Mn: In Busuanga Is., anomalous values are overlapped to that of Cu, Zn, at the west side of San Nicolas in the southern part, south side of Minuit in the northern part and north side of Bintuan in southwestern part. In Coron Is., anomalous values are overlapped to that of Pb, Cu, As and Sb at the northeastern part. In Culion Is., highly anomalous values are located north of Mt. Maus, southwest of Mt. Oltaloro at the southern part.

As: In Busuanga Is., anomalous values are overlapped to that of Cu, Zn, Mn and Sb at the south side of Minuit in the northern part and the northeast side, northwest side of San Nicolas in the southern part. In Coron Is., anomalous values are overlapped to that of Cu, Pb, Zn and Sb at the northeastern part.

Sb: In Busuanga Is., anomalous values are overlapped to that of Cu, Zn, Mn and As at the south side of Minuit in the northern part and the northwest side of San Nicolas in the southern part.
In Coron Is., anomalous values are overlapped to that of Cu, Pb, Zn and As at the northeastern part.
About 10 highly anomalous values are located near Halse Harbor in the western part of Culion Is.

Hg: In Busuanga Is., anomalous values are overlapped to that of Cu, Zn, Mn, As and Sb at the south side of Minuit in the northern part and in the northeast side, northwest side of San Nicolas in the southern part and near Bintuan. In Coron Is., anomalous values are overlapped to that of Cu, Pb, Zn and As at the northeastern part. In Culion Is., over 10 anomalous values are located near Berg in the western part and at the southeast side. This anomalous zone is partially overlapped to that of Cu and Sb.

Sn: In Busuanga Is., 5-7 anomalous values are located at the east side and at 10 km northeast of San Nicolas in the southern part.
This anomalous zone is partially overlapped to that of Cu, Zn, Mn and Sb. In Culion Is., several highly anomalous values are located at Mt. Oltaloro at the southern part.

W: Three highly anomalous values are located at the south side of Minuit in the northern part of Busuanga Is.

2) Univariate analysis for heavy mineral samples

All analytical values of Au and Ag are under detection limit (Au: 20 ppb, Ag: 100 ppb) and only 2 analytical values of Ga are over detection limit (Ga: 2 ppm). Univariate analysis therefore was not carried out. The Ga analytical values over detection limit came from NH052 (2.3 ppm) in the Quaternary sediments and NK 020 (3.8 ppm) in the LC Formation.

Analytical Value (Z)	Symbol	Grade
$M+1.0\sigma \leqq Z < M+1.5\sigma$	●	Possibly anomalous value
$M+1.5\sigma \leqq Z < M+2.0\sigma$	▲	Probably anomalous value
$M+2.0\sigma \leqq Z$	■	Highly anomalous value

Local features of anomalous values in each element are shown in the attached maps with the above symbols (Ref. PL-07). Their detailed descriptions are as follows:

Cu: In busuanga Is., over 10 highly anomalous values are located in the LC Formation 2-10 km east and 10 km northeast of San Nicolas. This anomalous zone overlaps that of Zn, Mn and Sb. At 6 km northwest of San Nicolas, around Bintuan in the southeastern part in the south side of Minuit in the north coast and north to northeast of Salvacion in the west coast, 5-6 highly anomalous values are observed.

In Culion Is., 5-10 highly anomalous values are located northeast of Mt. Maus in the southern part and around Dracabaito in the southernmost part.

Pb: Five highly anomalous values are located at the northeastern part of Coron Is. This anomalous zone is overlapped to that of Cu, Zn, As, Mn and Sb. Several anomalous values are scattered each in Busuanga Is. and Culion Is.

Ag: Anomalous values were not extracted as all samples are under detection limit.

Zn: In Busuanga Is., anomalous values are overlapped to the Cu anomalous zone. In Coron Is., anomalous values are overlapped to that of Pb, Cu, As, Mn and Sb.

Mn: In Busuanga Is., anomalous values are overlapped to that of Cu, Zn, at the east side of San Nicolas in the southern part, south side of Minuit in the northern part and north side of Bintuan in southwestern part. In Coron Is., anomalous values are overlapped to that of Pb, Cu, As and Sb at the

northeastern part. In Culion Is., highly anomalous values are located north of Mt. Maus, southwest of Mt. Oltaloro at the southern part.

As: In Busuanga Is., anomalous values are overlapped to that of Cu, Zn, Mn and Sb at the south side of Minuit in the northern part and the northeast side, northwest side of San Nicolas in the southern part. In Coron Is., anomalous values are overlapped to that of Cu, Pb, Zn and Sb at the northeastern part.

Sb: In Busuanga Is., anomalous values are overlapped to that of Cu, Zn, Mn and As at the south side of Minuit in the northern part and the northwest side of San Nicolas in the southern part.

In Coron Is. anomalous values are overlapped to that of Cu, Pb, Zn and As at the northeastern part.

About 10 highly anomalous values are located near Halse Harbor in the western part of Culion Is.

Hg: In Busuanga Is., anomalous values are overlapped to that of Cu, Zn, Mn, As and Sb at the south side of Minuit in the northern part and in the northeast side, northwest side of San Nicolas in the southern part and near Bintuan. In Coron Is., anomalous values are overlapped to that of Cu, Pb, Zn and As at the northeastern part. In Culion Is., over 10 anomalous values are located near Berg in the western part and at the southeast side. This anomalous zone is partially overlapped to that of Cu and Sb.

Sn: In Busuanga Is., 5-7 anomalous values are located at the east side and at 10 km northeast of San Nicolas in the southern part.

This anomalous zone is partially overlapped to that of Cu, Zn, Mn and Sb. In Culion Is., several highly anomalous values are located at Mt. Oltaloro at the southern part.

W: Three highly anomalous values are located at the south side of Minuit in the northern part of Busuanga Is.

2) Geochemical analysis for heavy mineral samples

All analytical values of Au and Ag are under detection limit (Au: 20 ppb, Ag: 100 ppb) and only 2 analytical values of Ga are over detection limit (Ga: 2 ppm). Univariate analysis therefore was not carried out the Ga analytical values over detection limit came from NH052 (2.3 ppm) in the Quaternary sediments and NK 020 (3.8 Ppm) in the LC Formation.

4-3 Statistical Analysis of Geochemical Survey Results in Palawan VI Area

4-3-1 Basic Statistical Data

1) Statistical data in each rock code

The country rocks are divided into the following 8 populations (rock code) according to the geochemical features of each rock.

Rock code	Contents	Number of Samples
BC	schist group	10
K	basic lava, basic tuff chert	316
N1	sandstone, shale, basic clastics	1,080
N2	sandstone, mudstone siltstone, conglomerate	179
Ls	limestone	16
Qt	unconsolidated gravel, sand, silt, mud	258
Gb	gabbro, diabase	14
Uc	harzburgite, dunite, pyroxenite, serpentinite	170
Subtotal		2,043
Duplicate		42

Statistical data of each rock code are as follows (These values were calculated by logalithmic base then transformed to normal value):

Rock Code BC: Schist Group 10 Samples

Unit: ppm (Except Hg)

	Cu	Pb	Ag	Zn	Co	Ni	Mn	As	Hg (ppb)	Cr	Remark
$\bar{x}$	40.1	5	0.5	61.7	53.7	661	791	1.1	28	7,517	
1.0σ value	49.1	5.1	0.5	82.8	76.9	1,354.3	1,678	2.26	48.2	15,317	
1.5σ value	54.3	5.1	0.5	95.9	92.2	1,938.6	1,258.5	3.20	63.3	21,999	Threshold value
2.0σ value	60.1	5.1	0.5	111.2	110.4	2,774.9	1,469.1	4.54	83.1	31,467	
Maximum	55	5	0.5	88	120	4,100	1330	5.8	78	20,000	
Minimum	28	5	0.5	33	34	300	540	0.5	20	2,200	

Rock Code K: Cretaceous Basic Rocks 316 Samples

Unit: ppm (Except Hg)

	Cu	Pb	Ag	Zn	Co	Ni	Mn	As	Hg (ppb)	Cr	Remark
$\bar{x}$	40.0	5.8	0.5	65.2	34.9	168	954	1.5	64	1,283	
1.0σ value	60.3	8.5	0.5	89.2	52.3	467.8	1,521.9	3.68	327.9	5,922	
1.5σ value	74.1	10.3	0.5	104.3	63.9	779.9	1,922.9	5.86	743.5	12,725	Threshold value
2.0σ value	91.1	12.5	0.5	122.0	78.3	1,300.6	2,429.5	9.33	1,685.3	27.344	
Maximum	97	29	0.5	147	118	2,200	3,200	7.4	15,000	60,000	
Minimum	4	5	0.5	18	6	12	230	0.2	15	50	

Rock Code N1: Palaeogene Sedimentary Rocks 1,080 Samples

Unit: ppm (Except Hg)

	Cu	Pb	Ag	Zn	Co	Ni	Mn	As	Hg (ppb)	Cr	Remark
$\bar{x}$	20.6	8.2	0.5	47.0	17.7	83	556	2.0	51	865	
1.0σ value	46.1	14.5	0.5	79.6	45.4	392.5	1,221.3	5.18	228.4	8,228	
1.5σ value	68.9	19.2	0.5	103.6	72.6	853.8	1,809.6	8.32	483.8	25,380	Threshold value
2.0σ value	103.1	25.6	0.5	134.9	116.1	1,857.3	2,681.4	13.37	1,024.9	78,290	
Maximum	800	81	0.5	163	920	8,500	6,600	9.6	9,400	125,000	
Minimum	1	5	0.5	2	1	1	25	0.2	10	25	

Rock Code N2: Neogene Sedimentary Rocks 179 Sample

Unit: ppm (Except Hg)

	Cu	Pb	Ag	Zn	Co	Ni	Mn	As	Hg (ppb)	Cr	Remark
$\bar{x}$	12.2	6.6	0.5	33.3	13.5	55	368	1.8	66	973	
1.0σ value	35.1	10.8	0.5	72.8	39.4	339.4	1,082.8	4.36	319.3	8,843	
1.5σ value	59.6	13.8	0.5	107.7	67.2	845.9	1,858.4	6.78	700.6	26,653	Threshold value
2.0σ value	101.1	17.7	0.5	159.2	114.7	2,106.0	3,189.4	10.54	1,537.6	80,330	
Maximum	86	52	0.5	144	152	1,430	2,700	13	4,000	91,000	
Minimum	1	5	0.5	3	1	1	29	0.2	20	50	

Rock Code Ls: Tertiary Limestone 16 Samples

Unit: ppm (Except Hg)

	Cu	Pb	Ag	Zn	Co	Ni	Mn	As	Hg (ppb)	Cr	Remark
$\bar{x}$	17.3	5.6	0.5	33.2	57.9	406	836	1.4	24	14,387	
1.0σ value	35.9	7.7	0.5	68.3	190.3	2,256.7	1,581.5	5.89	36.7	64,945	
1.5σ value	51.6	8.9	0.5	97.9	344.9	5,319.0	2,175.6	12.10	45.8	137,985	Threshold value
2.0σ value	74.2	10.5	0.5	140.2	625.2	12,536.7	2,992.9	24.86	57.3	293,170	
Maximum	92	15	0.5	129	530	7,700	2,900	12	75	86,000	
Minimum	6	5	0.5	15	10	36	360	0.2	20	700	

Rock Code Qt: Quaternary Sedimentary Rocks 258 Samples

Unit: ppm (Except Hg)

	Cu	Pb	Ag	Zn	Co	Ni	Mn	As	Hg (ppb)	Cr	Remark
$\bar{x}$	27.5	5.4	0.5	49.4	32.7	180	738	1.2	43	2,565	
1.0σ value	51.2	7.3	0.5	78.2	75.4	743.9	1,545.2	3.26	131.7	86,115	
1.5σ value	69.9	8.4	0.5	98.5	114.5	1,512.6	2,236.7	5.37	230.3	98,410	Threshold value
2.0σ value	95.4	9.8	0.5	123.9	173.9	3,075.3	3,237.5	8.84	402.8	110,705	
Maximum	109	40	0.5	161	910	12,800	5,000	21	5,300	123,000	
Minimum	3	5	0.5	11	1	4	25	0.2	20	50	

Rock Code Gb: Gabbro-Diabase 14 Samples

Unit: ppm (Except Hg)

	Cu	Pb	Ag	Zn	Co	Ni	Mn	As	Hg (ppb)	Cr	Remark
$\bar{x}$	43.6	5	0.5	47.4	42.7	37.4	733	0.7	20	4,673	
1.0σ value	77.6	5.1	0.5	67.2	63.1	1,142.1	1,161.9	1.94	20.1	16,215	
1.5σ value	103.4	5.1	0.5	79.9	76.7	1,995.3	1,462.7	3.23	20.1	30,206	Threshold value
2.0σ value	137.9	5.1	0.5	95.2	93.3	3,486.1	1,841.3	5.36	20.1	56.268	
Maximum	75	5	0.5	70	95	3,500	1,290	2.2	20	26,000	
Minimum	7	5	0.5	24	22	47	280	0.2	20	170	

Rock Code Uc: Ultramafic Rocks 170 Samples

Unit: ppm (Except Hg)

	Cu	Pb	Ag	Zn	Co	Ni	Mn	As	Hg (ppb)	Cr	Remark
$\bar{x}$	27.4	5.4	0.5	55.2	92	1,032	1,000	0.8	39	14,206	
1.0σ value	60.1	7.1	0.5	97.4	273.8	3,963.4	2,264.4	2.06	111.3	88,290	
1.5σ value	89.1	8.1	0.5	129.6	472.3	7,765.8	3,407.7	3.44	187.9	100,860	Threshold value
2.0σ value	132.1	9.2	0.5	172.1	814.7	15,215.9	5,128.1	5.69	317.3	113,430	
Maximum	110	21	0.5	230	1,290	8,800	6,800	6.1	2,100	126,000	
Minimum	2	5	0.5	18	9	26	130	0.2	20	300	

2) Histogram

Histograms for each detected element in each lithological code are made by logarithmic scale with 1/2 standard deviation unit as shown in Appendix 8-2.
The histogram features for each element are as follows:

Cu: Histograms for each code show almost logarithmic normal distribution, but in codes N1, N2, Qt and Uc, high grade side distributions are not enough. Maximum content (800 ppm) sample is included in code N1 (Palaeogene sedimentary rock group)

Pb: Histograms do not show logarithmic normal distribution as samples are almost under detection limit. Maximum content (81 ppm) sample is included in code N1 (Palaeogene sedimentary rock group).

Ag: All samples are under detection limit, therefore, each histograms do not show normal logarithmic distribution.

Zn: Histograms for each code show almost logarithmic normal distribution, but in codes Qt, N1 and N2, high grade side distributions are not enough. Maximum content (230 ppm) sample is included in code Uc (Ultramafic rocks).

Co: Histograms for each code show almost logarithmic normal distribution, but in codes N1, N2 and Qt, high grade side distributions are not enough and in code Uc, distribution near mean value is not enough.
Maximum content (1,290 ppm) sample is included in code Uc (Ultramafic Rocks).

Ni: Histograms for each code show almost logarithmic normal distribution, but in code N1, low grade side of mean value is not enough. Maximum content (12,800 ppm) sample is included in Qt (Quaternary sediments).

Mn: Histograms for each code show almost logarithmic normal distribution, but in code N1, N2 and Qt, high grade side distributions are not enough. Maximum content (6,800 ppm) sample is included in Uc (Ultramafic rocks).

As: Histograms for each code show almost logarithmic normal distribution, but in code K, N1 and Qt, high grade side distributions are not enough. Maximum content (21 ppm) sample is included in Qt (Quaternary sediments).

Hg: Histograms for each code except Gb show almost logarithmic normal distribution, but in code K, N1, N2 and Qt, near mean value distributions are not enough. This is due to the many samples that are under detection limit. Maximum content (15,000 ppb) sample is included in K (Cretaceous basic rocks).

Cr: Histograms for each code show almost logarithmic normal distribution, but in code N1, near mean value distribution is not enough. Maximum content sample (126,000 ppm) is included in Uc (Ultramafic rocks).

3) Cumulative Frequency Curves

Cumulative frequency curves corresponding to the above mentioned histograms are shown in Appendix 8-2. They have a transition point between mean value M+1.0σ to M+2.0σ in each code. This justifies the estimation of M+1.5σ value as the threshold value.

The features of the curve for each element are as follows:

Cu: Transition point is not clear in code BC and Gb due to the small amount of samples. Transition point is clear near M+2.0σ value in code N1, and near M+1.5σ value in code K, N2, Ls, Qt, and Uc.

Pb, Ag: Over 70% samples are under the detection limit and the histograms do not show logarithmic normal distribution, therefore transition points are not clear.

Zn: Transition points are observed near M+1.0σ value in code BC and Ls, near M+2.0σ value in code N1, and near M+1.5σ value in code K, N2, Qt, Gb and Uc.

Co: Transition points are observed near M+1.0σ value in code BC, Ls and Gb, near M+2.0σ value in code K and N1, and near M+1.5σ value in code N2, Qt and Uc.

Ni: Transition points are observed near M+1.0σ value in code BC, Ls and Gb, near M+2.0σ value in code N1, and near M+1.5σ value in code K, N2, Qt and Uc.

Mn: Transition points are observed near M+1.0σ value in code BC and Ls, near M+2.0σ value in code N1 and K, near M+1.5σ value in code N2, Qt, Gb and Uc.

As: Transition points are observed near M+1.0σ value in code BC and Ls, near M+2.0σ value in code Qt, and near M+1.5σ value in code K, N1, N2, Gb and Uc.

Hg: Transition points are observed near M+1.0σ value in code BC and Ls, near M+2.0σ value in code N1 and N2, and near M+1.5σ value in code K, Qt, Gb and Uc, even though over 55% of the samples are under detection limit.

Cr: Transition points are observed near M+1.0σ value in code BC, N2, Ls, Qt and Uc, near M+2.0σ value in code N1, and near M+1.5σ value in code K and Gb.

4) Correlation Coefficient

Correlation coefficients between elements for all samples are shown in Table-9. High correlations are observed between Cu and Zn, Co, Mn; Zn and Co, Mn; Co and Ni, Mn, Cr, Ni and Mn, Cr.

Table-9 Correlation Coefficient between Each Detected Element in Palawan VI Area

	Cu	Pb	Ag	Zn	Co	Ni	Mn	An	Hg	Cr
Cu	1.0000									
Pb	-0.0553	1.0000								
Ag	0.0000	0.0000	0.0000							
Zn	0.6861	0.2009	0.0000	1.0000						
Co	0.5933	-0.2787	0.0000	0.5700	1.0000					
Ni	0.4783	-0.3314	0.0000	0.4075	0.9099	1.0000				
Mn	0.6548	0.0587	0.0000	0.7515	0.7398	0.5915	1.0000			
As	-0.1232	0.5289	0.0000	0.2398	-0.2890	-0.2851	0.0838	1.0000		
Hg	0.0103	0.1116	0.0000	0.1298	0.0305	0.0012	0.0864	0.1840	1.0000	
Cr	0.2343	-0.4012	0.0000	0.1251	0.7198	0.8381	0.3605	-0.3611	-0.0411	1.0000

4-3-2 Analysis for Heavy Mineral Samples

1) Analytical method

A total of 136 heavy mineral samples were collected in the Palawan VI (Quezon-Rio Tuba) Area. Statistical analysis was carried out on the microchemical analysis results.

These samples were taken from the downstream side of stream junctions. They were reduced from 3 kg to 20 grams by panning in each place.

On these samples, microchemical analysis for Au, Ag and Ga were carried out by atomic absorption method at PETROLAB.

The results of this are shown in Appendix 10-2.

These microchemical analysis results are assumed to show logarithmic normal

dispersion. Mean value and standard deviation values were calculated similar to the stream sediment samples analyses. M+1.5σ value is estimated as threshold value and the results were classified based on this value. The statistical values are shown in Table-10.

Table-10 Statistical Values of Heavy Mineral Samples in Palawan VI (Quezon-Rio Tuba) Area

	$\bar{x}$	M+1.0σ	M+1.5σ	M+2.0σ	Maximum	Minimum
Au (ppb)	38.1	167.1	350.2	747.4	870	-20
Ag (ppb)	54.8	91.5	118.2	152.7	430	-100
Ga (ppm)	3.67	7.1	10.0	13.9	15.6	-2

2) Separation test of heavy mineral samples

Constituent minerals of heavy mineral sample were identified by binocular microscope on 10 specimens randomly selected. Magnetite is recognized as the main constituent mineral. Other minerals noted are chromite, quartz and pyroxene. Details are shown in Table-11.

Table-11 Constitutent Minerals of Heavy Mineral Sample in Palawan VI (Quezon-Rio Tuba) Area

Order	1	2	3	4	5	6	7	8	9
Mineral	Magnetite	Chromite	Quartz	Pyroxene	Ilmenite	Horn-blende	Feldspar	Hematite	Iron Oxide
Range (%)	70-10	35-Tr	80-2	37-3	20-Tr	20-Tr	20-1	4-Tr	2-Tr
Average (%)	33.5	18.7	18.5	11.7	6	5.1	4.6	1.4	0.7

4-3-3 Local Distribution of Anomalous Values

1) Univariate analysis for stream sediment samples

Anomalous values in each lithological code are classified in the following range limit.

These classified anomalous values were plotted in 1 : 250,000 scale sample locality map with symbols ●, ▲ and ■.

Analytical Value (Z)	Symbol	Grade
$M+1.0\sigma \leqq Z < M+1.5\sigma$	●	Possibly anomalous value
$M+1.5\sigma \leqq Z < M+2.0\sigma$	▲	Probably anomalous value
$M+2.0\sigma \leqq Z$	■	Highly anomalous value

Local features of anomalous values in each element are shown in the attached maps with the above symbols (Ref. PL-8).

Their detailed descriptions are as follows:

Cu: At the north side of Pyramid Hill and near the site of the Pulute Range mineral showing, one highly anomalous value is seen in each area accompanied by several probably anomalous values. The former is located in code N1 and the latter is located in code Uc.

At the south side of Mt. Cormi, several probably anomalous values are seen with continuation in code Uc.

At 7 km south of Eran Bay (middle north shoreline) and south slope of Addison Peak (6 km west of Brookes Point), several probably anomalous values are located in code N1.

At the south slope of Mt. Maliz (20 km SW of Brookes Point), several probably anomalous values are located in code K.

At 11 km NE of Rio Tuba, two highly anomalous values are observed with two probably anomalous values in code Ls. This anomalous zone is similar to that of Pb, As.

At the south side of Balabac in Balabac Is., over 10 possibly anomalous values are observed but highly or probably anomalous values are not observed.

Pb: In the northeastern part of the area, at the south side of Quezon in code N2, at the east side of Panitan in code N1 and at the north side of Pulute Range in code K, one highly anomalous value is observed in each area accompanied by several possibly and probably anomalous values.

The north side of Pulute Range anomalous zone is assumed to be connected to the Barong Barong A, B, C mineral showings. Along Pulot River (south slope of the northeastern part of the area), several highly and probably anomalous values are located in code N1.

At 16 km north and 10 km north-northeast of Brookes Point, several highly anomalous values are distributed with continuations in code K.

In the southern part of the area, around Spike Peak upstream of Ransang River (north side slope) and at the south slope of Double Peak, several highly anomalous values are distributed with probably and possibly anomalous values in code N1. At 11 km NE of Rio Tuba, four highly anomalous values are observed in code Ls.

At 5 km south of Balabac in Balabac Is., one highly anomalous value is located with possibly anomalous values.

Zn: In the northeastern part of the area, one highly anomalous value is located with probably and possibly anomalous values at the north side of Mt. Aboabo in code K and several probably anomalous values are located at the south and east sides of Quezon in code N1 and N2.

Upstream of Barong Barong River (16 km NNE of Brookes Point), four highly anomalous values are observed with about ten probably anomalous values in code K and Uc. This anomalous zone is assumed to be related with the Barong Barong mineral showings.

In the middle part of the area, upstream of Ransang River and around Spike Peak, over 10 possibly anomalous values are concentrated in code N1.

In the south part of the area, 6 km northwest of Rio Tuba, several highly anomalous values are located with possibly and probably anomalous values. This anomalous zone overlaps with that of Co, Ni, Mn and Cr.

At the northeast side of Rio Tuba, several highly and probably anomalous values are located in code Qt. These are derived from code Ls.

At the south side of Balabac of Balabac Is., four highly anomalous values are observed with probably and possibly anomalous values.

Co: In the northeastern part of the area, several probably anomalous values are concentrated at the north slope of Pulute Range in code K, and over 10 highly anomalous values are distributed in a 10 km × 10 km areal extent with probably and possibly anomalous values at the southeast side of Mt. Cormi in code K.

In the middle part of the area, four highly anomalous values are observed in code K at 16 km west of Brookes Point and two highly anomalous values are located in code Uc which accompany Gb upstream of Ilog River (north side slope).

In the southern part of the area, 8 highly anomalous values are observed in code Uc at 8 km northwest of Rio Tuba. This anomalous zone overalps with that of Zn, Ni, Mn and Cr.

One highly anomalous value is located in code K with one possibly anomalous value at the north slope of Balabac Peak of Balabac Is.

Ni: In the northeastern part of the area, several probably anomalous values are concentrated in code K at the north slope of Pulute Range. This anomalous zone overlaps with that of Co. At the midstream of Pulot River, 5 highly anomalous values are distributed in a 10 km × 10 km areal extent with many probably anomalous values in code N1. This anomalous zone overlaps with that of Co.

In the middle part of the area, 5 highly anomalous values are concentrated with many probably anomalous values in code K at the southeast slope of Mt.

Mantalingjan and about 10 probably anomalous values are concentrated in code N1 at the middle stream of Ilog River of the north side slope.

In the southern part of the area, 3 highly anomalous values are located with 3 probably anomalous values in code Uc at 7 km northwest of Rio Tuba.

This anomalous zone is related to the Rio Tuba Mine and overlaps that of Co.

In Balabac Is., one highly anomalous value is observed in code K with one probably anomalous value around Balabac Peak.

Mn: In the northeastern part of the area, several highly anomalous values are distributed in code N1 with probably and possibly anomalous values at the west side of Panitan and around Ramakan. The former zone has a 10 km × 10 km areal extent and overlaps with that of Pb, and 4 highly anomalous values are concentrated in code Uc with probably and possibly anomalous values at the south slope of Mt. Calibugan.

In the southern part of the area, several probably anomalous values are concentrated in code N1 at the south side of Spike Peak and 3 highly anomalous values are located in code N2 at the west side of Double Peak.

At 7 km northwest of Rio Tuba, 6 highly anomalous values are concentrated in code Uc. This anomalous zone overlaps with that of Ni, Co, Zn and Cr.

In Balabac Is., about 10 highly anomalous values are concentrated in code N1 at the south side of Balabac. This anomalous zone overlaps with that of Zn.

As: In the northeastern part of the area, one highly anomalous value is observed in code N2 with 5 probably anomalous values at 4 km west-southwest of Quezon, one highly anomalous value in code Uc at 20 km north-northeast of Brookes Point and two probably anomalous values in code K 2 km south of the above mentioned places.

In the middle part of the area, several highly and probably anomalous values are scattered in code N1 and K with many possibly anomalous values around Spike Peak and its east side.

In the southern part of the area, one highly and 7 probably anomalous values are distributed in code N1 with many possibly anomalous values at the south side of Double Peak. This anomalous zone overlaps with that of Mn. Three highly and three probably anomalous values are concentrated in code Ls 12 km NE of Rio Tuba. This zone overlaps with that of Zn. At 15 km northwest of Rio Tuba, two highly anomalous values are observed in code N1 with many possibly anomalous values.

In Balabac Is., two probably anomalous values are observed in code K with 8 possibly anomalous values 5 km south of Balabac. This zone overlaps with that of Ni and Co.

Hg: In the northeastern part of the area, about 50 highly anomalous values are concentrated in code K and N1 around Pyramid Hill.

This anomalous zone is assumed to have been derived from hot spring alterations. Cu anomalous zone overlaps with the northern part of the zone.

In the middle part of the area, over 10 highly anomalous values are observed in code K around Mt. Maliz. This zone overlaps partially with the Cu anomalous zone. Along Ramsang River and Conduaga River (north slope of the area), over 20 highly anomalous values are observed in code N1. This zone overlaps partially with the anomalous zone of Zn.

In the southern part of the area, over 50 highly anomalous values are observed in a NE trending elongated zone 25 km long in code N1 and N2 around Double Peak.

In Balabac Is, anomalous values are not observed.

Cr: In the northeastern part of the area, three highly anomalous values are observed in code K and N1 with probably and possibly anomalous zone at the north side of Pulute Range and two highly anomalous values are concentrated in code N1 with over 30 probably anomalous values at the southeast slope of Mt. Cormi. This anomalous zone reflects the influence of the ultramafic rocks of Mt. Cormi and overlaps partially with the anomalous zones of Ni and Co.

In the middle part of the area, four highly anomalous values are located in code N1 and N2 at the south side of Malabungan (northern coast of the area). This anomalous zone is influenced by the ultramafic rocks which are distributed among the central part of the area. The southern part of this anomalous zone overlaps with that of Ni and Co at the midstream of Ilog River.

In the southern part of the area, several highly anomalous values are distributed in code Uc and N1 (west side of Uc) with over 10 probably anomalous values at 8 km northwest of Rio Tuba. This anomalous zone is influenced by the ultramafic rocks of Rio Tuba Mine and overlaps with that of Mn, Ni and Co.

In Balabac Is, only one possibly anomalous value is observed in code K at 5 km south of Balabac.

2) Univariate analysis for heavy mineral samples

Extracted anomalous values by statistical procedure of heavy mineral samples are classified as below. These classified anomalous values are plotted utilizing the symbols ●, ▲ and ■, on a 1:250,000 scale sample location map (Ref. PL-9).

Analytical Value (Z)	Symbol	Grade
$M+1.0\sigma \leqq Z < M+1.5\sigma$	●	Possibly anomalous value
$M+1.5\sigma \leqq Z < M+2.0\sigma$	▲	Probably anomalous value
$M+2.0\sigma \leqq Z$	■	Highly anomalous value

Details of the anomalous values are as follows:

Au: One highly anomalous value, three probably anomalous values and one possibly anomalous value are extracted.

Highly anomalous value is located in code N1 at 8 km north of Mt. Calibugan in the northeastern part of the area.

Probably anomaous values are located in code N1 downstream of Pulot River (south slope in the northeastern part of the area) and at 10 km southeast of Malabungan in the north coast.

Possibly anomalous value is located in code Ls at 10 km north-northeast of Rio Tuba.

Ag: Only one highly anomalous value is extracted. Its location is in code N1 at 3 km east-northeast of Spike Peak in the middle part of the area.

Ga: One highly anomalous value, two probably anomalous values and four possibly anomalous values are extracted.

A highly anomalous value is located in code N1 at 15 km north of Mt. Calibugan in the northeastern part of the area.

Probably anomalous values are located in code N1 at 15 km north of Mt. Calibugan in the northeastern part of the area and 15 km north-northeast of Rio Tuba.

Possibly anomalous values are located in code K and N1 at 10 km north of Pulot, at the upstream part (In code K) and at the downstream part of (in code N1) Pulot River.

4-4 Statistical Analysis of Geochemical Survey Results in West Negros Area

4-4-1 Basic statistical data

1) Statistical data in each rock code

Country rocks are divided into the following 10 populations (rock codes) according to the geochemical features of each rock.

Rock code	Contents	Number of Samples
Qal	Quaternary Sediments	69
CP	Andesitic tuff and Lava	16
KF	Sand-. Silt-. & Mudstone	2
CF (Tum)	Tuffaceous Sandstone & Mudstone	59
DL	Limestone	186
TC (Tlm)	Sand- & Siltstone, Shale	145
IL (Tol)	Limestone	1
BF (Tes)	Basaltic & Andesitic Clastics & Metaclastics	406
Tcp	Limestone	3
PI	Intrusive Rocks	259
Subtotal		1,146
Duplicate Samples		20

Statistical data of each code are as follows:
(These values are calculated in logarithmic base, then transformed to normal values.)

Rock Code Qal: Quaternary Sediments 69 Samples

Unit: ppm (Except Hg)

	Cu	Pb	Ag	Zn	Co	Ni	Mn	Mo	As	Hg (ppb)	Remark
$\bar{x}$	35.3	5.3	0.5	42.6	12.9	16.6	458	1.1	2.8	20.4	
1.0σ value	77.4	6.7	0.59	86.9	23.8	32.6	911	1.75	6.95	22.9	
1.5σ value	114.7	7.6	0.65	124.1	32.3	43.6	1,284	2.21	11.0	24.3	Threshold value
2.0σ value	169.9	8.6	0.72	177.3	43.8	60.3	1,810	2.79	17.5	25.8	
Maximum	2,500	20.0	1.0	350	46	47	2,900	17.0	56.0	40.0	
Minimum	7.0	5.0	0.5	9	3	3	89	1.0	0.6	20.0	

Rock Code CP: Andesitic Tuff & Lava 16 Samples

Unit: ppm (Except Hg)

	Cu	Pb	Ag	Zn	Co	Ni	Mn	Mo	As	Hg (ppb)	Remark
$\bar{x}$	27.9	5.0	0.5	51.6	12.7	24.3	501	1.0	3.0	22	
1.0σ value	40.9	5.0	0.5	72.9	19.9	27.4	774	1.0	6.9	30.7	
1.5σ value	49.6	5.0	0.5	86.6	24.9	29.1	963	1.0	0.4	35.9	Threshold value
2.0σ value	60.1	5.0	0.5	103	31.2	30.9	1,198	1.0	15.6	41.9	
Maximum	74	5.0	0.5	98	27.0	32.0	1,180	1.0	8.0	54.0	
Minimum	18	5.0	0.5	28	5.0	20.0	230	1.0	0.5	20.0	

Rock Code KF: Sandstone, Siltstone, Mudstone 2 Samples

Unit: ppm (Except Hg)

	Cu	Pb	Ag	Zn	Co	Ni	Mn	Mo	As	Hg (ppb)	Remark
$\bar{x}$	25.8	5.0	0.5	43.0	9.5	14.5	279	1.0	3.3	20.0	
1.0σ value	30.4	5.0	0.5	44.4	10.2	15.2	309	1.0	3.9	20.0	
1.5σ value	33.0	5.0	0.5	45.2	10.6	15.6	325	1.0	4.2	20.0	Threshold value
2.0σ value	35.8	5.0	0.5	45.9	11.0	16.0	342	1.0	4.6	20.0	
Maximum	29.0	5.0	0.5	44.0	10.0	15.0	300	1.0	3.7	20.0	
Minimum	23.0	5.0	0.5	42.0	9.0	14.0	260	1.0	2.9	20.0	

Rock Code CF (Tum): Tuffaceous Sandstone, Mudstone 59 Samples

Unit: ppm (Except Hg)

	Cu	Pb	Ag	Zn	Co	Ni	Mn	Mo	As	Hg (ppb)	Remark
$\bar{x}$	50.8	5.0	0.5	66.7	23.7	20.9	892	1.0	4.8	22.8	
1.0σ value	75.6	5.0	0.5	96.0	36.4	29.6	1,442	1.0	9.7	31.9	
1.5σ value	92.1	5.0	0.5	115.2	45.[illegible]	35.3	1,834	1.0	13.9	37.7	Threshold value
2.0σ value	112.4	5.0	0.5	138.2	56.	42.0	2,333	1.0	19.8	44.6	
Maximum	141	5.0	0.5	207	45.0	43.0	1,900	1.0	23.0	100	
Minimum	21.0	5.0	0.5	31.0	7.0	11.0	210	1.0	0.8	20	

Rock Code DL: Limestone 186 Samples

Unit: ppm (Except Hg)

	Cu	Pb	Ag	Zn	Co	Ni	Mn	Mo	As	Hg (ppb)	Remark
$\bar{x}$	29.1	5.1	0.5	42.6	12.3	13.3	389	1.1	4.9	23.1	
1.0σ value	77.9	6.0	0.56	82.2	28.1	27.2	872	1.4	10.5	34.5	
1.5σ value	127.4	6.5	0.59	114.3	42.5	38.9	1,307	1.6	15.4	42.2	Threshold value
2.0σ value	208.5	7.1	0.62	158.9	64.2	55.6	1,958	1.8	22.5	51.7	
Maximum	370	24.0	2.10	155	51.0	37.0	1,830	6.0	70.0	180	
Minimum	3.0	5.0	0.5	5.0	3.0	2.0	61	1.0	0.5	20	

Rock Code TC (Tlm): Sandstone, Siltstone, Shale 145 Samples

Unit: ppm (Except Hg)

	Cu	Pb	Ag	Zn	Co	Ni	Mn	Mo	As	Hg (ppb)	Remark
$\bar{x}$	46.3	5.1	0.5	71.0	27.4	19.1	1,004	1.0	3.2	22.1	
1.0σ value	67.4	5.5	0.5	103.2	43.1	28.1	1,521	1.0	5.8	31.3	
1.5σ value	81.4	5.8	0.5	124.3	54.1	34.1	1,872	1.0	7.8	37.3	Threshold value
2.0σ value	98.3	6.0	0.5	149.7	67.9	41.4	2,304	1.0	10.5	44.4	
Maximum	91.0	11.0	0.5	199.0	72.0	44.0	2,110	1.0	13.0	200	
Minimum	11.0	5.0	0.5	21.0	4.0	4.0	260	1.0	0.5	20.0	

Rock Code BF (Tes):Basaltic, Andesitic Detrital Rock and other Altered Rocks 406 Samples

Unit: ppm (Except Hg)

	Cu	Pb	Ag	Zn	Co	Ni	Mn	Mo	As	Hg (ppb)	Remark
$\bar{x}$	59.3	5.5	0.5	71.2	24.1	21.1	836	1.0	2.9	23.5	
1.0σ value	107.7	8.4	0.59	114.3	38.8	32.7	1,348	1.59	7.6	38.5	
1.5σ value	145.1	10.4	0.64	144.9	49.3	40.8	1,712	1.93	12.2	49.4	Threshold value
2.0σ value	195.5	12.8	0.70	183.7	62.5	50.8	2,175	2.35	19.7	63.3	
Maximum	4,400	107	0.5	380	60.0	55.0	2,330	18.0	299	1,500	
Minimum	5.0	5.0	0.1	15.0	3.0	4.0	130	1.0	0.2	20	

Rock Code Tcp: Limestone 3 Samples

Unit: ppm (Except Hg)

	Cu	Pb	Ag	Zn	Co	Ni	Mn	Mo	As	Hg (ppb)	Remark
$\bar{x}$	46.6	5.0	0.5	107.2	30	19.1	1,196	1.0	1.95	20	
1.0σ value	54.7	5.0	0.5	149	36	23.5	1,260	1.0	2.92	20	
1.5σ value	59.2	5.0	0.5	175.5	39.4	26.1	1,293	1.0	3.57	20	Threshold value
2.0σ value	64.1	5.0	0.5	206.8	43.2	29.0	1,327	1.0	4.36	20	
Maximum	55.0	5.0	0.5	143	36.0	22.0	1,270	1.0	3.10	20	
Minimum	40.0	5.0	0.5	75	25.0	15.0	1,160	1.0	1.50	20	

Rock Code PI: Intrusive Rock 259 Samples

Unit: ppm (Except Hg)

	Cu	Pb	Ag	Zn	Co	Ni	Mn	Mo	As	Hg (ppb)	Remark
$\bar{x}$	60.5	5.9	0.5	45.2	15.1	13.6	577	1.2	1.72	26.2	
1.0σ value	136	9.96	0.59	79.3	23.6	23.8	946	1.93	4.14	63.5	
1.5σ value	204	12.9	0.65	105	29.5	31.5	1,211	2.46	6.42	98.9	Threshold value
2.0σ value	306	16.7	0.71	139	36.8	41.7	1,550	3.14	9.95	154	
Maximum	4,000	180	2.20	260	45.0	75.0	2,700	15.0	69.0	8,000	
Minimum	7.0	5.0	0.1	8.0	3.0	3.0	59	1.0	0.1	20	

2) Histograms

Histograms for each detected element in each lithological code are made by logarithmic scale as shown in Appendix 8-3.

The histogram features for each element are as follows:

Cu: Histograms for each code show almost logarithmic normal distribution, but in codes Qal, CF, D1, low grade sides of mean value are not enough. On the other hand, in codes, BF and PI which contain numerous samples, high grade sides of mean value are excessive. Maximum content (4,400 ppm) is included in code BF.

Pb: Over 99% of the samples show under detection limit, therefore each histogram do not show normal logarithmic distribution.

Ag: Over 99% of the samples show under detection limit, therefore each histogram do not show normal logarithmic distribution. Over 10 anomalous value samples (over 1 ppm) are observed in code P1.

Zn: Histograms for each code show almost logarithmic normal distribution, but in code Qal, CP, CF, DL, TC and PI, low grade sides of mean value are not

enough, while surplus samples are seen at the same place in code DL. Maximum grade sample is contained in BF.

Co: Histograms for each code show almost logarithmic normal distribution. But in codes Qal, CP, CF, DL, TE and PI, the low grade sides near the mean value are in excess.

Ni: Histograms for each code show almost logarithmic normal distribution, but in code Qal, TC and BF, low grade sides near the mean value are in excess. In code DL, high grade side near mean value is in excess.

Mn: Histograms for each code show almost logarithmic normal distribution, but in code Qal, CP, TC, CF and BF, low grade sides near the mean value are in excess. In code DL, high grade side near mean value is in excess.

Mo: Over 99% the samples show under detection limit, therefore each histogram does not show normal logarithmic distribution. In code Qal, DL, BF and PI, sample over 10 anomalous values are observed near 10 ppm.

As: Histograms for each code show almost logarithmic normal distribution, but in code Qal, CF, DL, BF and PI, high grade sides near the mean value are not enough.

Hg: Over 99% of the samples show under detection limit, therefore each histogram does not show normal logarithmic distribution. In code CF, DL and TC, anomalous values are observed near 100 - 200 ppb and near 1,000 ppb in code BF and PI.

3) Cumulative Frequency Curves

Cumulative frequency curves corresponding to the abovementioned histograms are shown in Appendix 8-3. They have a transition point between M+1.0σ value to M+2.0σ value in each code. This justifies the estimat of M+1.5σ value as threshold value. The feature of the curve for each element are as follows:

Cu: In code CP, CF, DL, BF and PI, transition points are observed near M+1.5σ value.

Pb, Ag: Over 99% of the samples are under the detection limit content, therefore transition points are not clear.

Zn: In code Qal, CP, TC and BF, transition points are observed near M+1.5σ value. In code CF and PI, they are observed near M+2.0σ value.

Co: In code Qal, DL, TC and BF, transition points are observed near M+1.0σ value. In code CP and PI, they are observed near M+1.5σ value.

Ni: In code Qal, CP, CF, BF and PI, transition points are observed near M+1.0σ value.

Mn: In code Qal, CP, DL and PI, transition points are observed near M+1.5σ value and in other code, transition points are not clear.

Mo: Over 99% of samples are under the detection limit content, therefore transition points are not clear.

As: In code Qal, CF, DL, TC, BF and PI, transition points are observed near M+1.0σ value.

Hg: Over 99% of samples are under the detection limit content, therefore transition points are not clear.

4) Correlation Coefficient

High correlations are observed between Cu and Zn, Co, Mo; Zn and Co, Ni, Mn; Co and Ni, Mn; Ni and Mn.

Correlation coefficients between elements for all samples are shown in Table-12.

Table-12 Correlation Coefficient between Each Detected Element in West Negros Area

	Cu	Pb	Ag	Zn	Co	Ni	Mn	Mo	As	Hg
Cu	1.000									
Pb	0.169	1.000								
Ag	-0.005	-0.432	1.000							
Zn	0.457	0.199	-0.113	1.000						
Co	0.488	-0.035	0.008	0.731	1.000					
Ni	0.318	-0.053	0.032	0.497	0.674	1.000				
Mn	0.378	0.035	-0.009	0.704	0.805	0.493	1.000			
Mo	0.490	0.130	-0.027	-0.007	-0.071	-0.136	-0.183	1.000		
As	0.176	0.168	-0.105	0.193	0.085	0.168	0.013	0.096	1.000	
Hg	0.139	0.333	-0.089	0.134	0.027	0.041	0.011	0.095	0.111	1.000

4-4-2 Analysis for Heavy Mineral Samples

1) Analytical method

A total of 96 heavy mineral samples were collected in the West Negros Area by panning. Statistical analysis was carried out on the microchemical analysis results.

On these samples, microchemical analysis for Au, Ag and Ga were carried out by atomic absorption method at PETROLAB.

The results of this are shown in Appendix 10-3. These microchemical analysis results are assumed to show logarithmic normal distribution. Mean values and standard deviation values were calculated similar to the stream sediment sample analyses. M+1.5σ value is estimated as the threshold value and the results are classified by this value. These statistical values are shown in Table-13.

Table-13 Statistical Values of Heavy Mineral Samples in West Negros Area

	$\bar{x}$	M+1.0σ	M+1.5σ	M+2.0σ	Maximum	Minimum
Au (ppb)	55.5	421.5	1,160.1	3,195	3,600	10
Ag (ppb)	57.8	98.1	127.8	166.6	380	50
Ga (ppm)	9.4	13.8	16.7	20.3	20.5	1

2) Separation Test of Heavy Mineral Samples

Constituent minerals of heavy mineral samples were identified by binocular microscope on 10 specimens randomly selected.

Table-14 Constituent Minerals of Heavy Mineral Sample in West Negros Area

	Magnetite	Pyroxene	Hornblende	Quartz	Chromite	Hematite
Range (%)	65-3	60-3	50-Tr.	15-1	27-Tr.	5-1
Average (%)	41.7	19.3	16.8	7.8	5.8	2.9

4-4-3 Local Distribution of Anomalous Values

1) Univariate analysis for stream sediment samples

Anomalous values in each lithological code are classified into the following range limit.

These classified anomalous values were plotted in a 1 : 250,000 scale sample locality map with symbols ●, ▲ and ■.

Analytical Value (Z)	Symbol	Grade
$M+1.0\sigma \leqq Z < M+1.5\sigma$	●	Possibly anomalous value
$M+1.5\sigma \leqq Z < M+2.0\sigma$	▲	Probably anomalous value
$M+2.0\sigma \leqq Z$	■	Highly anomalous value

Local features of the anomalous values in each element are shown in the attached maps with the above symbols (Ref. PL-10).

Their detail descriptions are as follows:

Cu: Six highly anomalous values are located in the basaltic andesitic clastics (BF) at the north side of the intrusive rock (PI) 16 km NNE of Sipalay in the west coast. Otherwise, over 10 highly anomalous values and about 10 probably anomalous values are located in the limestone (DL) and intrusive rock (PI) at the south side upstream of Taoangan River, 22 km east of Sipalay.

Pb: Several highly anomalous values are located in the alternating sandstone, siltstone and shale (TC) in the eastern part of the area, in the contact zone between intrusive rock (PI) and limestone (DL) at upstream of Sipalay River and in the intrusive rock (PI) at the midstream of Tayabanon in the southern part.

Ag: Over 99% of the samples are under the detection limit content, therefore the number of anomalous values are few. One highly anomalous value is each located in the midstream of Sipalay River at 6 km east of Sipalay, and near the contact part between the intrusive rock (PI) and basaltic andesitic clastics (BF) at 6 km east of Bacuyangan in the central part of west coast.

Zn: Seven highly anomalous values are located in the intrusive rock (PI) at 16 km east-southeast of Sipalay. Otherwise, five highly anomalous values are located in the intrusive rock (PI) at 6 km east of Bacuyangan in the central part of west coast. Moreover, many possibly anomalous values are scattered in TC, DL and KF Formations in the eastern part.

Co: Anomalous values are located in the intrusive rock (PI) at the upstream of Sipalay River at 15 km east of Sipalay.

Many possibly and probably anomalous values are scattered in TC and CF Formation in the eastern part.

Ni: Anomalous values (including six highly anomalous values) are located in the intrusive rock (PI) at the south side of Sitio Bagatban in the central part. Otherwise, many possibly and probably anomalous values are located in the basaltic, andesitic clastics (BF) at the upstream of Bayawan River in its east side.

Mn: Several highly anomalous values are located in the contact part between PI and BF Formations at 15 and 22 km east-southeast of Sipalay. Many possibly and probably anomalous values are located in BF, CF and TC Formation at the eastern part.

Mo: Over 99% samples are under the detection limit content, therefore the number of anomalous values are few. Several highly anomalous values are located in the PI Formation at 15 km ESE of Sipalay and at the northeastern part of Sitio Bagatban in the central part.

As: Anomalous values (including several highly anomalous values) are located in the BF Formation at the south part of Linaon in its northwest edge, in the limestone (DL) at 12 km east-northeast of Sipalay, in the intrusive rock (PI) at the west side of Sitio Bagatban at the central part and in the BF Formation in its east side.

Hg: Anomalous values (including several highly anomalous values) are located in the limestone (DL) at 20 km east of Sipalay, in the PI Formation at 15 km southeast of Sipalay, in the PI Formation at 5 km southeast of Bacuyangan in the west coast, in the TC Formation at the north side of Cangoni in the central northern part and in the CF and BF Formations at the upstream of Bayawan River in the southern part.

The following items have been clarified on the basis of these results. The polymetallic anomalous zones of Cu, Pb, Zn, Co, Ni, As, Hg and Mo are located in 15 - 22 km east of Sipalay and that of Zn, Ni, Co, As and Hg are located in the BF Formation at the upstream of Bayawan River in the southern part.

2) Univariate analysis for heavy mineral samples (Ref. PL-11)

Au: Many analytical values of Au are under detection limit. Highly anomalous value (3,600 ppb) shows only in the TC Formation at 5 km WSW of Canlomay in the northeastern part.

Ga: One highly and one probably anomalous values are located in the CF Formation at the northeastern part, and two probably anomalous values are located in the BF and CF Formations at the southeastern part. Several possibly anomalous values are also scattered in the DL Formation at the northwestern part.

5. SYNTHESIS

5. Synthetic Analysis

5-1 Summary

5-1-1 Geology and Structure

The Palawan V (Busuanga) Area and Palawan VI (Quezon-Rio Tuba) Areas are both located in the westernmost part of the Philippines. A major fault, the Ulugan Bay Fault, which passed through Central Palawan Is. is thought to divide these two areas into a northeasten and southwesten part. The Palawan V (Busuanga) Area which comprises the northeasten portion is made up mainly of Palaeozoic and Mesozoic formations. The Palawan VI (Quezon-Rio Tuba) Area on the other hand, belongs to the southwesern one consisting mainly of Cretaceous formations including ophiolites.

The West Negros Area is located in the western side of the Central Physiographic Province of the Philippines consisting basically of Mesozoic basic pyroclastics as basement rock unit. Diorite bodies were noted to have intruded the Mesozoic formation. Palaeogene and Neogene sedimentary rocks are distributed around these basement rocks.

The Samar I~III Area belong to the central portion of the Eastern Physiographic Province (Samar-Davao Sub-Province). The basement rocks of Samar I~III Area consist of metavolcanics, metasediments and ultramafic rocks of Late Cretaceous to Palaeogene age. Palaeogene diorite intruded these rocks. All of these rock units are covered unconformably by Neogene to Quaternary pyroclastics and limestones.

5-1-2 Mineralization

The known metallic ore deposits in the survey areas are as follows:

In Palawan V (Busuanga) Area, bedded manganese type deposit is known only in the Triassic Liminangcong Formation.

In Palawan VI (Quezon-Rio Tuba) Area, nickel-laterite type deposits in the weathered zone of the ophiolite, massive sulfide type deposits in Miocene sedimentary rocks and vein type deposits in basaltic lavas are known.

In West Negros Area, there are many indications of porphyry copper mineralizations (Sipalay Mine etc.) which accompanied the diorite intrusion.

In Samar I Area, Kuroko type deposits (Bagacay Mine etc.) in Miocene tuff and manganese deposits in Oligocene to Miocene limestones are known.

Known non-metallic ore deposits are as follows:

The productions of silica sand and porcelain clay near Tagbita Bay at the southwesten part of Palawan VI (Quezon-Rio Tuba) Area is well known.

5-1-3 Relationships between the geochemical survey results and mineralization

1) Univariate analysis for stream sediment samples

In this survey, 695 stream sediment samples from Palawan V (Busuanga) Area, 2,043 samples from Palawan VI (Quezon-Rio Tuba) Area, 1,146 samples from West Negros Area and 1,309 samples from Samar I~III Area were collected and analyzed by atomic absorption method (AAS) for Cu, Pb, Ag, Zn, Mn, As, Sb, Hg, Sn and W for the Palawan V (Busuanga) Area, Cu, Pb, Ag, Zn, Co, Ni, Mn, As, Hg and Cr for the Palawan VI (Quezon-Rio Tuba) Area, Cu, Pb, Ag, Zn, Co, Ni, Mn, Mo, As and Hg for the West Negros Area and Cu, Pb, Zn, Ag, As, Hg, Ni, Co, Mn and Cr for the Samar I~III Area.

The results of these analyses have been treated statistically utilizing univariate analysis procedures except for the Samar I~III Area. In Samar I~III Area, the univariate analysis was not carried out because the survey area (2,148 km^2) occupies only about 16% of the whole Samar Is. (13,429 km^2).

Statistically derived anomalous zones which are assumed to have direct relationship to mineralizations are as follows:

Palawan V (Busuanga) Area

1) In Busuanga Is., polymetallic anomalous zones of Cu, Zn, Mn, As and Sb are observed in cherts at 2 - 10 km east and 10 km northeast of San Nicolas (southern part of Busuanga Is.).

2) In Culion Is., overlapped anomalous zones of Cu, Mn in the northern part of Mt. Maus, and Sb, Hg in Hls Harbor to Berg of the western side are observed.

3) In coron Is., polymetallic anomalous zones of Cu, Pb, As and Hg are observed in limestone at the northeastern part. Contact metamorphic type deposit is expected in this place.

Palawan VI (Quezon-Rio Tuba) Area

1) Polymetallic anomalous zones of Cu, Zn, Ni, Co and Cr are observed in the ultramafic rocks at southeast of Mt. Cormi.

2) Overlapped anomalous zones of Pb, Zn and Mn are observed in the ultramafic rocks and basic lavas at 10 km north of Brookes Point. These zones seem to be influenced by the Barong Barong mineral showings.

3) Overlapped anomalous zones of Cu, Pb, Zn and As are observed in the Miocene limestone at 10 km northeast of Rio Tuba.
Contact metasomatic type deposit is expected in this area at the basis of the presence of limestone and anomalous elements.

4) Overlapped anomalous zones of Zn, Co, Ni, Mn, As and Cr are observed in the ultramafic rocks at 6 km northwest of Rio Tuba. These anomalous zones seem to be influenced by the Rio Tuba Mine.

5) Overlapped anomalous zones of Zn, Ni, Co, Mn and As are observed at south of Balabac in Balabac Is. These seem to be influenced by the Balabac Mine.

West Negros Area

1) Overlapped anomalous zone of Cu, Pb, Zn, Co, Ni, As, Hg and Mo are observed in the distribution areas of diorite, limestone and basic pyroclastics at 15 - 22 km east of Sipalay. These seem to be influenced by the mineralization of Sipalay Mine.

2) Overlapped anomalous zones of Zn, Ni, Co, As and Hg are observed in the basic pyroclastics area at upstream of the Bayawan River.

2) Univariate analysis for heavy mineral samples.

In palawan V (Busuanga) Area, the Au, Ag and Ga content of almost all heavy mineral samples are under detection limit leading to the observance of non-anomalous values.
In Palawan VI (Quezon-Rio Tuba) Area, one highly and one probably anomalous values of Au and Ga are located near the Mn anomalous zone in the N1 Formation at the north side of Pulute Range in the northeastern part respectively.
One highly anomalous value of Au and four possibly anomalous values of Ga are located in the N1 Formation at the northern side of Pulot of the east coast. One possibly anomalous value of Au and one probably anomalous value of Ga are located in 10 - 15 km north-northeast of Rio Tuba. One highly anomalous value of Ag is located in the N1 Formation at 2 km northeast of Spike Peak.
In West Negros Area, one highly anomalous value of Au and Ag are each located in 5 km west-northwest of Canlomay. Two highly and one possibly anomalous values of Ag are located in limestone at 13 km east of Sipalay. One highly and one probably anomalous values of Ga are located in the CF Formation at the northeastern part. Two probably anomalous values of Ga are also located in the BF Formation in the southeastern part.

5-1-4 Conclusions

The Palawan V (Busuanga) Area consists of the Liminangcong Formation (correlated to the lower-middle Triassic) and Coron Formation (mainly limestone) which unconformably overlie the former formation.

The Liminangcong Formation is composed of an upper formation (LF1) and a lower formation (LF2). LF1 is composed of alternating chert, sandstone and siltstone, and is distributed mainly in Busuanga Is. LF2 is composed mainly of chert and is distributed mainly in Culion Is.

One stratabound type manganese deposit is known in a chert horizon at the northern part of San Nicolas, Busuanga Is. Results of the geochemical surveys show that contact type mineralization can be expected at the northeastern part of Coron Is.

The Palawan VI (Quezon-Rio Tuba) Area include the southwesten part of Mainland Palawan and Balabac Is. The central mountain range in the southwest Mainland Palawan consists of basic pyroclastic rocks, ultramafic rocks and post-Miocene sedimentary rocks deposited around the former rock units. Balabac Is. is underlain by basic pyroclastics in the east side and post-Miocene sedimentary rocks in the west.

Nickel laterite, massive sulfide and quartz vein type deposits are known to exist in these areas.

Silica sand now being mined at Tagbita is the most famous among the non-metallic deposits.

As a result of the geochemical surveys, polymetallic anomalous zones of Cu, Zn, Ni, Co and Cr were proven to exist in the ultramafic rocks at southeast of Mt. Cormi in the northeastern part. Polymetallic anomalous zones of Cu, Pb, Zn, and As were also proven to exist in limestones located in 10 km northeast of Rio Tuba.

The West Negros Area is thought to be a topographical plateau. The basement formation consists of Mesozoic basic pyroclastics intruded by diorite.

Paleogene and Neogene sedimentary rocks are distributed around the basement rocks.

Porphyry copper type deposits (Sipalay deposit etc.) are known in diorite and basic pyroclastics that are in contract with the diorite. As a result of this geochemical survey, polymetallic anomalous zones of Zn, Ni, Co, As and Hg were proven to exist in the distribution area of basic pyroclastic rocks at upstream of Bayawan River of the southern part.

The following items have been clarified by the synthetic consideration applied on the abovementioned results.

(1) Polymetallic anomalous zones of Cu, Zn, Ni, Co and Cr located in southeast of Pulute Range in the northeastern part of Palawan VI (Quezon-Rio Tuba) Area.
These anomalous zones are located in the ultramafic rocks at the southwestern part of the main Palawan Is. and include the Pulute Range mineral showing. Nickel-laterite type deposit is expected.

(2) Polymetallic anomalous zones of Cu, Pb, Zn, Co, Ni, As, Hg and Mo at 15 - 22 km east of Sipalay in West Negros Area.
The Sipalay Mine which is in actual operation is located in the San Jose mineralization zone at 10 km north-northeast of Sipalay. Many mineral showings (e.g. Calatong River I, II) are known in this anomalous zone. Intense alteration of country rocks is very noticeable. On the basis of the strong alteration patterns and the presence of detected anomalous elements, porphyry copper type mineralization is expected in this area.

(3) Polymetallic anomalous zones of Zn, Ni, Co, As and Hg in the distribution area of the basic pyroclastics at upstream of the Bayawan River in the southern part of West Negros Area.
These anomalous zones have not been encountered as mineral showing. However, vein type mineralization is expected on the basis of the accumulation of several detected anomalous elements.

(4) Polymetallic anomalous zones of Cu, Pb, Zn, As, Sb and Hg in limestone of Coron Is. in the Palawan V (Busuanga) Area.
These anomalous zones have not been observed as mineral showings, but contact metasomatic deposit of the limestone is expected based on the recognized combination of detected anomalous elements.

(5) Polymetallic anomalous zones of Cu, Pb, Zn and As in limestone, 10 km northeast of Rio Tuba in Palawan VI (Quezon-Rio Tuba) Area.
These anomalous zones have not been noted as mineral showing, but contact metasomatic deposit in this limestone is expected on the basis of the detected anomalous elements.

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(3) N. Bautista (1970); Mineral verification of one hundred and ten lode claims in Rio tuba Bataraza, Palawan. applied for lease by the Rio Tuba Nickel Mining Corporation.

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APPENDIX

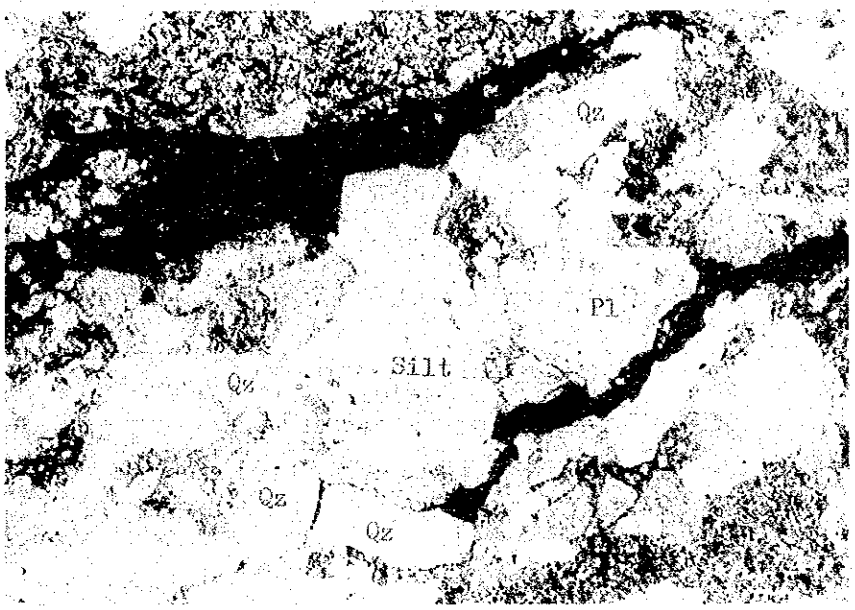
Appendix 1

Microphotograph(Thin Section)

Palawan V (Busuanga) Area
(Thin Section Microphotograph)

Sandstone (Sample No. NE-002)
Locality : West Coast of Culion Island
Rock Fregment : Siltstone, Chert, Chalcedony
Matrix : Quartz, Plagioclase, Calcite

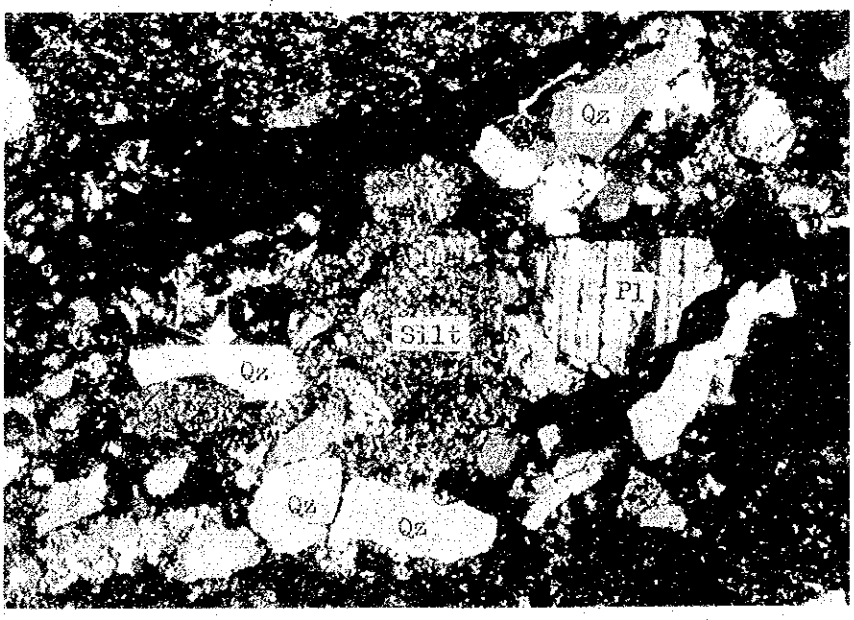
Parallel Nicol



0 2 mm

Silt : Siltstone
Pl : Plagioclase
Qz : Quartz

Crossed Nicol

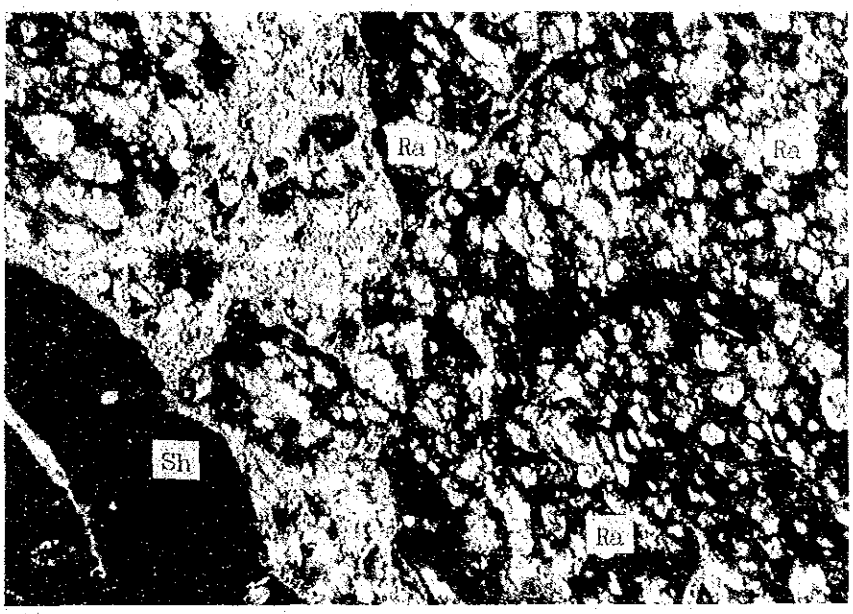


0 2 mm

Radiolarian Chert (Sample No. NK-022)

Locality : Range Part of Northern Culion Island
Rock Fragment : Shale
Matrix : Microcrystalline Quartz, Clay Minerals, Soliceous Microfossil (Radiolaria)

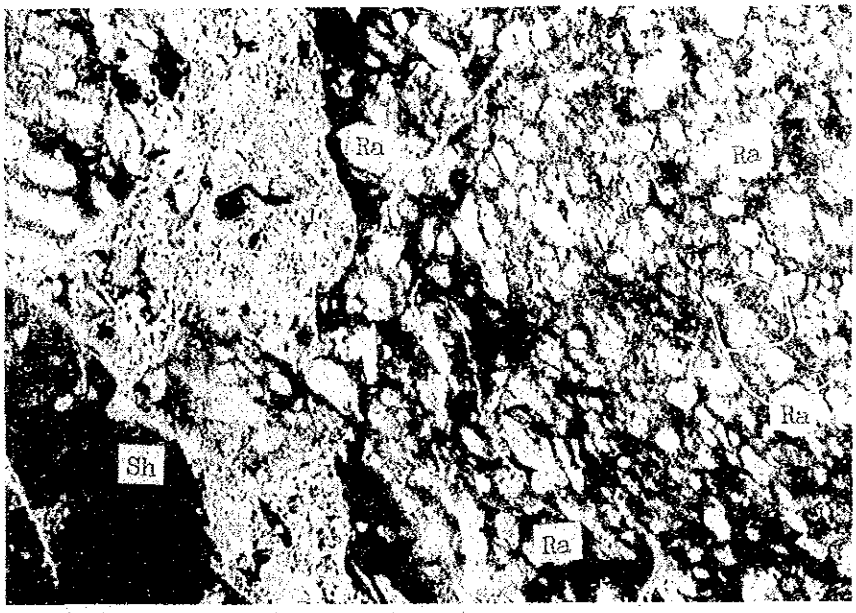
Parallel Nicol



Sh : Shale
Ra : Radiolaria

0 2 mm

Crossed Nicol



0 2 mm

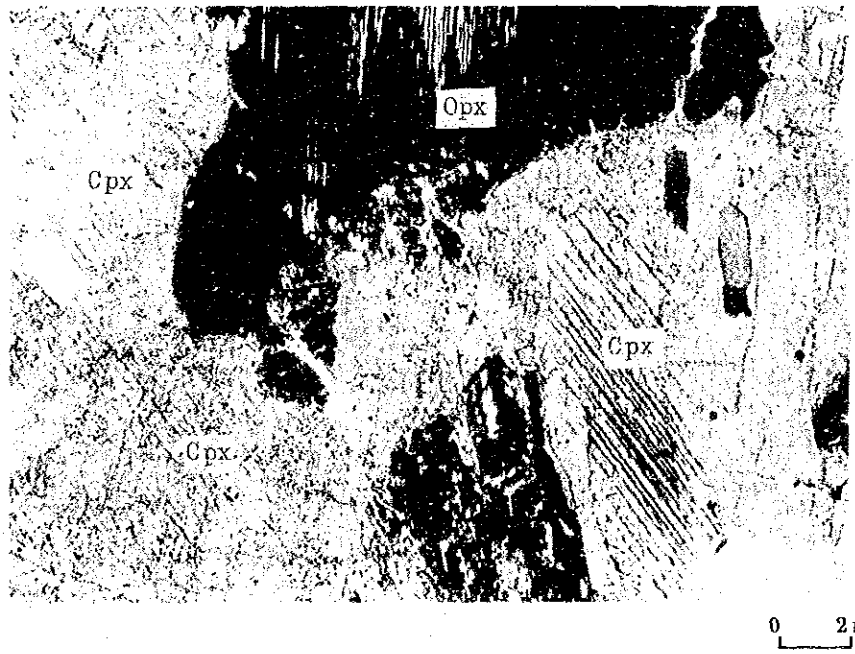
Palawan VI (Quezon-Rio Tuba) Area
(Thin Section Microphotograph)

Pyroxenite (Sample No. SXR-03)
Locality : 3 Km E of Mt. Landargun
Main Mineral : Clinopyroxene, Orthopyroxene, Olivine
Accessory Mineral : Iron Mineral

Parallel Nicol

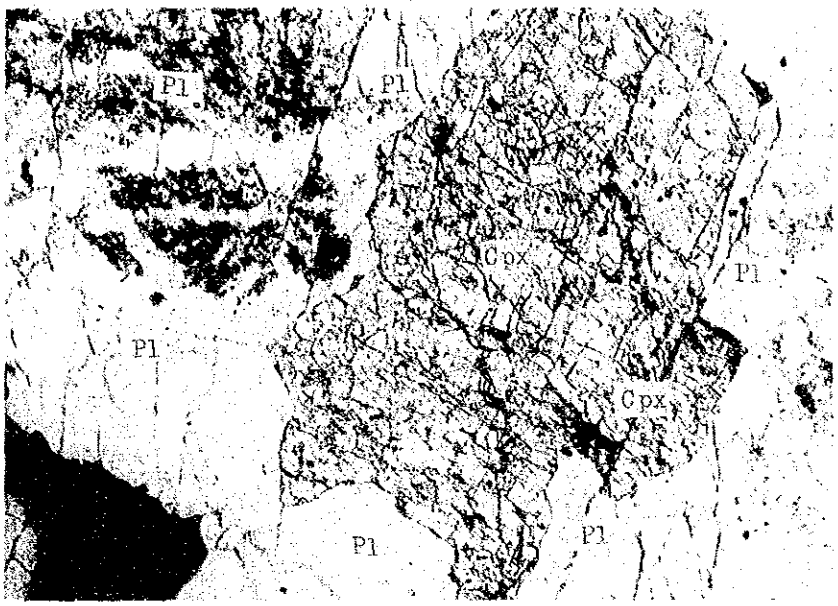
CPx : Clinopyroxene
OPx : Orthopyroxene

Crossed Nicol



Gabbro (Sample No. SOR-22)
Locality : 12 Km N of Brookes Point
Main Mineral : Plagioclase, Clinopyroxene
Accessory Mineral : Serpentine, Magnetite, Prehnite

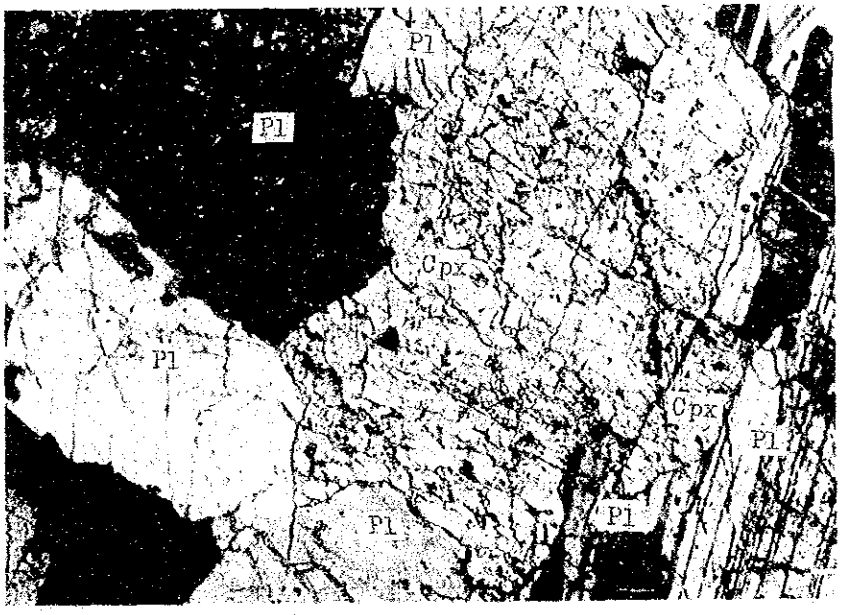
Parallel Nicol



0 2 mm

Pl : Plagioclase
CPx : Clinopyroxene

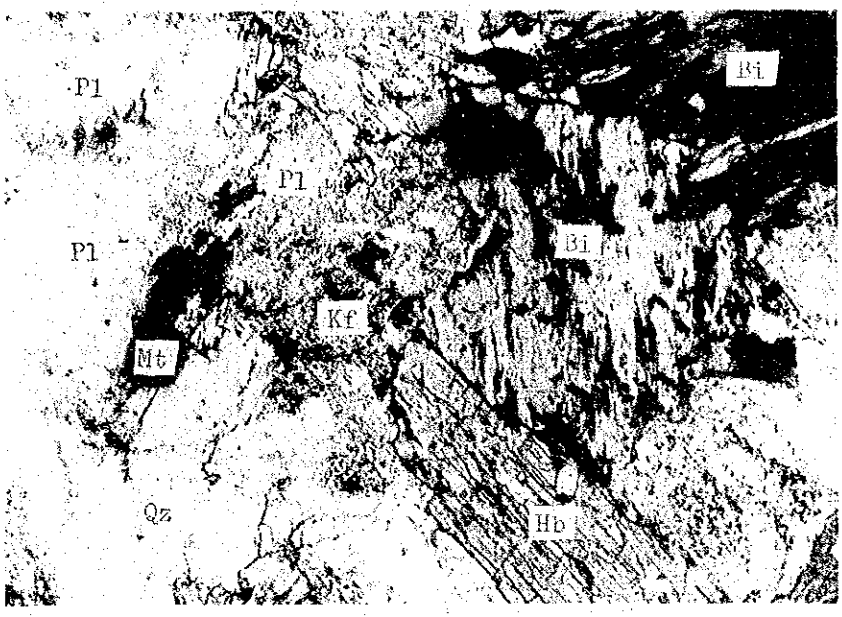
Crossed Nicol



0 2 mm

Hornblende-Biotite Granodiorite (Sample No. SLR-12)
Locality : 6 Km NE of Mt. Corumi
Main Mineral : Quartz, Plagioclase, Biotite, Hornblende, K-feldspar
Accessory Mineral : Chlorite, Magnetite

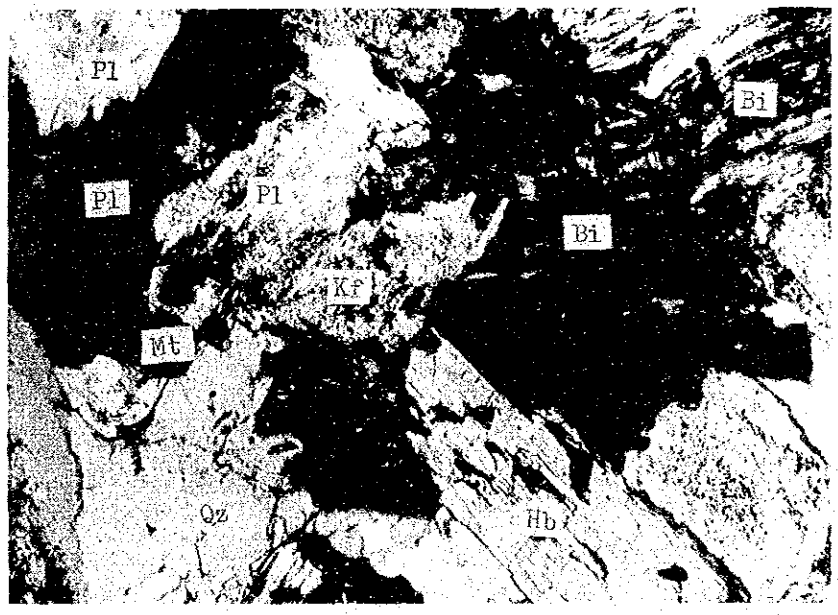
Parallel Nicol



0 2 mm

Qz : Quartz
Pl : Plagioclase
Bi : Biotite
Hb : Hornblende
Kf : K-feldspar
Mt : Magnetite

Crossed Nicol

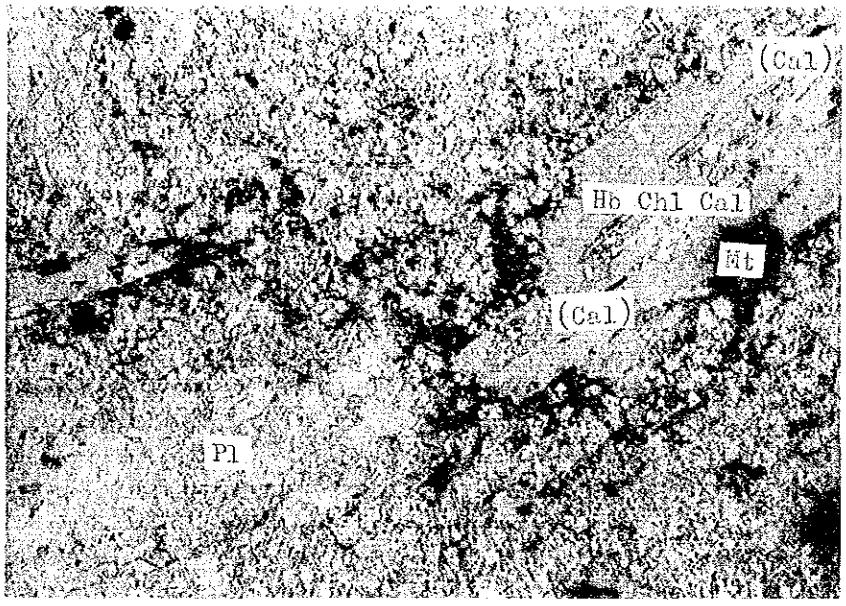


0 2 mm

West Negros Area
(Thin Section Microphotograph)

Diorite Porphyry (Sample No. FR-32)
Locality : 6 Km E of Damatan Valley
Phenocryst : Plagioclase, Hornblende, Magnetite
Groundmass : Quartz, K-feldspar, Plagioclase
Secondary Mineral : Chlorite, Calcite

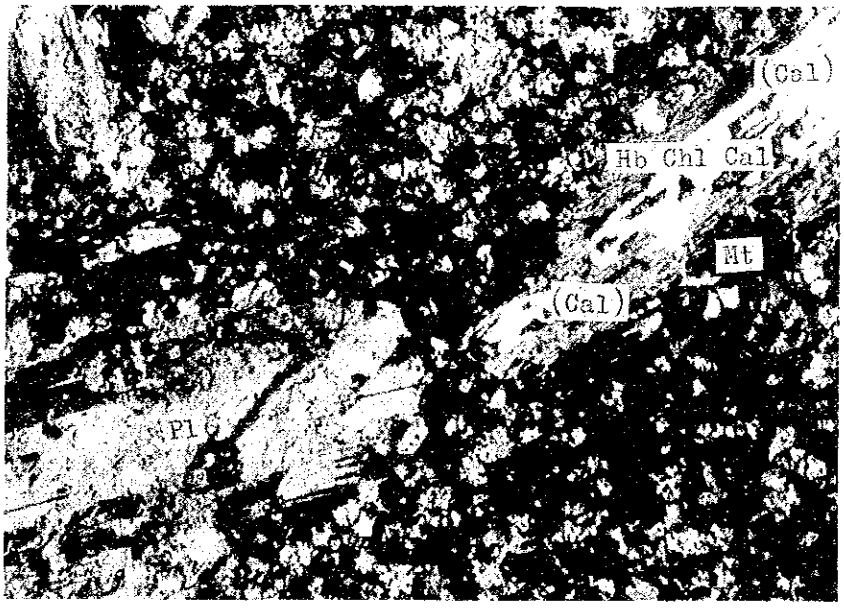
Parallel Nicol



Pl : Plagioclase
Hb : Hornblende
Mt : Magnetite
Chl : Chlorite
Cal : Calcite

0 2 mm

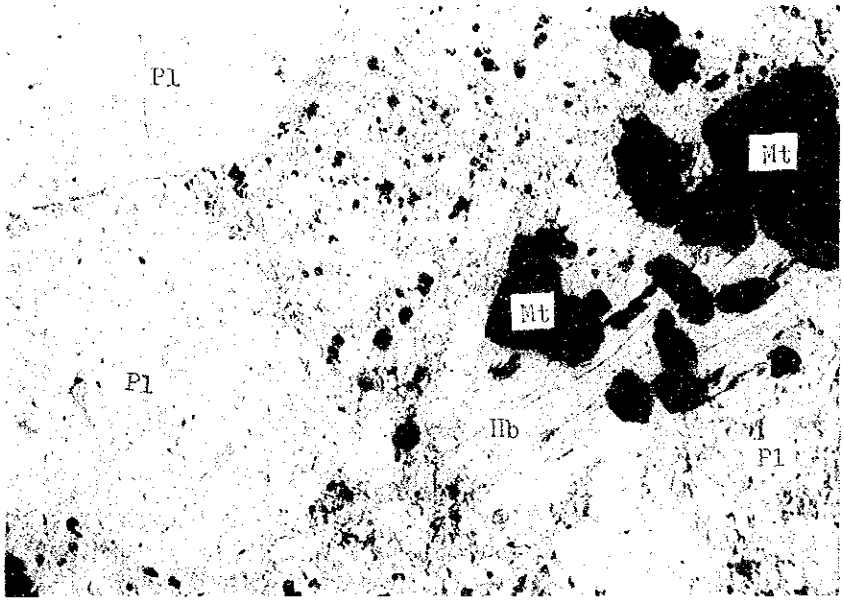
Crossed Nicol



0 2 mm

Spessartite (Sample No. BL-69)
Locality : 2 Km NNE of Damaton Valley
Phenocryst : Plagioclase, Hornblende, Magnetite
Matrix : Plagioclase, Hornblende, Magnetite
Secondary Mineral : Chlorite

Parallel Nicol



Pl : Plagioclase
Hb : Hornblende
Mt : Magnetite

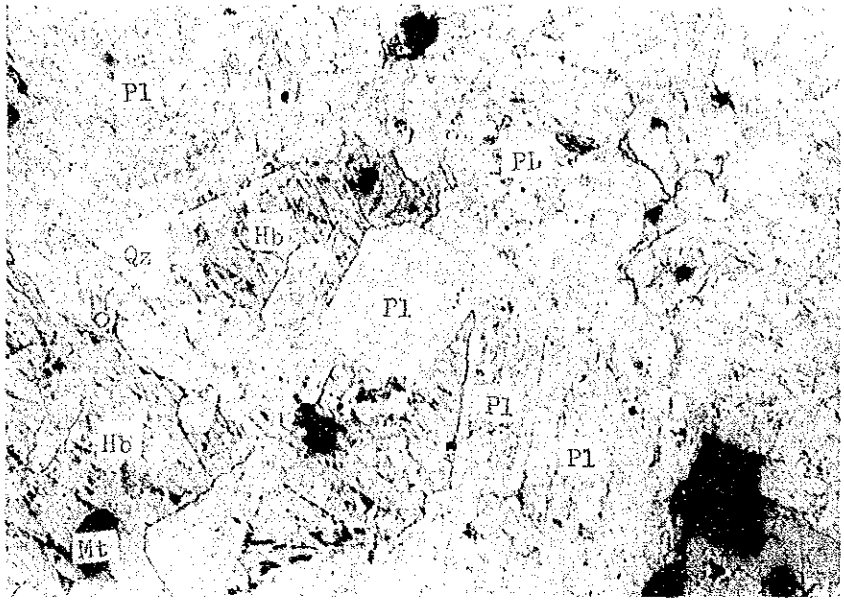
0 2 mm

Crossed Nicol

0 2 mm

Hornblende Gabbro (Sample No. BL-48)
Locality : 6.5 Km SSE of Sipalay
Main Mineral : Plagioclase, Hornblende, Quartz
Accessory Mineral : Magnetite, Clinopyroxene, Orthopyroxene
Secondary Mineral : Chlorite, Calcite

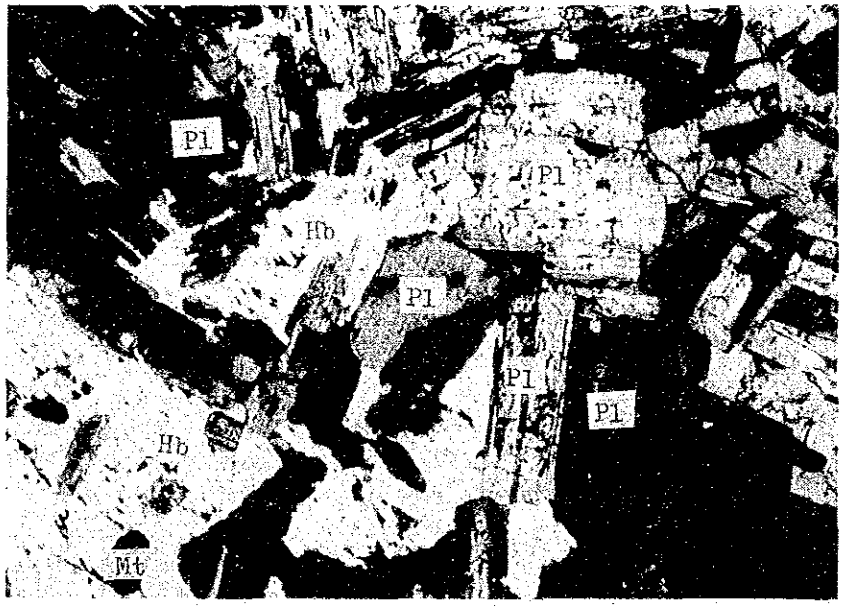
Parallel Nicol



0 2 mm

Pl : Plagioclase
Hb : Hornblende
Mt : Magnetite
Qz : Quartz

Crossed Nicol

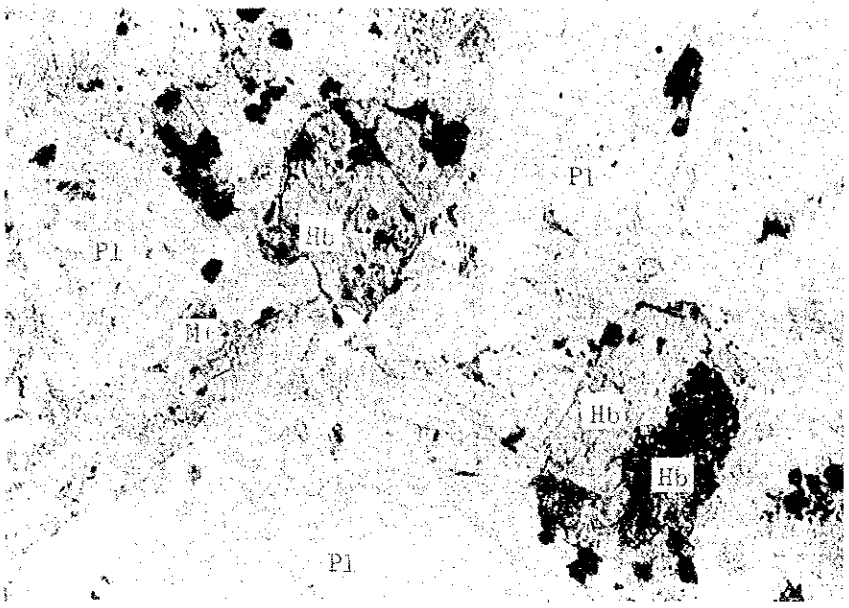


0 2 mm

Samar I ~ III Area
(Thin Section Microphotograph)

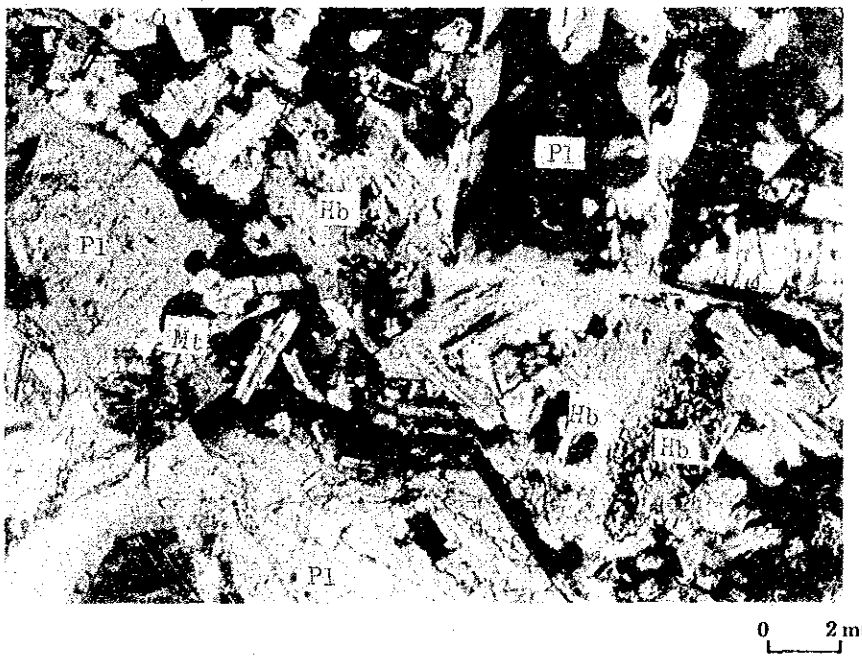
Diorite-Porphyrite (Sample No. WL 010R)
Locality : 14 Km NW of Bagacay
Phenocryast : Plagioclase, Hornblende
Groundmass : Plagioclase, Hornblende, K-feldspar, Magnetite, Quartz

Parallel Nicol



Pl : Plagioclase
Hb : Hornblende
Mt : Magnetite

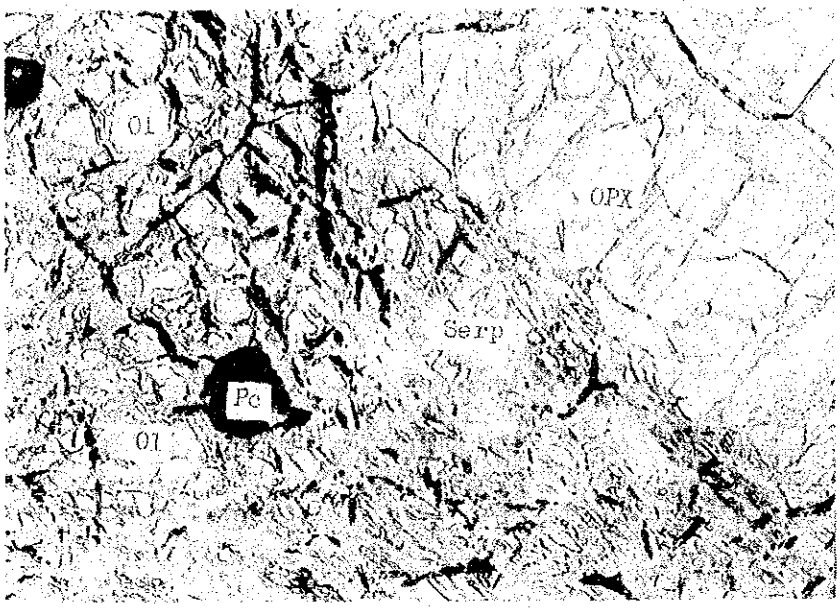
Crossed Nicol



Lherzolite (Sample No. EH 04R)

Locality	:	12 Km NWW of Llorente
Phenocryst	:	Orthopyroxene, Olivine, Clinopyroxene
Groundmass	:	Picotite, Magnetite

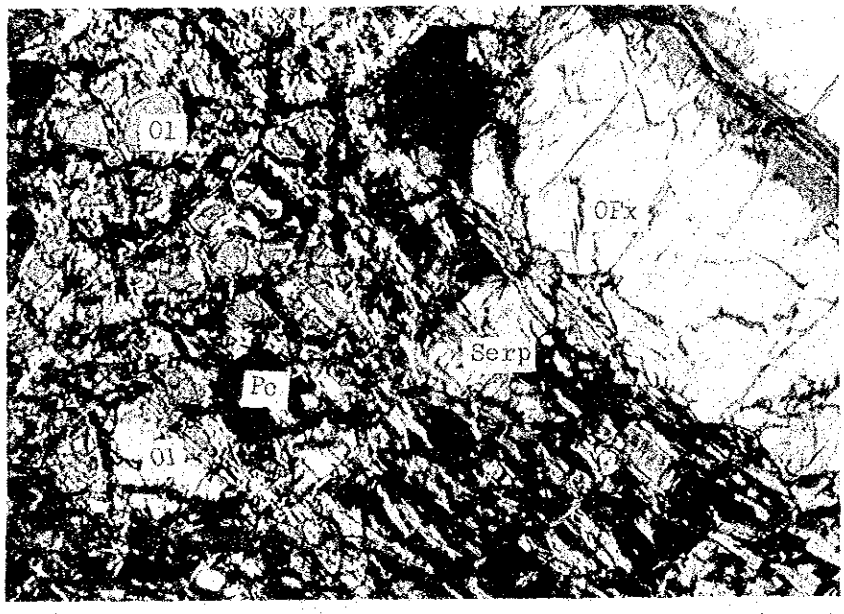
Parallel Nicol



OPx : Orthopyroxene
Ol : Olivine
Pc : Picotite
Serp : Serpentine

0 2 mm

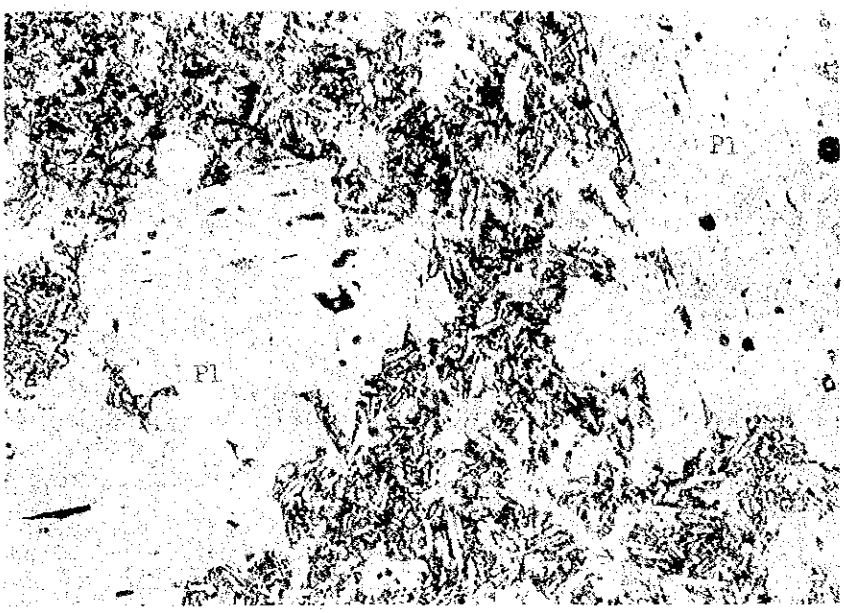
Crossed Nicol



0 2 mm

Basalt (Sample No. NG 02R)
Locality : 27 Km W of Dolores
Phenocryst : Plagioclase, Orthopyroxene
Groundmass : Plagioclase, Clinopyroxene, Orthopyroxene, Magnetite
Secondary Mineral : Chlorite, Calcite, Zeolite

Parallel Nicol



Pl : Plagioclase

0 2 mm

Crossed Nicol

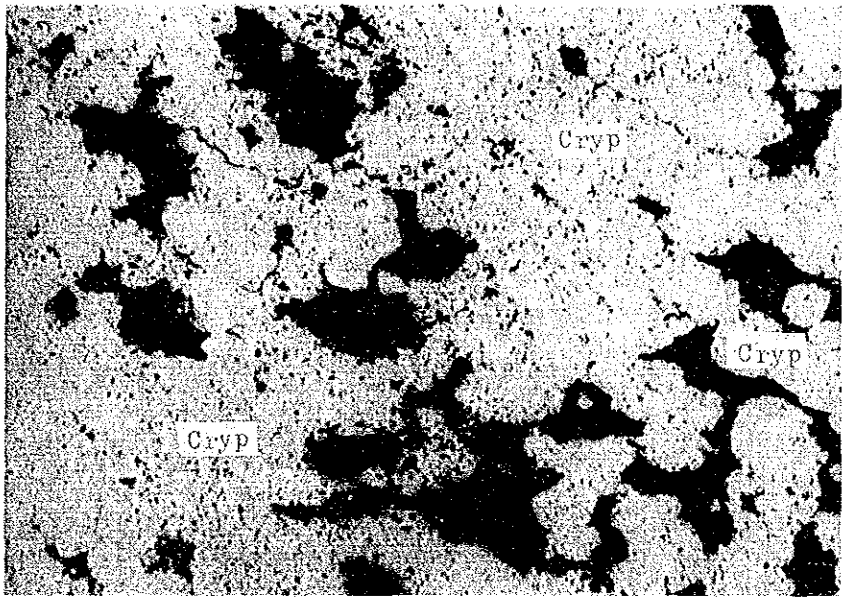
0 2 mm

Appendix 2

Microphotograph(Polished Section)

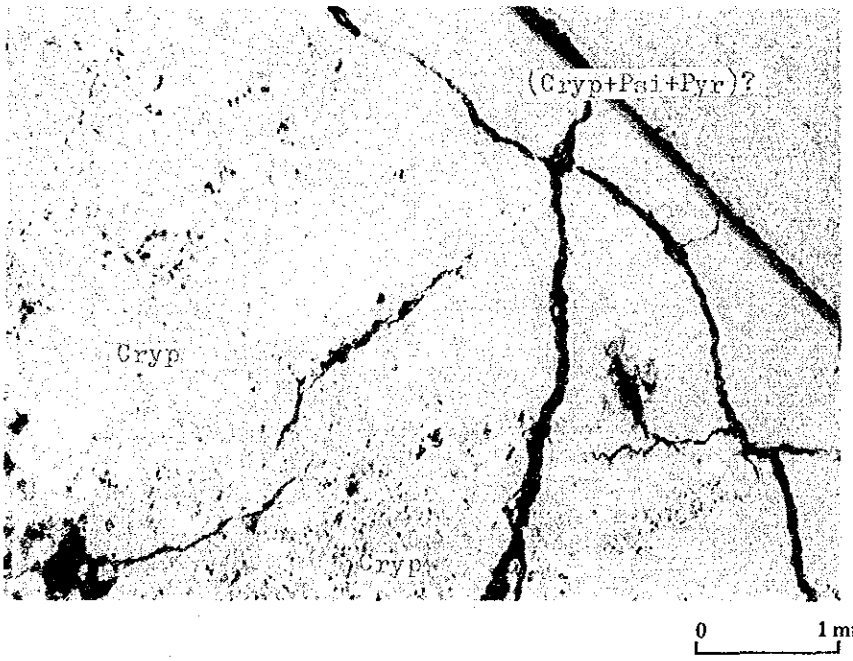
Palawan V Area
(Polished Section Microphotograph)

Manganese Ore (Sample No. NA-037)
Locality : Lanka Mine, 6 Km ESE of San Nicolas of Busuanga Island



Cryp: Cryptomelane

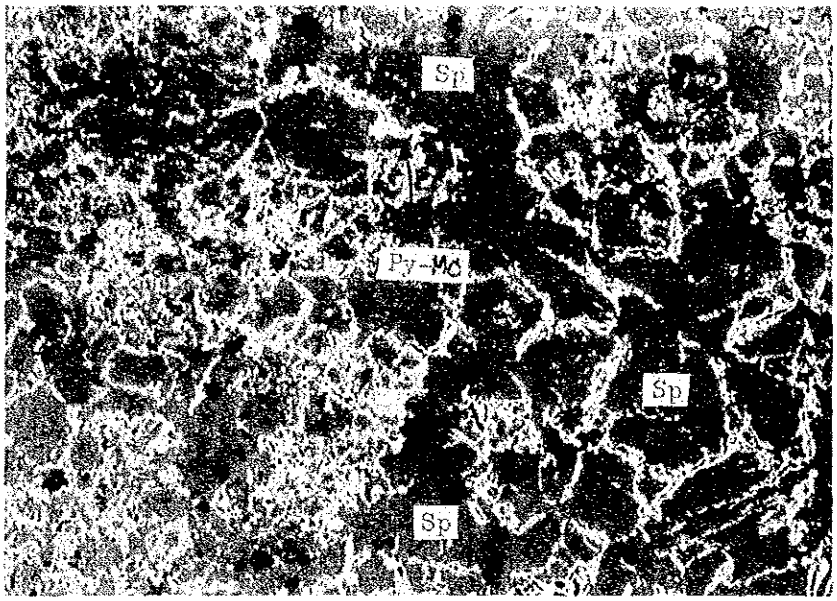
Manganese Ore (Sample No. NK-046)
Locality : Kabol-Kabol Mine, 1 Km NW of Kabol-Kabol of Culion Island



Cryp: Cryptomelane

Palawan VI (Quezon-Rio Tuba) Area
(Polished Section Microphotograph)

Brownish Chalcopyrite-Sphalerite-Pyrite-Marcasite Ore (Sample No. SMR-19A)
Locality : Barong Barong B, 70 Km N of Brookes Point



Sp : Sphalerite
Py : Pyrite
Mc : Marcasite

0 1 mm

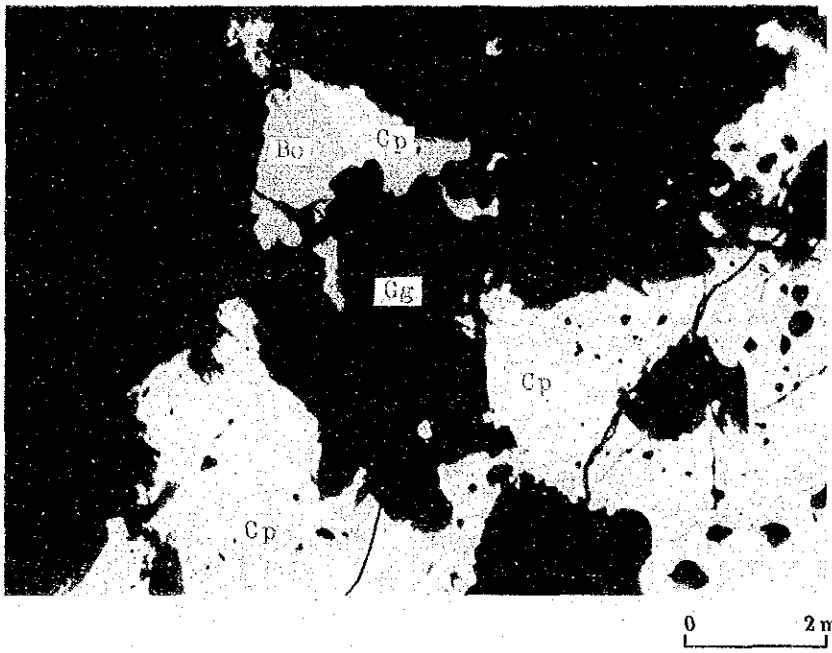
Chromite in Serpentinized Peridotite (Sample No. SLR-10C)
Locality : Pulute Range, 20 Km SSW of Quezon

Cr : Chromite

0 2 mm

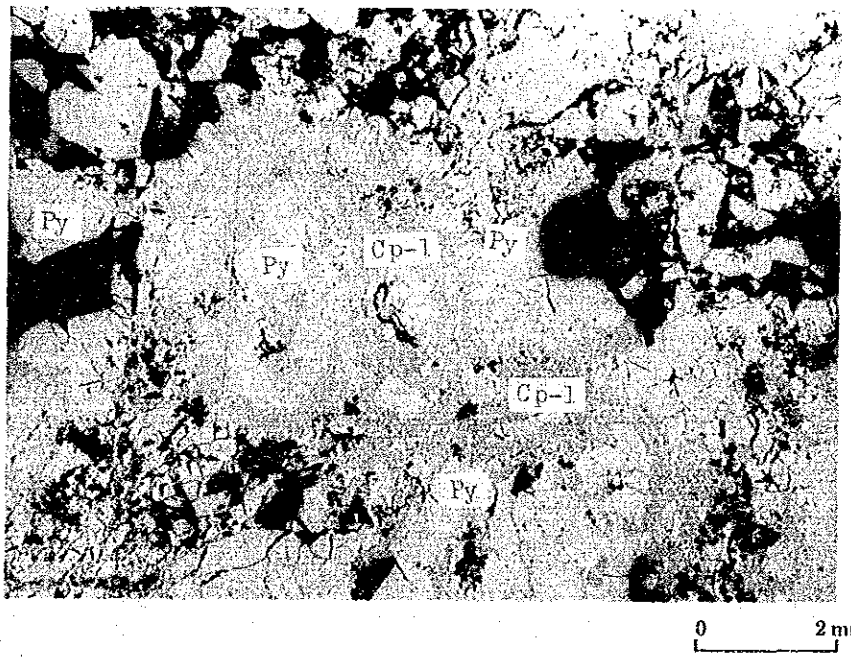
West Negros Area
(Polished Section Microphotograph)

Magnetite-Chalcopyrite Ore (Sample No. C-01A)
Locality : Capayasan, 5 Km ES of Jinoba-an



Cp : Chalcopyrite
Bo : Bornite
Gg : Gangue minerals

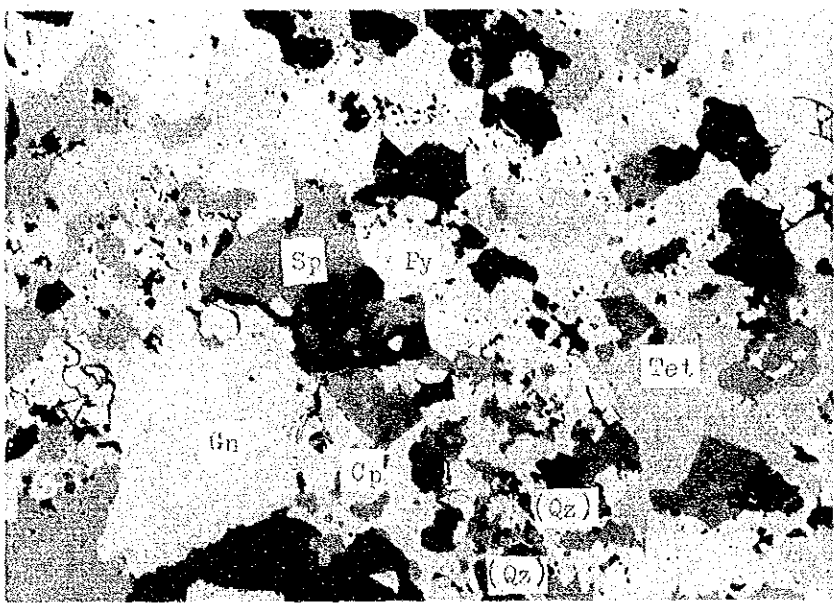
Pyrite-Brownish Chalcopyrite Ore (Sample No. SIBC-02)
Locality : Colet and Catwanan, Binucawan River of Sipalay River Branch



Cp_{-1}: Brownish Chalcopyrite
Py : Pyrite

Samar I ~ III Area
(Polished Section Microphotograph)

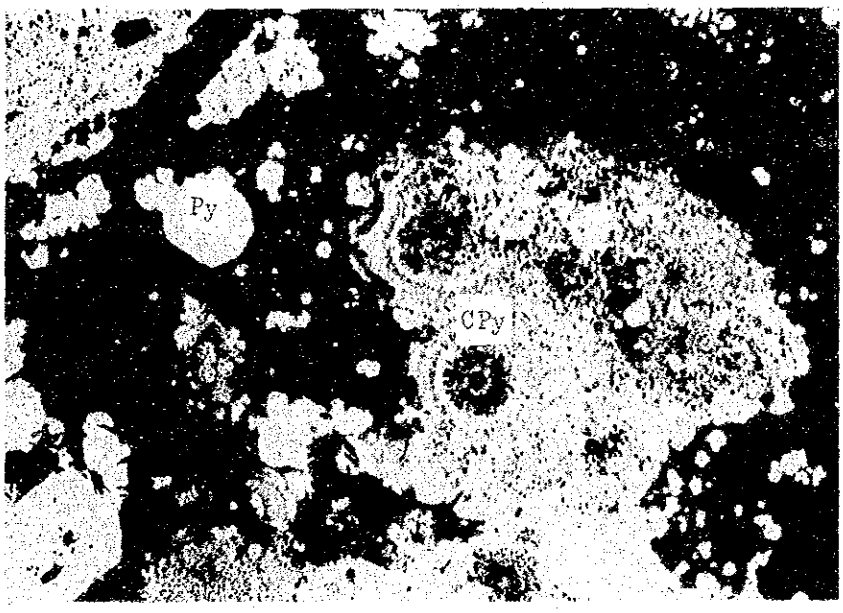
Pyrite-Sphalerite-Chalcopyrite-Tetrahedrite-Galena Ore (Black Ore)
(Sample No. Spot No. 1)
Locality : Pasiko Creek



0 1 mm

Py : Pyrite
Sp : Sphalerite
Cp : Chalcopyrite
Tet : Tetrahedrite
[Qz] : Rock Crystal
Gn : Galena

Pyrite Ore (Sample No. EJ10)
Locality : Bagacay Mine



0 2 mm

Py : Pyrite
CPy : Colloform Pyrite

Appendix 3

Microfossil Correlation Table

Appendix 3 Raiolaria, Faraminifera Correlation Table

Dr. Makoto Okamura, Kochi University

District	Sample	Rock facies	Radiolaria	Foraminifera	Further remarks
PALAWAN V	NE017	Chert	Rare/Very poor	Barren	Metachert
"	JS014R	Chert	Rare/Very poor	Barren	Black siliceous shale
"	NF092A	Limestone	Barren	Barren	Light gary limestone
"	NF100A	Limestone	Barren	Barren	Light gary limestone
"	NM024	Limestone	Barren	Barren	Light gray metalimest.
PARAWAN VI	SE002	Chert	Common to rare/ poor Archaeodictyomitra(?) sp. Parvicingula(?) sp.	Barren Barren	Reddish radiolarian chert with pyrite grain Upper Jurassic(?) to Lower Cretaceous
"	SD020	Sandstone	Barren	Barren	Gray fine grained sst.
"	SY073R	Chert	Rare/Very poor Xitus(?) sp. Eucyrtis(?) sp.	Barren	Reddish meta-radiolarian chert Upper part of Lower Cretaceous
"	SLR13A	Calc. sst.	Barren	Barren	Gray fine grained sst.
"	SS043R	Calc. shale	Barren	Rare/Very poor	Paleocene to Recent
"	SU008R	Shale	Barren	Barren	Dark gray fine laminated fine grained sandstone
"	SLR15	Sandstone	Barren	Barren	Light gray fine grained sandstone
"	VS2	Mudstone	Barren	Barren	Gray laminated fine grained sandstone
"	SLR-14	Sandstone	Barren	Barren	Gray very fine grained sandstone
W. NEGROS	BM36	F. gr. sst.	Barren	Barren	Gray f. gr. sandstone
"	BK11	Mudstone	Barren	Barren	Dark gray conglomeratic claystone
"	BH23	Siltst.	Barren	Barren	Dark gray me. gr. sst.
"	KR019	Mudstone	Barren	Rare/Poor Cellanthus sp.	Gray sandy siltst. Pliocene to Recent
"	BK034	Mudstone	Barren	Barren	Dark gray sandy siltst.
"	FR16	Limestone	Barren	Barren	Light gray micritic limestone
"	BR70	Siltstone	Barren	Barren	Dark gray fine laminated very fine graind sst.
"	KR016	Calc. siltst.	Barren	Barren	Gray calc. siltstone
"	KR027	F. gr. sst.	Barren	Rare/Poor	Cretaceous to Recent Light gray sandy siltst.
"	KR020	F. gr. sst.	Barren	Barren	Gray calcareous sandst.
PARAWAN VI	SC-21	Mudstone	Barren	Barren	Dark gray siltstone

Radiolarian analysis from the Samar Island

Sample number	Rock facies	Radiolarians
EN03	Pale brown limestone	Barren
EQ2R	Calcareous sandstone	Barren
HE1R	Siltstone	Rare/Poor
EH2R	Fine-grained sandstone	Rare/Moderate
EH7R	Limestone	Barren
NE02R	Sandstone	Few foraminifera
NK06R	Mudstone	Rare/Moderate
NQ07R	Siltstone	Barren
NP02R	Siltstone	Barren
NH02R	Mudstone	Rare foraminifera
WN005R	Mudstone	Barren
WK04R	Limestone	Barren
WA032	Limestone	Barren
WK14R	Chert	Barren
FWS003	Calcarenite	Barren

List of Radiolaria

EH2R *Stichocorys peregrina* (Riedel, 1953)
Lithopera sp.
Diartus sp.
Spongaster sp.
Stylatractus sp.

Nivixitus maclaughlini - Middle Cretaceous form
Reworked radiolarians
from adjacent areas (?)
Age; Early to Middle Pliocene

EH1R *Stylatractus* sp.

NK06R Pyritized radiolarians only
Hemicryptocapsa(?) sp.

Appendix 3 Nannoplankton Correlation Table

Dr. Naotake Okada, Yamagata University

AREA	PARAWAN VI					WESTERN NEGUROS				
SAMPLE NUMBER	SC-21	SS043R	SU008R	SLR-15	SLR-14	BM-36	KR-019	BR-70	KR027	KR020
ABUNDANCE - PRESERVATION	R P	F P	F P	T -	T -	A M	F M	R P	C P	T -
ETCHING / OVERGROWTH		2/2	2/2			0/1	0/1		1/3	
Braarudosphaera bigelowii	-	-	-	-	-	F	-	-	F	-
Calcidiscus leptoporus	-	-	-	-	-	C	-	-	-	-
Calcidiscus macintyrei	-	-	-	-	-	R	-	-	-	-
Chiphragmalithus calathus	-	F	-	-	-	-	-	-	-	-
Coccolithus miopelagicus	-	-	R	-	-	-	-	-	-	-
Coccolithus pelagicus	-	C	C	-	+	-	C	-	-	-
Coronocyclus nitescens	-	-	-	-	-	-	C	-	-	-
Cyclicargolithus floridanus	-	-	A	+	-	A	A	+	A	-
Dictyococcites antarcticus	-	-	C	-	-	-	-	-	-	-
Discoaster barbadiensis	-	A	-	-	+	-	-	-	-	-
Discoaster challengeri	-	-	-	-	-	C	-	-	-	-
Discoaster deflandrei	-	-	F	-	-	C	F	-	A	-
Discoaster exilis	-	-	F	-	-	C	-	-	-	-
Discoaster saipanensis	-	F	-	-	-	-	-	-	-	-
Discoaster variabilis	-	-	C	-	-	A	-	-	-	-
Discoaster spp.	-	-	-	-	-	-	-	+	-	+
Helicosphaera carteri	-	-	-	-	-	F	F	-	F	-
Helicosphaera aff. *reticulata*	-	-	-	-	-	-	R	-	-	-
Micula stauropora	+	-	-	-	(+)	-	-	-	-	-
Neococcolithus protenus	-	R	-	-	-	-	-	-	-	-
Pontosphaera multipora	-	-	-	-	-	R	-	-	-	-
Reticulofenestra gelida	-	-	F	-	-	-	-	-	-	-
Reticulofenestra haquii	-	-	-	-	-	C	-	-	-	-
Reticulofenestra minuta	-	-	-	-	-	-	C	-	C	-
Reticulofenestra minutula	-	-	-	-	-	F	-	-	-	-
Reticulofenestra pseudoumbilica	-	-	-	-	-	F	-	-	-	-
Reticulofenestra spp.	-	-	-	-	-	-	C	-	-	-
Sphenolithus compactus	-	-	A	-	-	C	-	-	-	-
Sphenolithus heteromorphus	-	-	C	-	-	A	-	-	C	-
Sphenolithus moriformis	-	A	C	-	-	C	-	-	C	-
Sphenolithus radians	-	F	-	-	-	-	-	-	-	-
Sphenolithus spp.	-	-	-	-	-	-	-	-	-	+
Tribrachiatus orthostylus	-	F	-	-	-	-	-	-	-	-
Watznaueria barnesae	+	-	-	-	-	-	-	-	-	-
Zygrhablithus bijugatus	-	F	-	-	-	-	-	-	-	-
NANNOZONE (CP-)		9b-10			9-15					
(CN-)			4			4			3	

(AGE) SC-21: Late Cretaceous (Coniacian - Maastrichtian)
SS043R: early Eocene
SU008R, BM-36: middle Miocene
SLR-15, BR-70: middle Eocene - middle Miocene
SLR-14: Eocene
KR-019: Oligocene - early Miocene
KR-027: early Miocene
KR-020: middle Paleocene - early Pliocene

Barren Samples Examined: Parawan V Area (NE017, NF092A, NF100A, NM024, JS014)
Parawan VI Area (SE002, SD020, SY073R, SLR13A, VS-2)
Western Neguros Area (BK11, BH23, BK024, FR16, KR016)

OCCURRENCE OF CALCAREOUS NANNOFOSSILS IN SAMAR ISLAND SMAPLES

SAMPLE NUMBER ABUNDANCE - PRESERVATION ETCHING / OVERGROWTH	ENO3 R P 0/3	NKO6R A M 1/0	FWSO03 R P 0/3
Biscutum constans	-	F	-
Chiastozygus litterarius	-	F	-
Corolithion signum	-	R	-
Cretarhabdus conicus	-	R	-
Cretarhabdus crenulatus	-	C	+
Discorhabdus rotatrius	-	F	-
Eiffelithus eximius	-	F	-
Eiffellithus turriseiffelii	-	C	-
Eprolithus floralis	-	C	-
Glaucolithus diplogrammus	-	F	-
Kamptnerius magnificus	-	R	-
Lithastrinus septenarius	-	F	-
Manivitella pemmatoidea	-	F	-
Marthasterites furcatus	-	F	-
Micula concava	-	F	-
Micula decussata	+	R	+
Placozygus spp. (snall)	-	A	-
Prediscospahera columnata	-	C	-
Prediscosphaera cretacea	-	C	-
Rotelapillus octoradiatus	-	R	-
Rhagodiscus angustus	-	R	-
Tranolithus phacelosus	-	R	-
Watznaueria barnesae	+	A	+
Watznaueria biporata	-	F	-
Zeugrhabdotus embergeri	-	R	-
NANNOZONE (CC-)	14-26	15-16	14-26

Age: ENO3 & FWSO03: Santonian - Maastrichtian
NKO6R: Santonian

OCCURRENCE OF CALCAREOUS NANNOFOSSILS IN SAMAR ISLAND SAMPLES

SAMPLE NUMBER	EQ2R	EH1R	EH2R	NEO2R	NHO2R
ABUNDANCE - PRESERVATION	R P	R M	R P	A M	C M
ETCHING / OVERGROWTH	0/3	0/1	0/3	1/0	0/1
Calcidiscus leptoporus	-	-	-	C	F
Calcidiscus macintyrei	-	-	-	-	F
Ceratolithus primus	-	-	-	R	-
Ceratolithus rugosus	-	-	-	R	-
Coccolithus pelagicus	-	-	-	-	F
Cyclicargolithus floridanus	+	+	+	-	r
Dictyococcites bisectus	+	-	+	-	-
Discoaster asymmetricus	-	-	-	-	F
Discoaster brouweri	-	-	-	F	A
Discoaster intercalaris	-	-	-	F	F
Discoaster pentaradiatus	-	-	-	C	C
Discoaster surculus	-	-	-	F	R
Discosater tamalis	-	-	-	-	R
Discoaster variabilis	-	-	-	C	C
Florisphaera profunda	-	-	-	A	C
Helicosphaera carteri	-	-	-	F	C
Helicosphaera euphratis	-	-	-	-	R
Helicosphaera minuta	-	-	-	-	R
Pontosphaera spp.	-	-	-	R	F
Reticulofenestra haquii	-	-	-	A	F
Reticulofenestra minuta	-	-	-	A	C
Reticulofenestra minutula	-	-	-	A	F
Reticulofenestra pseudoumbilica	-	-	-	C	R
Reticulofenestra spp.	+	+	+	-	-
Sphenolithus abies	-	-	-	C	A
Sphenolithus moriformis	+	-	-	-	-
Sphenolithus neoabies	-	-	-	F	C
Sphenolithus predistentus	+	-	-	-	-
Sphenolithus verensis	-	-	-	C	C
Syracosphaera spp.	-	-	-	R	R
Umbilicosphaera sibogae v. *foliosa*	-	-	-	C	R
NANNOZONE				CN10b	CN10-11

Age: EQ2R & EH2R: Late Eocene - Late Oligocene
EH1R: Middle Eocene - Early Miocene
NEO2R & NHO2R: Early Pliocene

Barren Samples Examined: EH7R, NQ07R, NP02R, WN005R, WK04R, WA032, WK14R

Appendix 4

Time Determination Data of K- Ar Method

Appendix 4

TELEDYNE ISOTOPES

POTASSIUM – ARGON LABORATORY

Report of Analysis

T. I. W. O. # 3-9916-122 Your P. O. # 062-2301 Date – 21 January 1988 Page 1 of 1

Submitted by Teledyne Japan K.K.
Nihonseimei Akasaka Bldg.
8-1-19 Akasaka, Minato-ku
Tokyo 107, Japan

for Overseas Mineral Resources
Development Co., Ltd.

Att: Mr. Y. Ohyama

T. I. Sample #	Your Sample #	Material Analyzed	Isotopic Age (Ma)	^{40}Ar * (scc/gm x 10^{-6})	% ^{40}Ar *	% K	Notes
KA88-1887	WK012R	Whole Rock	98.7 ± 4.9				
				.270	64.2	.68	
				.270	80.4	.69	
				.270	62.8		
KA88-1888	EF02R	Whole Rock	-- ± --				1
						<.02	
						<.02	

Notes

1. This sample contained less than 0.02% potassium, our minimum detection limit. Accordingly, we cancelled the argon analysis and did not calculate an isotopic age.

Myron Siragusa
Geochemistry Section

TELEDYNE ISOTOPES

POTASSIUM - ARGON LABORATORY

Report of Analysis

T. I. W. O. # 3-9850-122 Your P. O. # 062-1738 Date - 17 June 1987

Submitted by Teledyne Japan K.K.
Nihonseimei Akasaka Bldg.
8-1-19 Akasaka, Minato-ku
Tokyo 107, Japan

for Overseas Mineral Resourses Development Co.,Ltd.

Att: Mr. Y. Ohyama

T. I. Sample #	Your Sample #	Material Analyzed	Isotopic Age (Ma)	^{40}Ar * (scc/gm x 10-5)	% ^{40}Ar *	% K	Notes
KA87-1634	SLR-12	Whole Rock	35.5 ± 1.8				
				.140	39.9	.99	
				.136	58.5	.99	
KA87-1635	SW-033	Whole Rock	14.9 ± .7				
				.260	71.9	4.43	
				.258	88.2	4.48	
KA87-1636	BL-48	Whole Rock	28.2 ± 1.4				1
				.055	20.5	.49	
				.052	53.0	.48	
KA87-1637	FR-04	Whole Rock	25.1 ± 1.3				
				.153	82.3	1.55	
				.153	83.3	1.56	
KA87-1638	FR-32	Whole Rock	28.0 ± 1.4				
				.173	79.5	1.57	
				.173	82.9	1.58	

Notes

1. Because we feel that the lowest '% $^{40}Ar*$' is not representative of the actual argon concentration, we have chosen to use the lowest '% $^{40}Ar*$' of the remaining replicate analyses in the error calculation.