1-4-3 Placer Gold

The placer gold deposits are located in the east of Ananon and along the Kadlakogod creek. The gold occurs in alluvium and gold was recovered through pitting and panning. Most of pits there were dug or explored before the World War Ⅱ. Panning were conducted for the sample from old pits. Gold grains were observed by naked eye in concentrates of many pits. The weight of feed ore was 45kg to 80kg per sample, and concentrate was 2g to 40g per sample.

(1) Ananon North Area: The area is situated 1km east of Ananon and it is located near the junction between the Taganopol river and the Carorongan creek. About 20 pits are distributed 20m to 50m north from the Taganopol river. Most of old pits are collapsed and the site was covered with abaca plantation.

According to the local peoples, the pits had been dug originally before World War Ⅱ by a Manila resident and some of them were dug deeper to find primary quartz vein in 1980's by a Paracale resident. The result is said that a 5cm wide quartz vein with gold grain by naked eye were encountered at he depth of 7m. Now the pit is filled with water.

The profiles of pits is shown in Fig.18 and the results of analysis is shown in Table 13.

Table 13 Assay Results of the Panned Concentrate (Ananon North Area)

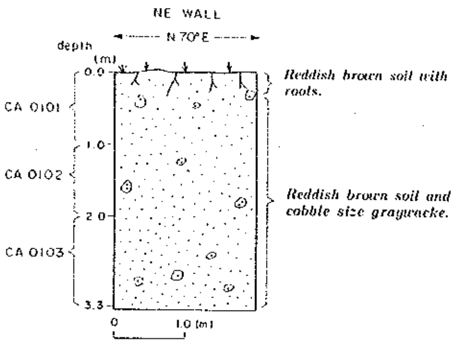
Sample No.	Feed	Panning concentrate		Feed	Ag	Cu	Pb	Zn	Gross	
		weight	Au						Au grain	Feed Au g/t
	Kg	g	g/t	Au g/t	ppm	%	%	%	g	Au g/t
CA 0101	45	4.30	5.44	0.0005	2	0.031	<0.001	0.02	-	0.0005
CA 0102	45	3.30	12.72	0.0009	<2	0.031	<0.001	0.012	-	0.0009
CA 0103	45	10.10	47.28	0.0106	<2	0.016	<0.001	0.009	-	0.0106
CA 0201	45	15.50	52.25	0.0180	2	0.022	0.001	0.031	-	0.0180
CA 0202	45	15.00	10.95	0.0037	4	0.023	0.003	0.03	0.0059	0.1348
CA 0203	45	12.00	12.81	0.0034	2	0.018	<0.001	0.032	-	0.0034
CA 0301	45	6.70	2.24	0.0003	2	0.025	0.002	0.023	-	0.0003
CA 0302	45	11.40	14.18	0.0036	<2	0.029	0.001	0.014	-	0.0036
CA 0303	45	5.90	11.7	0.0015	2	0.029	<0.001	0.015	0.0208	0.4638

Through panning of the sediments in pits, gold was observed by the naked eye in 3 concentrates from 3 pits among 9 concentrates from 9 pits. The samples with gold were taken from 2m to 3m from the surface and no gold was observed in the concentrate from the shallower part by naked eye. Gold grains of 4mm by 1mm and 2.5mm by 2mm in dimensions were observed (CA 0202, CA 0303). These grains were excluded in the chemical analysis of the concentrates.

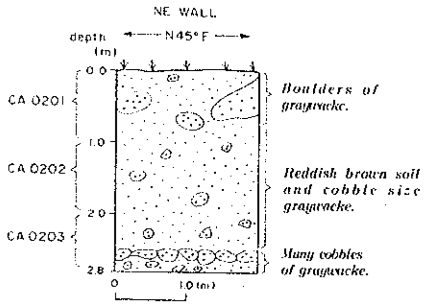
Au contents were 2.24g/t to 52.25g/t in concentrates. Converted into one ton of the feed ore, samples CA 0103 and CA 0201 became more than 0.01g/t Au in the feed ore.

In addition, 2 grains of gold excluded from chemical analysis are added and calculated back into the feed, then samples CA 0202 and CA 0303 are equal to 0.1348g/t Au and 0.4638g/t Au respectively in the

CA 01



CA 02



Sample No.	Feed	Panning concentrate		Feed	Ag	Cu	Pb	Zn	Gross	
									Au grain	Feed
	Kg	g	Au g/t	Au g/t	ppm	%	%	%	g	Au g/t
CA 0101	45	4.30	5.44	0.0005	2	0.031	<0.001	0.02	-	0.0005
CA 0102	45	3.30	12.72	0.0009	<2	0.031	<0.001	0.012	-	0.0009
CA 0103	45	10.10	47.28	0.0106	<2	0.016	<0.001	0.009	-	0.0106
CA 0201	45	15.50	52.25	0.0180	2	0.022	0.001	0.031	-	0.0180
CA 0202	45	15.00	10.95	0.0037	4	0.023	0.003	0.03	0.0059	0.1348
CA 0203	45	12.00	12.81	0.0034	2	0.018	<0.001	0.032	-	0.0034
CA 0301	45	6.70	2.24	0.0003	2	0.025	0.002	0.023	-	0.0003
CA 0302	45	11.40	14.18	0.0036	<2	0.029	0.001	0.014	-	0.0036
CA 0303	45	5.90	11.69	0.0015	2	0.029	<0.001	0.015	0.0208	0.4638

LEGEND

roots in soil

soil and sand

boulder of graywacke

CA 03

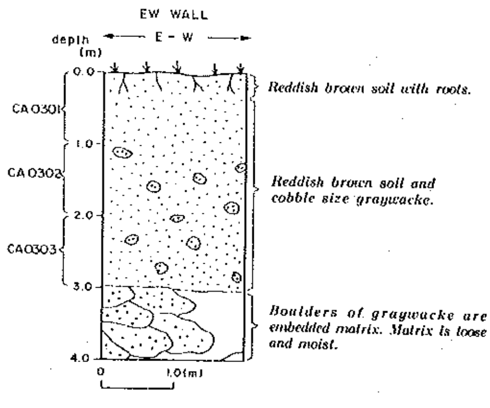


Fig. 18 Section of Pits of the Ananon North Area

feed.

The area is located in the lower reaches of the Carorongan and Taganopol Mineral Occurrences. The Taganopol river basin produces many floats of quartz vein and some of them are thought to be hydrothermal origin. The gold anomaly in stream sediments in the Taganopol river area is by far larger and wider than in Kadlakogod. Judging from the fact mentioned above, possibly of placer gold is possibly larger here than in the Kadlakogod creek.

(2) Kadlakogod Area: The area is located about 4km east of Tagbak. The placer gold deposit is located along the Kadlakogod creek.

Gold was recovered through panning from Quaternary sediments in pits. About 30 pits were dug before World War II mainly at the eastern bank of the Kadlakogod creek.

After 1987, one family has been working for abaca plantation and panning. Panning has been carried out intermittently and 6 to 8 grams of gold is recovered monthly. According to the family, they dug about 250 pits since 1987 but most of them are already collapsed and difficult to locate them.

Table 14 shows the results of ore analysis, Table 15 shows the results of concentrates analysis, Fig 19 shows the route map of the surrounding area and Fig.20 shows the profiles of pits. Two quartz veins with 10cm wide and a few fist-size floats of quartz veins are found in this survey at the upper reaches of the pits site. A small body of andesite porphyry belonging to Batalay Intrusives was found at the upper reaches of the pits and the surrounding graywacke and thin beds of acidic tuff underwent silicification, argillization and some pyritization. However no primary gold deposits were found but placer gold may have genetical relation to the andesite porphyry.

Table 14 Assay Results of the Kadlakogod Area

Sample No.	Sample Type	Width (cm)	Au g/t	Ag ppm	Cu %	Pb %	Zn %
AR-095	milky Qv	5	<0.03	<2	0.001	0.003	0.003
AR-098	And porp	hs	<0.03	<2	0.005	0.002	0.007
AR-099	And porp & Py	hs	<0.03	<2	0.014	0.002	0.011
AR-104	Qv along And dik	5	<0.03	<2	<0.001	0.001	0.003
AR-105	Qv along fault	10	<0.03	<2	0.003	0.001	0.002
AR-106	milky Qv, flt	hs	<0.03	<2	0.001	0.001	0.002
AR-110	Qv	ϕ 10	2.92	<2	<0.001	0.002	0.002
BOR-006	Qv	1~3	<0.03	<2	0.006	<0.001	0.007
ER-137	Qv flt	5	<0.03	<2	0.004	0.003	0.002
JOR-002	Qv with Py, flt	hs	<0.03	2	0.003	<0.001	0.004

[Abbreviations] Qv:quartz vein, sch:schist, flt:float, Ch:chlorite, Ep,epidote, Py:pyrite, NC:native copper, dik:dike, and porp:andesite porphyry, acid tf:acidic tuff, hs:hand specimen

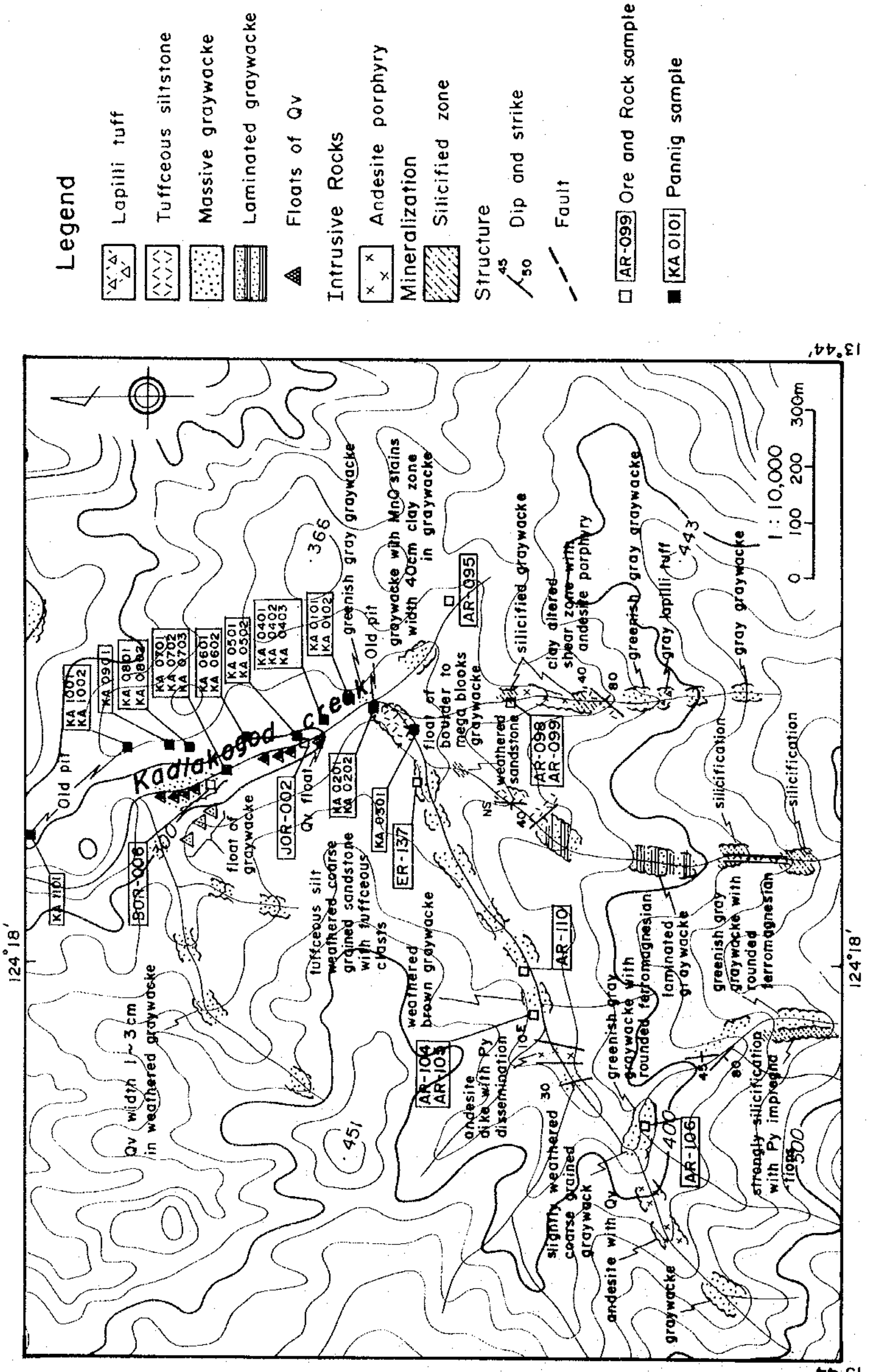
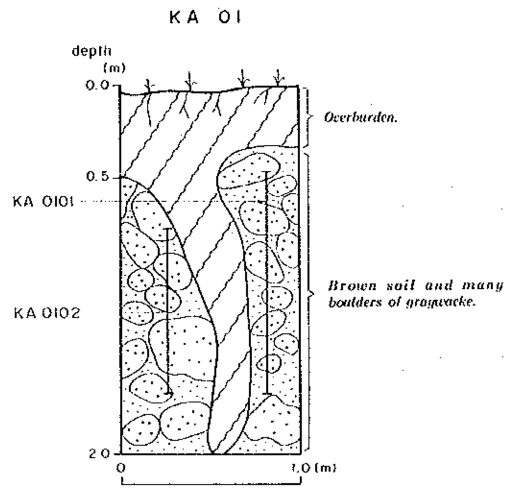
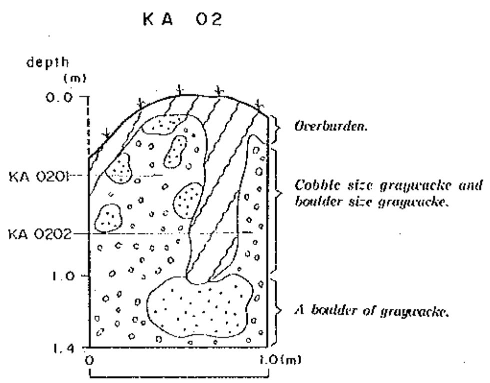
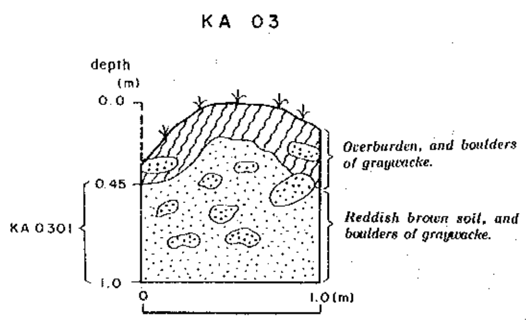
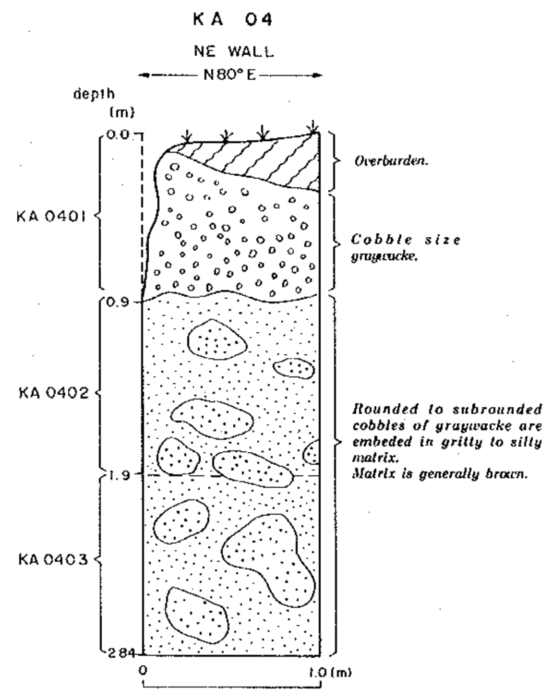


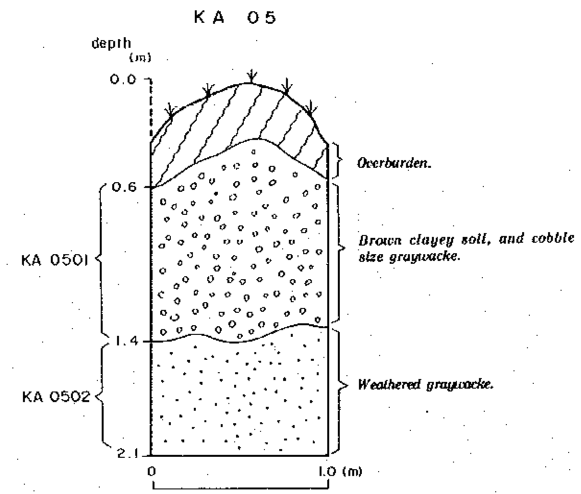
Fig. 19 Route Map of the Kadlakogod Area











Sample No.	Feed	Panning concentrate		Feed	Ag	Cu	Pb	Zn	Gross	
									Au grain	Feed
	Kg	g	Au g/t	Au g/t	ppm	%	%	%	g	Au g/t
KA 0101	75	26.20	3.86	0.0013	2	0.007	0.004	0.027	-	0.0013
KA 0102	80	30.50	0.19	0.0001	2	0.008	0.004	0.024	-	0.0001
KA 0201	80	40.10	49.39	0.0248	2	0.007	0.003	0.025	-	0.0248
KA 0202	80	32.80	622.07	0.2550	<2	0.007	0.004	0.026	0.3814	5.0225
KA 0301	80	18.30	5.07	0.0012	2	0.008	0.002	0.036	-	0.0012
KA 0401	45	2.00	-	-	2	0.01	0.002	0.023	-	-
KA 0402	45	16.00	0.5	0.0002	<2	0.013	0.006	0.018	-	0.0002
KA 0403	45	9.00	15.55	0.0031	2	0.008	0.001	0.025	-	0.0031
KA 0501	45	9.00	12.94	0.0026	<2	0.009	0.004	0.022	-	0.0026
KA 0502	45	16.60	7.22	0.0027	<2	0.007	0.002	0.017	-	0.0027
KA 0601	45	4.20	<0.90	<0.0001	<2	0.01	0.003	0.018	-	<0.0001
KA 0602	45	3.00	<0.90	<0.0001	<2	0.009	0.002	0.019	-	<0.0001
KA 0701	45	9.50	<0.25	<0.0001	2	0.007	0.005	0.024	-	<0.0001
KA 0702	45	13.80	22.89	0.0070	2	0.007	0.002	0.022	-	0.0070
KA 0703	45	20.00	49.05	0.0218	2	0.009	0.003	0.019	-	0.0218
KA 0801	45	11.10	0.62	0.0002	2	0.008	0.003	0.021	-	0.0002
KA 0802	45	7.80	93.56	0.0162	14	0.009	0.003	0.031	-	0.0162
KA 0901	45	12.20	5.35	0.0015	2	0.007	0.003	0.025	-	0.0015
KA 1001	45	11.80	1.24	0.0003	<2	0.008	0.001	0.023	-	0.0003
KA 1002	45	21.60	23.64	0.0113	2	0.008	0.002	0.031	-	0.0113
KA 1101	45	12.80	20.65	0.0059	2	0.007	0.002	0.021	-	0.0059

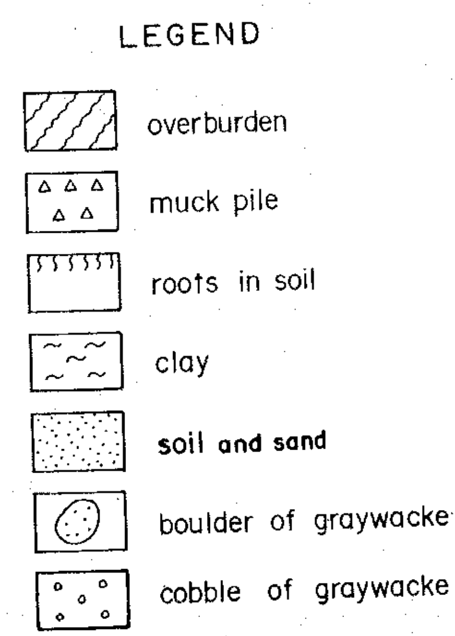


Fig. 20 Section of Pits of Kadlakogod Area (1)

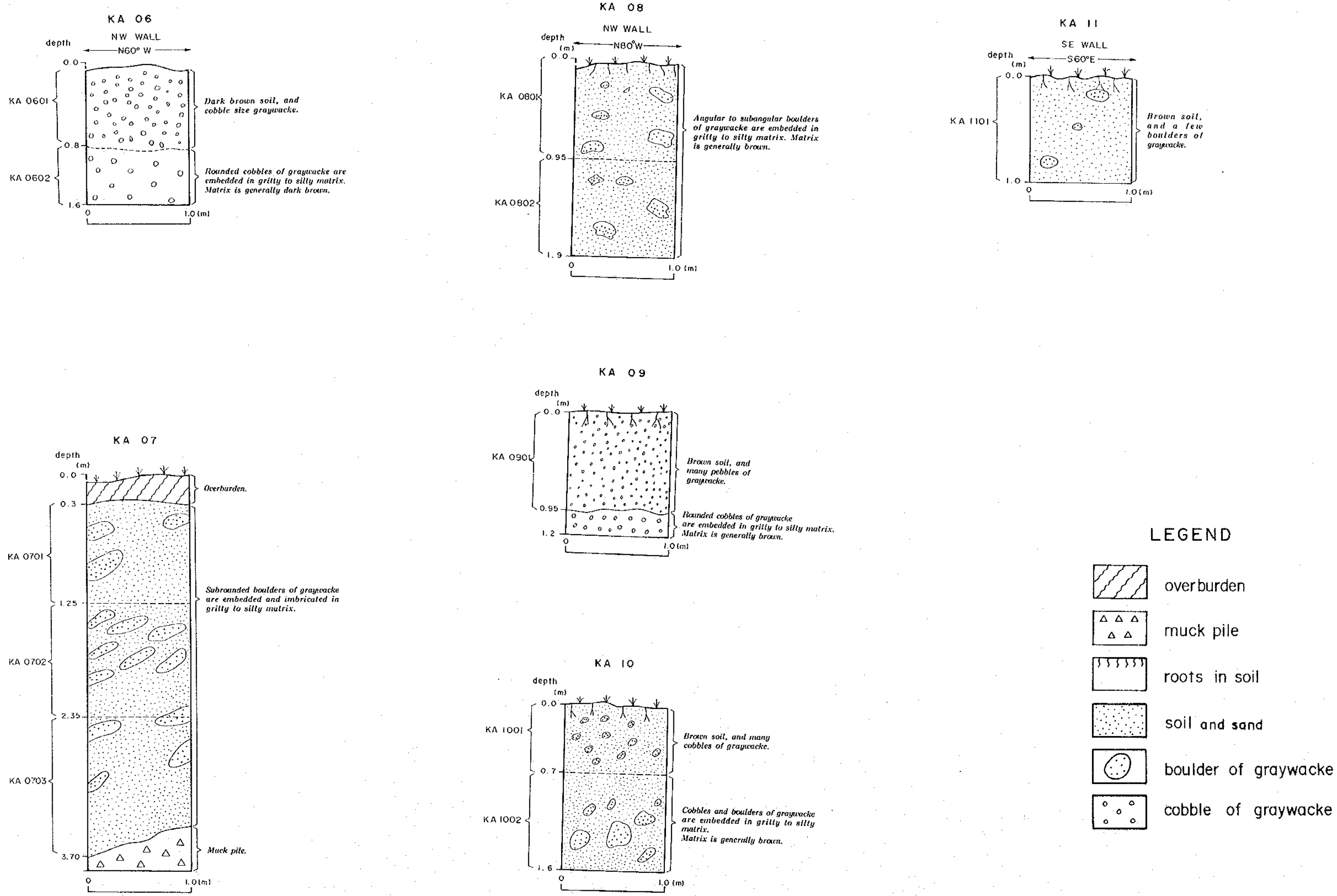


Fig. 20 Section of Pits of Kadlakogod Area (2)

Table 15 Assay Results of the Panned Concentrate (Kadlakogod Area)

Sample No.	Feed	Panning concentrate		Feed	Ag	Cu	Pb	Zn	Gross	
		weight	Au						Au grain	Feed
	Kg	g	g/t	Au g/t	ppm	%	%	%	g	Au g/t
KA 0101	75	26.20	3.85	0.0013	2	0.007	0.004	0.027	-	0.0013
KA 0102	80	30.50	0.19	0.0001	2	0.008	0.004	0.024	-	0.0001
KA 0201	80	40.10	49.39	0.0248	2	0.007	0.003	0.025	-	0.0248
KA 0202	80	32.80	622.07	0.2550	<2	0.007	0.004	0.026	0.3814	5.0225
KA 0301	80	18.30	5.07	0.0012	2	0.008	0.002	0.036	-	0.0012
KA 0401	45	2.00	-	-	2	0.01	0.002	0.023	-	-
KA 0402	45	16.00	0.50	0.0002	<2	0.013	0.006	0.018	-	0.0002
KA 0403	45	9.00	15.55	0.0031	2	0.008	0.001	0.025	-	0.0031
KA 0501	45	9.00	12.94	0.0026	<2	0.009	0.004	0.022	-	0.0026
KA 0502	45	16.60	7.22	0.0027	<2	0.007	0.002	0.017	-	0.0027
KA 0601	45	4.20	<0.90	<0.0001	<2	0.01	0.003	0.018	-	<0.0001
KA 0602	45	3.00	<0.90	<0.0001	<2	0.009	0.002	0.019	-	<0.0001
KA 0701	45	9.50	<0.25	<0.0001	2	0.007	0.005	0.024	-	<0.0001
KA 0702	45	13.80	22.89	0.0070	2	0.007	0.002	0.022	-	0.0070
KA 0703	45	20.00	49.05	0.0218	2	0.009	0.003	0.019	-	0.0218
KA 0801	45	11.10	0.62	0.0002	2	0.008	0.003	0.021	-	0.0002
KA 0802	45	7.80	93.56	0.0162	14	0.009	0.003	0.031	-	0.0162
KA 0901	45	12.20	5.35	0.0015	2	0.007	0.003	0.025	-	0.0015
KA 1001	45	11.80	1.24	0.0003	<2	0.008	0.001	0.023	-	0.0003
KA 1002	45	21.60	23.64	0.0113	2	0.008	0.002	0.031	-	0.0113
KA 1101	45	12.80	20.65	0.0059	2	0.007	0.002	0.021	-	0.0059

As the results of X-ray powder diffraction analysis, medium amount of chlorite and quartz, small amount of calcite and trace amount of sericite were detected in acidic tuff nearby andesite porphyry (AR-100). Large amount of quartz medium amount of pyrite, small amount of chlorite and sericite, trace amount of pyrophyllite were detected in the clay (BR-003).

Under microscope, medium amount of chlorite and calcite, and medium amount of magnetite and small amount of chalcopyrite and pyrite were identified in andesite porphyry (AR-099).

Panning was performed for 21 samples from 12 pits. Most of the pits surveyed were collapsed and no pits were reached to the basement. Accordingly panning feed samples were possibly taken from the upper portion of the sediments.

Gold was observed by the naked eye in 10 concentrates from 7pits. Maximum grain was 7mm by 6mm in dimensions weighing 0.38 gram (KA 0202). This grain was excluded from the chemical analysis of the concentrates. Au contents of the concentrates ranges from 0.50 to 622.07g/t. These values are converted into one ton of feed. As the results, sample KA 0201, KA 0202, KA 0703, KA 0802 and KA 1002 are more them 0.01g/t Au in the feed ore. In addition, when the gold grain of 0.38 gram was added and calculated, the original gold content of the feed of the sample KA 0202 becomes equal to 5.02g/t.

1-4-4 Native Copper

(1) Barinad Area: This area is located in the upper reaches of the Barinad creek (Fig.21). The geology is composed graywacke of Catanduanes Formation and Cretaceous Intrusives. The intrusive rocks are mainly formed of gabbro, but there are not a few parts where porphyritic texture is seen. On a geological map on a scale of 1/10,000 (PL-2) the geology is marked as gabbro collectively. These intrusive rocks are not accompanied by contact thermal metamorphism or alteration to clay. Also no sulfides are seen with the naked eye. Gabbro seen along the main stream of the creek has developed thin veins of quartz and calcite with a width of 0.5 to 1.0cm. In minute fissures in the gabbro and adjacent green graywacke and in thin veins of quartz and calcite, native copper is observed in the from of films and minute veins. Other than native copper and small amount of pyrite, no ore minerals are observed by naked eye.

As the result of a X-ray powder diffraction analysis, a medium amount of feldspar, small amounts of chlorite, pyrophyllite, quartz, epidote and prehnite, and trace amount of montmorillonite were detected from quartz vein (JR-042). From reddish brown coarse-grained graywacke (HR-035) large amounts of quartz and calcite, a medium amount of feldspar, and small amounts of montmorillonite, chlorite, pyrophyllite, and prehnite were detected. Large amounts of quartz and feldspar, small amounts of chlorite, kaolinite, laumontite, calcite and hematite, and trace amount of epidote were detected in gabbro (AR-055).

Ten samples, including gabbro, graywacke and volcanic rocks were observed under microscope. As for altered minerals chlorite, sericite, epidote and calcite were identified. Ore minerals such as native copper, chalcocite, bornite, chalcopyrite, pyrite, magnetite-maghemite and hematite were also identified. The number of samples including following minerals among ten samples are as follows; native copper 4, chalcocite 8, bornite 6, chalcopyrite 1, pyrite 1, magnetite-maghemite 8 and hematite 1.

The grade of the ore from this area is shown in Table 16. No sample shows significant contents of elements except 0.11% of Cu in sample ER-119.

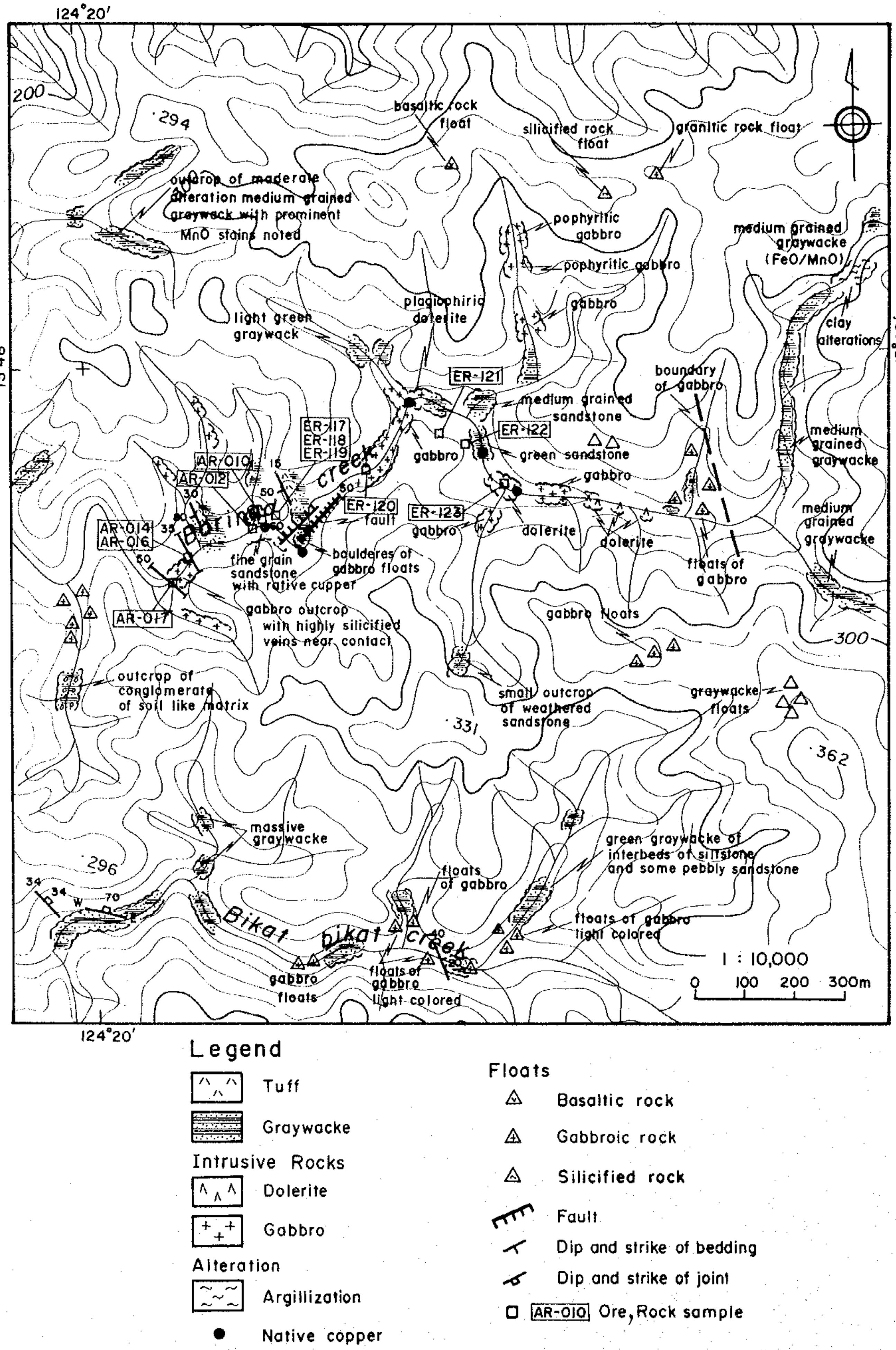


Fig. 21 Route Map of the Barinad Area

Table 16 Assay Results of the Barinad Area

Sample No.	Sample Type	Width (cm)	Au g/t	Ag ppm	Cu %	Pb %	Zn %
AR-010	Qv in sch	2	<0.03	<2	0.019	0.003	0.010
AR-012	milky Qv flt	150max	<0.03	<2	0.007	0.003	0.003
AR-014	Qv flt	3	<0.03	<2	0.001	0.004	0.003
AR-016	Qv & Py,Ch flt	40max	<0.03	<2	0.089	0.001	0.011
AR-017	Qv & Py,Ep	50	<0.03	<2	0.021	0.001	0.008
ER-117	ss & NC	hs	<0.03	<2	0.038	0.003	0.009
ER-118	reddish acid tf	hs	<0.03	<2	0.011	0.004	0.009
ER-119	ss & NC	hs	<0.03	<2	0.111	0.004	0.011
ER-120	diorite	hs	<0.03	<2	0.023	0.004	0.011
ER-121	dolerite	hs	<0.03	<2	0.019	0.004	0.010
ER-122	ss & NC	hs	<0.03	<2	0.051	0.003	0.014
ER-123	diorite & NC	hs	<0.03	<2	0.047	0.004	0.010

[Abbreviations] Qv:quartz vein, sch:schist, flt:float, Ch:chlorite, Ep,epidote, Py:pyrite, NC:native copper, and porp:andesite porphyry, acid tf:acidic tuff, hs:hand specimen

1-4-5 Others

In the following are described the mineral occurrences that do not fit the above mentioned classification.

(1) Kampayas Area: This area is located about 3km southeast of Mabini and is situated in the upper reaches of the Kampayas creek and the Taganopol river (Fig.22). The geology is largely made up of graywacke, sub-ordinarily of green-schist and intrusive rocks.

Intrusives consists of diorite of Batalay Intrusives and dolerite of Cretaceous Intrusives. Graywacke nearly the diorite are subjected to silicification, argillization and pyritization. No primary mineralization is confirmed, but gold contents in stream sediments in the upper reaches of the Kampayas creek and the Taganopol river are very high. Highest is 15,980ppb in the upper reaches of the Taganopol river. The mineralization may have genetical relationship with the diorite.

As the results of X-ray powder diffraction analysis, quartz, calcite, chlorite, sericite, interstratified mineral (chl/mont), montmorillonite were detected in four samples (Appendices-3).

Under microscope, chlorite, sericite are identified and small to trance amounts of chalcocite, bornite, chalcopyrite, covellite and magnetite were identified in the diorite (FR-021, 052).

Table 17 shows the results of one analysis.

All the contents are traceable except silicified vein with 0.12g/t Au (CR-005).

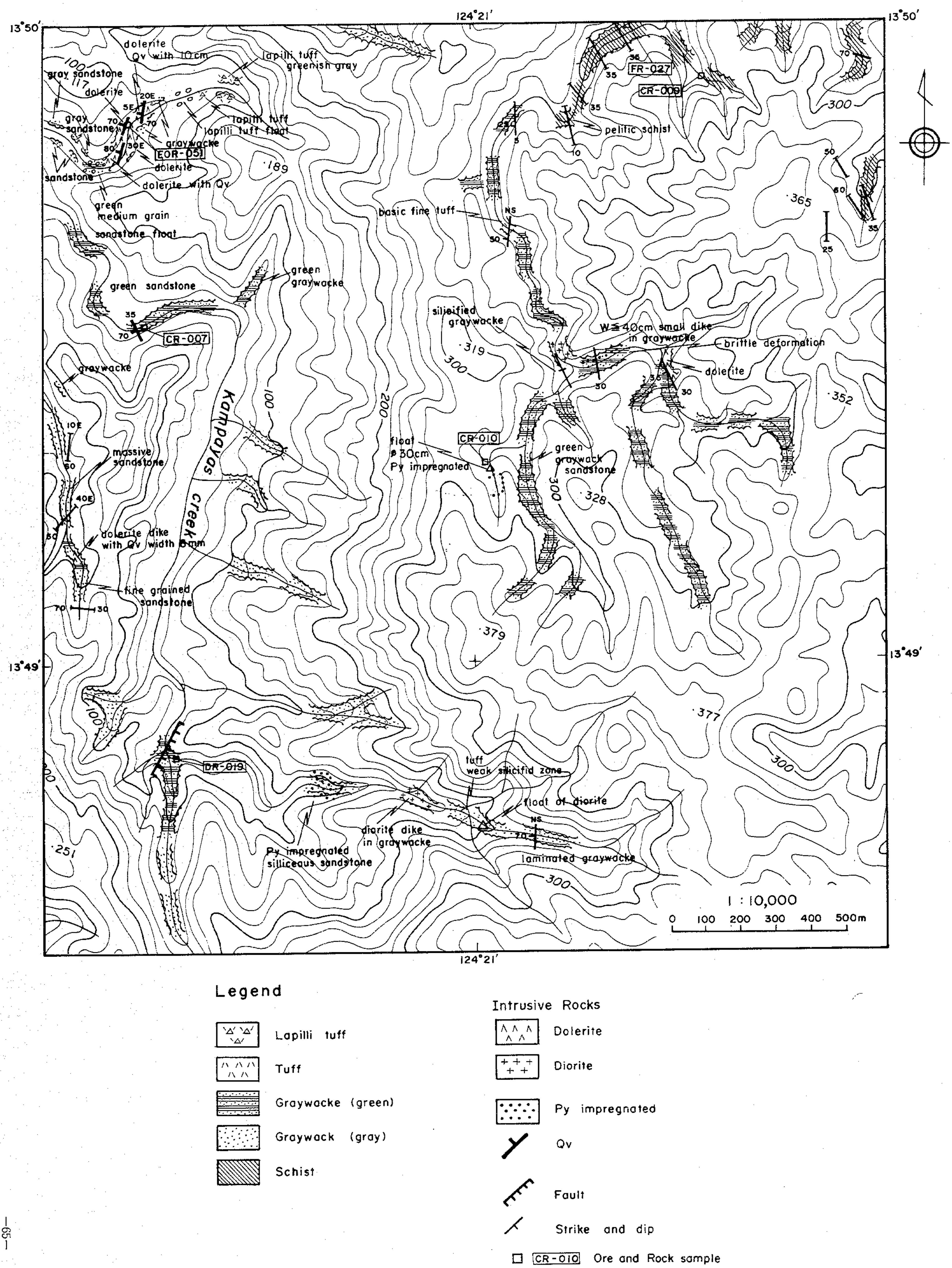


Fig. 22 Route Map of the Kampayas Area

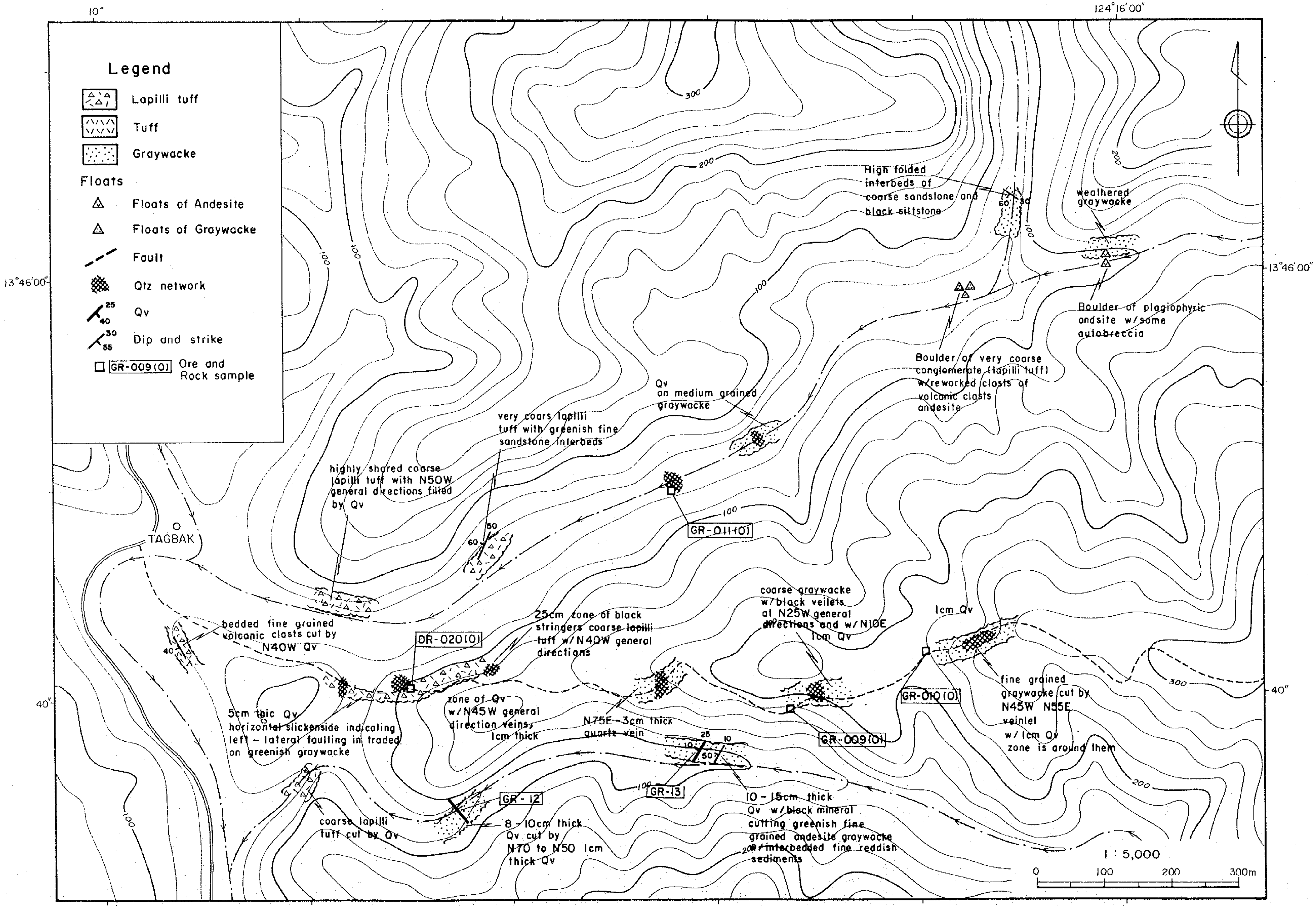


Fig. 23 Route Map of the Tagbak Area

Table 17 Assay Results of the Kampayas Area

Sample No.	Sample Type	Width (cm)	Au g/t	Ag ppm	Cu %	Pb %	Zn %
CR-007	silicified vein	5	0.12	<2	0.001	0.002	0.003
CR-009	Qv	3	<0.03	<2	0.001	0.001	0.002
CR-010	Qv & Py flt	10	0.09	<2	0.019	0.004	0.010
DR-019	Qv in fault	10	<0.03	<2	0.013	0.001	0.009
EOR-051	Qv in dolerite	<3	0.09	<2	0.008	0.004	0.008
FR-027	milky Qv in sch	5	<0.03	<2	<0.001	0.003	0.001

[Abbreviations] sch:schist, Qv:quartz vein, Py:pyrite

(2) **Tagbak Area:** The area is located in the eastern part of Tagbak. Along a mountain path extending to the east from Tagbak, one can see network quartz veins which have turned black because of iron and manganese stains (Fig. 23).

The thin quartz veins have a mean width of about 0.3cm and a maximum width of 2cm, showing in the two directions of Northeast-Southwest and Northwest-Southeast principally. The network veins are found here and there along the mountain path over a distance of about 1km in the East-West direction.

As the results of soil geochemical survey, content of elements including gold and copper were low and mineral potential in not high underneath the network regarding the shallow depth.

Table 18 shows the values of the analysis of minerals of Tagbak Area. All elements are traceable.

Table 18 Assay Results of the Tagbak Area

Sample No.	Sample Type	Width (cm)	Au g/t	Ag ppm	Cu %	Pb %	Zn %
DR-020	Qv in lap tf	10	<0.03	<2	0.002	0.001	0.003
GR-009	Qv in fault	<1	<0.03	<2	<0.001	0.004	0.002
GR-010	Qv in fault	<1	<0.03	2	0.009	0.002	0.007
GR-011	Qv in ss	10max	<0.03	2	0.001	0.002	0.002
GR-012	Qv in ss	<5	<0.03	4	<0.001	0.001	0.001
GR-013	Qv in ss	10	<0.03	2	0.001	0.002	0.002

[Abbreviations] Qv:quartz vein, lap tf:lapilli tuff, ss:sandstone

(3) **Pagsagnahan Area:** This area is located to the east of Pagsagnahan in the southernmost part of the survey area (Fig.24).

Intrusive rocks were found in this area by the First phase survey, and in the present survey the surroundings of the intrusive rocks were explored. The Batalay Intrusives of this area were classified into andesite as a result of chemical analysis. Though silicified zones and clay veins on a small scale are distributed in the surroundings of the rock bodies, the possibility of the existence of a deposit is found low

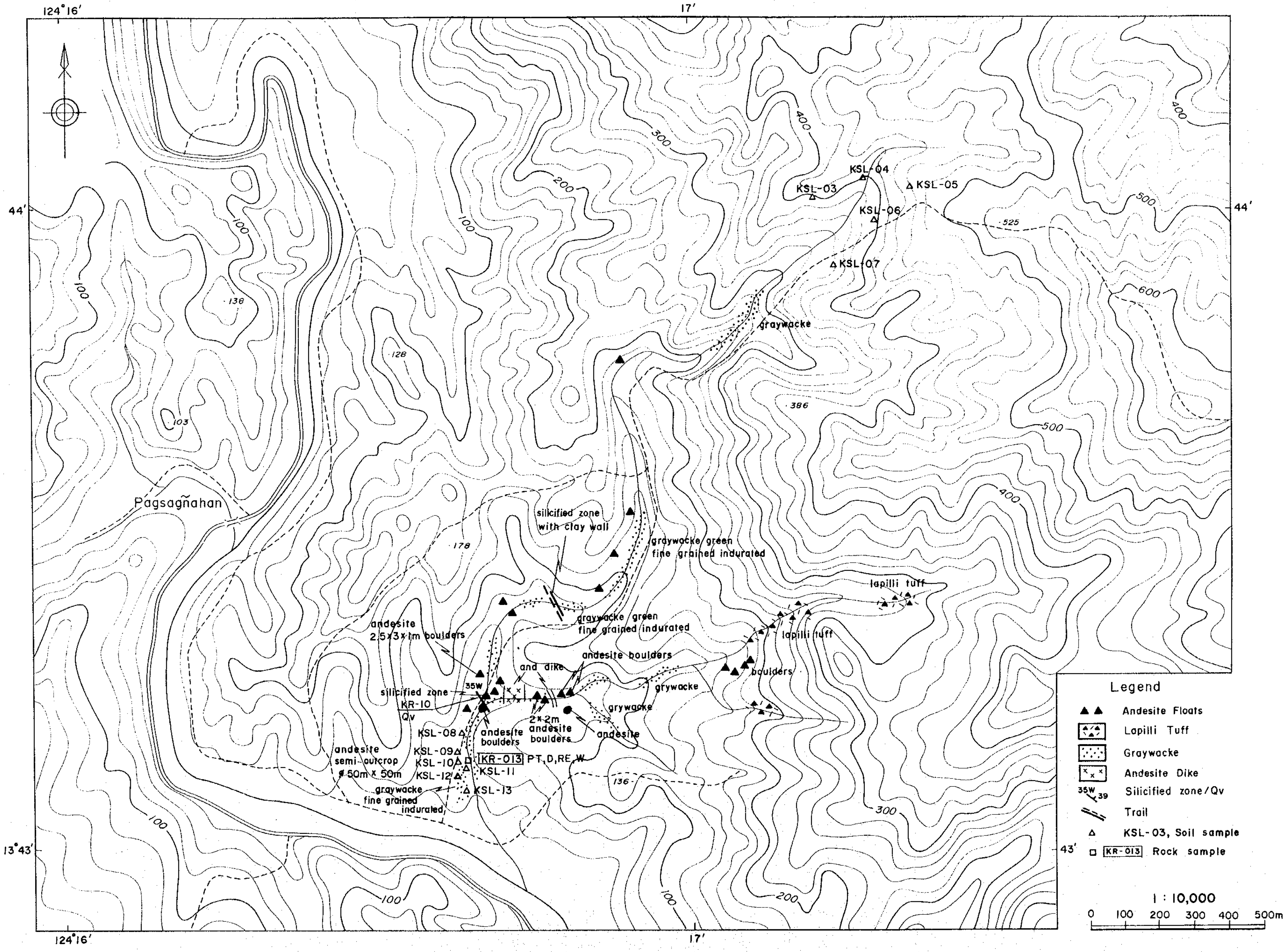


Fig. 24 Route Map of the Pagsagnahan Area

from the result of analyzing the minerals and soil.

Table 19 shows the analytical result of andesite.

Table 19 Assay Results of the Pagsagnahan Area

Sample No.	Sample Type	Width (cm)	Au ppb	Ag ppm	Cu ppm	Pb ppm	Zn ppm
KR-013	andesite dike	hs	5	<0.2	469	2	108

[Abbreviations] hs:hand specimen

1-5 Laboratory Works

1-5-1 Homogenization Temperature of Fluid Inclusion

Homogenization temperatures of 31 samples taken in this year were measured.

In measurement Metror FP5 (temperature control unit) and FP52 (heating stage) were used and the temperature when a gas bubble extinct is measured with accuracy of 0.1 degree Celsius.

The results of homogenization temperature is shown in Table 20 and in Fig.25.

Among the 31 samples, there were 15 samples for which the homogenization temperature measurement was impossible because the grain size of the inclusions were too small, being below 1 μ m. Among the 16 samples for which the measurement was possible, primary inclusion was in seven samples and secondary inclusion was in nine samples. Among the 31 samples those that were able to be judged to be hydrothermal quartz veins were the four samples from Taganopol Mineral Occurrence, AR-063, AR-065, AR-076 and BOR-009. Out of these the samples for which temperature measurement was allowed were only two samples AR-076 (vein width 50cm and Au content 10.33g/t) and sample BOR-009. The measured fluid inclusions were within the grain size of 1 μ m by 2 μ m to 15 μ m by 10 μ m. The homogenization temperature was 111.6 to 300℃; in particular there were many indicating 140 to 200℃ which signifies that the inclusion was formed at a low temperature. The mean values of the whole cases of homogenization temperature was 187.9℃. The samples indicating such a low temperature were of segregation quartz veins.

The samples with which the mean temperature exceeded 200℃ were only samples AR-076 and BOR-009, the mean temperature indicating 237.2℃ and 228.5℃ respectively. These fluid inclusions are of primary inclusion. Sample AR-076 indicated the highest homogenization temperature in this survey.

In samples AR-065 and BOR-009 from Taganopol Mineral Occurrence and sample EOR-007 from Carorongan Mineral Occurrence, much gaseous inclusions with a grain size of 1 to 5 μ m was recognized along minute fissures ; under microscope it is difficult to distinguish the fluid phase, and no change in the

Table 20 Homogenization Temperature of Fluid Inclusions

Sample No.	Tested mineral	width (cm)	Result	Count number	FI type	Avg. (℃)	Homogenization temp.range(℃)
AR-063	Quartz	4	no meas.		fine		
AR-065	Milky Quartz	25	no meas.		fine		
AR-076	Milky Quartz	20	measured	6	1	237.2	230.2～246.5
AOR-009	Quartz	20	measured	19	2	195.6	183.1～209.5
BOR-008	Quartz	10	measured	6	1	186.9	184.5～188.9
BOR-009	Quartz	60	measured	16	1	228.5	141.6～ >300
BOR-010	Milky Quartz	50	no meas.		fine		
CR-032	Quartz	5	measured	7	1	165.7	156.0～204.0
CR-033	Milky Quartz	5	measured	6	2	161.9	142.7～177.5
DR-004	Quartz	7	no meas.		fine		
DR-005	Quartz	10	measured	6	2	165.0	147.0～183.7
ER-036	Milky Quartz	15	no meas.		fine		
ER-144	Milky Quartz	3	measured	5	2	140.1	139.7～140.7
ER-155	Milky Quartz	0.5	no meas.		fine		
ER-164	Milky Quartz	70	no meas.		fine		
EOR-007	Milky Quartz	6	measured	18	1	196.6	138.7～220.3
EOR-013	Quartz	12	no meas.		fine		
EOR-014	Quartz	20	measured	18	1	186.7	179.0～204.8
EOR-016	Quartz	2	no meas.		fine		
EOR-025	Quartz	8	measured	8	2	151.2	141.1～166.5
EOR-028	Quartz	6	measured	11	2	173.2	147.4～188.4
EOR-032	Quartz	6	measured	4	2	157.9	132.5～215.7
EOR-036	Quartz	2	no meas.		fine		
EOR-039	Quartz	2	measured	13	1	150.9	111.6～201.2
EOR-042	Quartz	8	no meas.		fine		
EOR-058	Milky Quartz	15	no meas.		fine		
EOR-074	Milky Quartz	2	no meas.		fine		
EOR-081	Quartz	15	measured	16	2	168.5	146.8～207.6
FR-003	Quartz	hs	no meas.		fine		
FR-027	Quartz	5	measured	15	2	153.0	117.3～190.5
FR-038	Milky Quartz	15	no meas.		fine		

[Abbreviations] hs:hand specimen
[Inclusion type] 1:primary inclusion 2:secondary inclusion

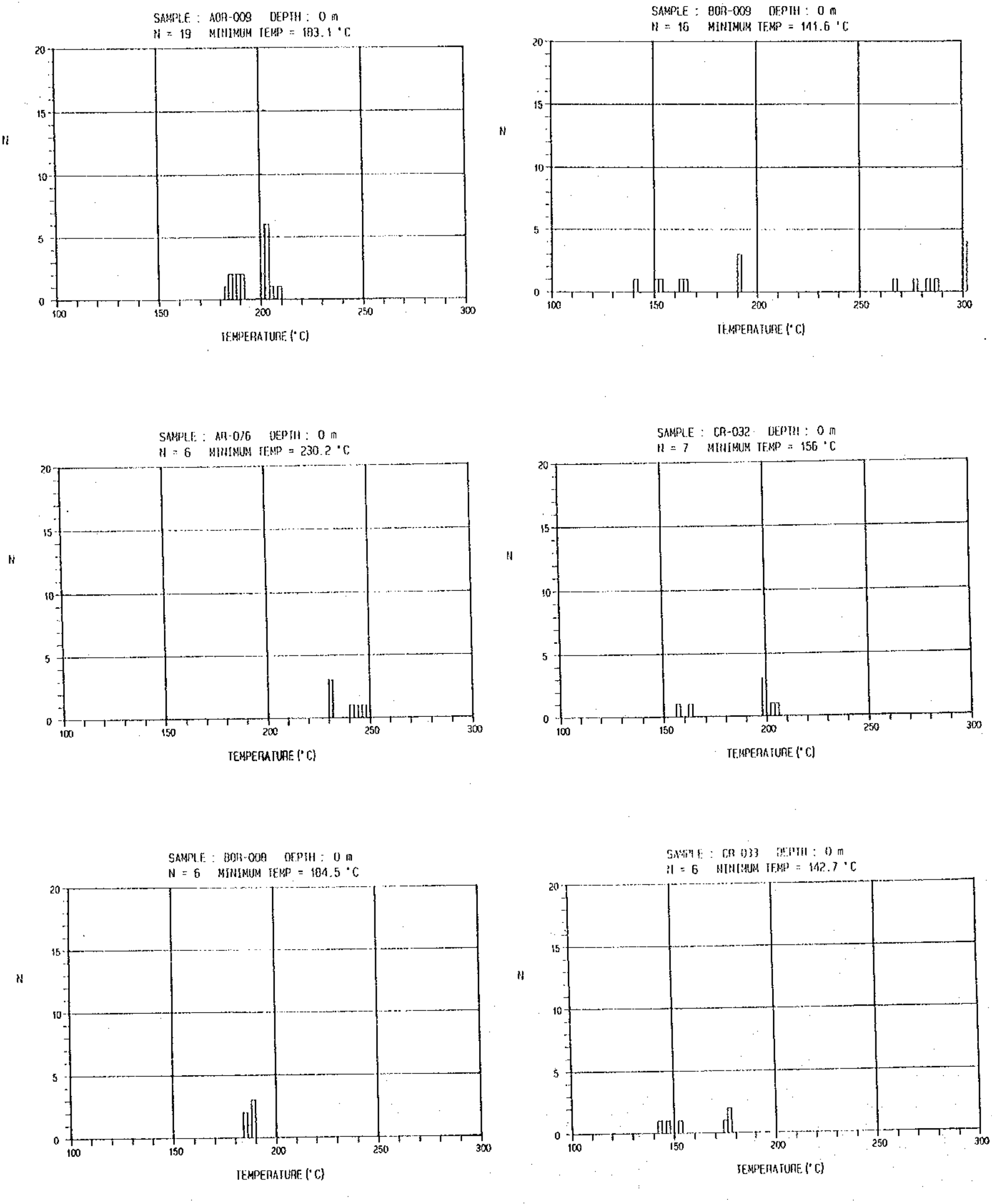


Fig. 25 Frequency Distribution of Homogenization Temperature (1)

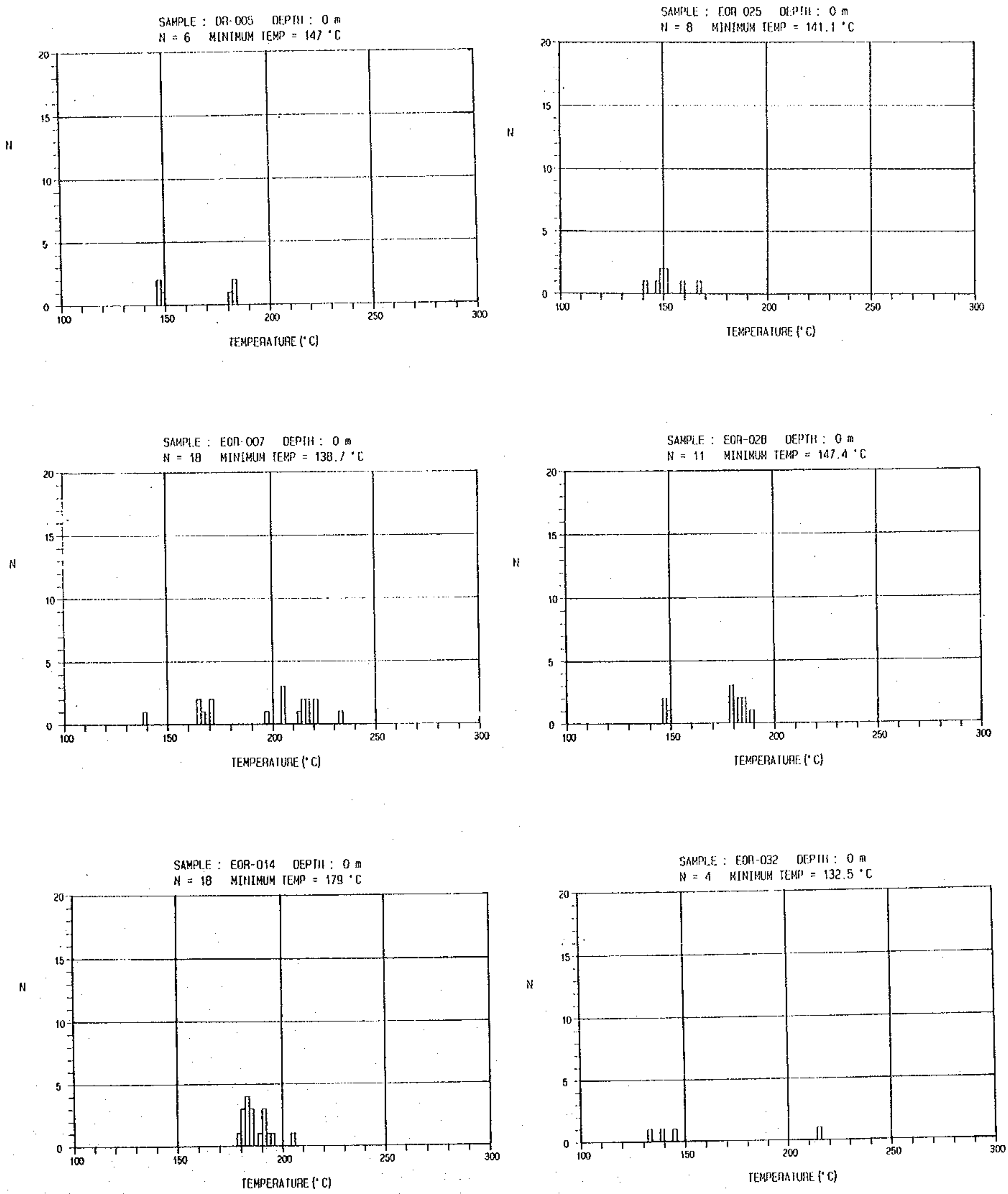


Fig. 25 Frequency Distribution of Homogenization Temperature (2)

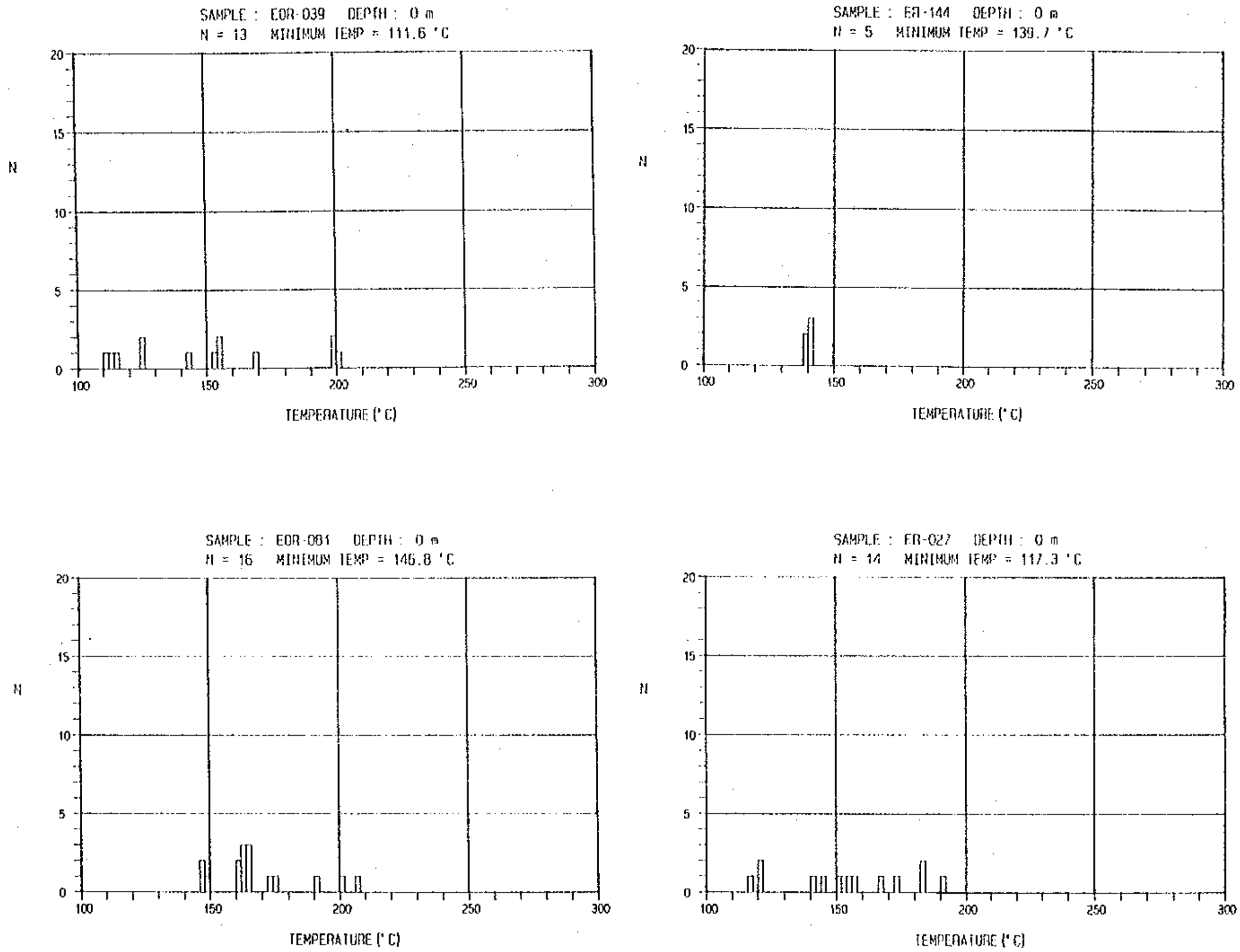


Fig. 25 Frequency Distribution of Homogenization Temperature (3)

Table 21 Resistivity and Polarization of Rock Samples

Sample No.	Description	Rock Type	Alter -ation	Resistivity (Ωm)	Polarization (%)
AR-074	alt. ss.(hydrothermally alt.)	3	B	1973.1	2.2
AR-076	Qv(with Py)	5	C	28050.0	1.1
AR-099	andesite porphyry(with Py)	1	B	1805.2	1.5
CR-016	dolerite(with secondary Bi)	2	B	2189.7	1.2
CR-033	sil. ss.(with Ep)	5	B	3754.9	0.9
DR-009	green schist(Py impregnation)	4	B	2000.8	1.4
DR-010	sil. f.g.ss.	3	B	5040.0	1.0
DR-012	basic ss.	3	B	3192.0	1.0
DR-014	dolerite	2	B	2199.1	1.2
DR-017	dolerite	2	B	2055.9	0.5
DR-018	dolerite(with clay vein)	2	B	2487.3	1.1
ER-022	dolerite(with Qv)	2	B	2931.4	0.6
ER-097	basaltic andesite(chloritized)	1	B	17691.6	1.3
ER-117	m.g.ss.(with native copper)	3	B	20580.0	2.0
ER-119	basic ss.(with native copper)	3	B	6318.0	1.2
ER-142	dolerite	2	A	17865.5	1.0
ER-151	sil.f.g.ss.	3	B	19584.3	0.9
ER-155	sil.ss.(with Qv)	3	B	5185.9	1.0
ER-171	basic ss.	3	B	7359.6	1.0
FR-002	silty ss.	3	B	3958.6	1.0
FR-053	m.g.ss.	3	A	3324.2	1.4
FR-061	sil.ss.	5	B	2400.0	0.7
FR-064	basalt	2	A	3092.6	1.6
FR-066	sil.ss.	3	B	1881.2	0.6
FR-074	alt.m.g.ss.	3	B	6915.9	1.0
GR-013	Qv(in ss.;W=10cm)	5	D	33464.5	1.2
GR-015	Qv(in ss.;W=3~5cm)	5	D	2327.4	1.4
GR-016	dolerite	2	B	9048.5	1.8
HR-021	lapilli tuff	3	B	6370.0	2.0
HR-029	gabbro(with Qv)	2	B	1867.8	1.9
HR-031	dolerite	2	B	11298.8	1.4

[Rock type] 1:andesite, 2:dolerite, 3:sandstone, 4:schist, 5:quartz vein·silicified rock
[Abbrebiations] alt:alteration, ss.:sandstone, Qv:quartz vein, Py:pyrite, Bi:biotite,
Ep:epidote, sil:siliceous, f.g.:fine grained, m.g.:medium grained

phase can be seen even when the temperature is raised. Such inclusions might be formed in boiling condition.

The result of measuring sample EOR-081 of secondary inclusion was 146.8 to 207.6℃. The lowering of temperature from 207.6℃ to 146.8℃ means that the single-phase hydrothermal pressure lowered from 18.5 atmospheric pressure to 4.4 atmospheric pressure by 14.1 pressure.

1-5-2 Measurement of Resistivity and Polarization

The measurement of resistivity and polarization was made on the 31 rock samples. The measurement was made after the samples had been prepared into rectangular parallelepipeds with the sides of 5×5×10cm as a rule with a diamond cutter and immersed in distilled water for a week.

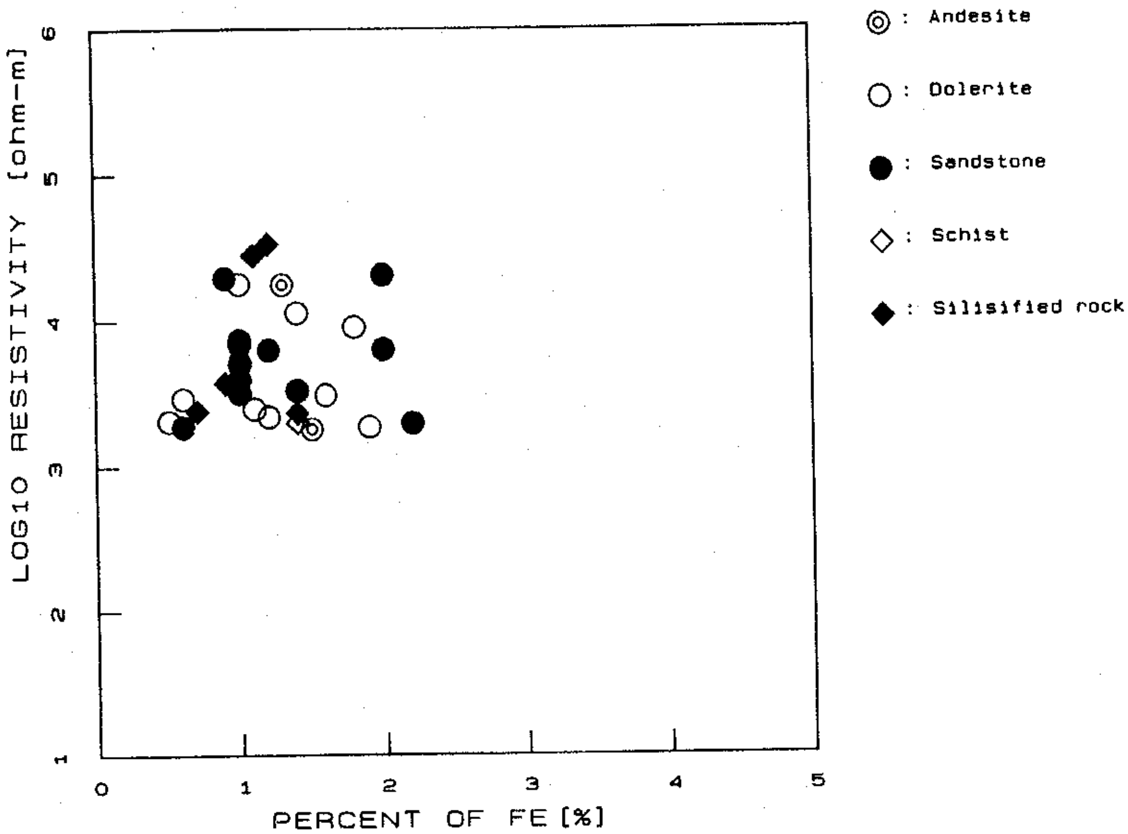
In the measurement IP and resistivity core tester CT-1 manufactured by Phoenix Geophysics Limited was used. In the polarization measurement the frequency of 0.3Hz and 5Hz was employed in view of the special property of the measuring instrument. Table 21 shows the results of measurement. The resistivity values were 1,805 to 33,465 Ω·m (7,684 Ω·m on an average), while the values of polarization were between 0.5 and 2.2% (1.2% on an average).

The degree of the rock alteration was classified by the naked eye as follows; **A:** Turning into clay is seen to some extent in the mafic mineral, but the rock texture remains clearly. **B:** The feldspar is cloudy and the rock has weakly discolored and the texture is obscure more or less. **C:** The color of the rock has changed white and the rock texture has nearly disappeared. **D:** Clay, quartz veins, ore mineral.

The samples were classified according to the rock type and extent of alteration, and these classified samples and their data were plotted in the diagram of resistivity and polarization (Fig.26).

Though the andesite has a little higher polarization than the basalt, no difference in resistivity is seen. Graywacke of Catanduanes Formation indicates slightly higher polarization than the basalt, but has similar physical properties. The green-schist of Catanduanes Formation belongs in a category of low resistivity. The resistivity of the silicified rock are dispersed, but it shows nearly constant polarization.

There is no big difference in resistivity between fresh rock and weakly altered rock, while the latter has some latitude in polarization values. The weakly altered rock tends to indicate higher polarization when the resistivity is low. The quartz veins have been subjected to strong mineralization accompanied with pyrite and they show the highest resistivity and low polarization.



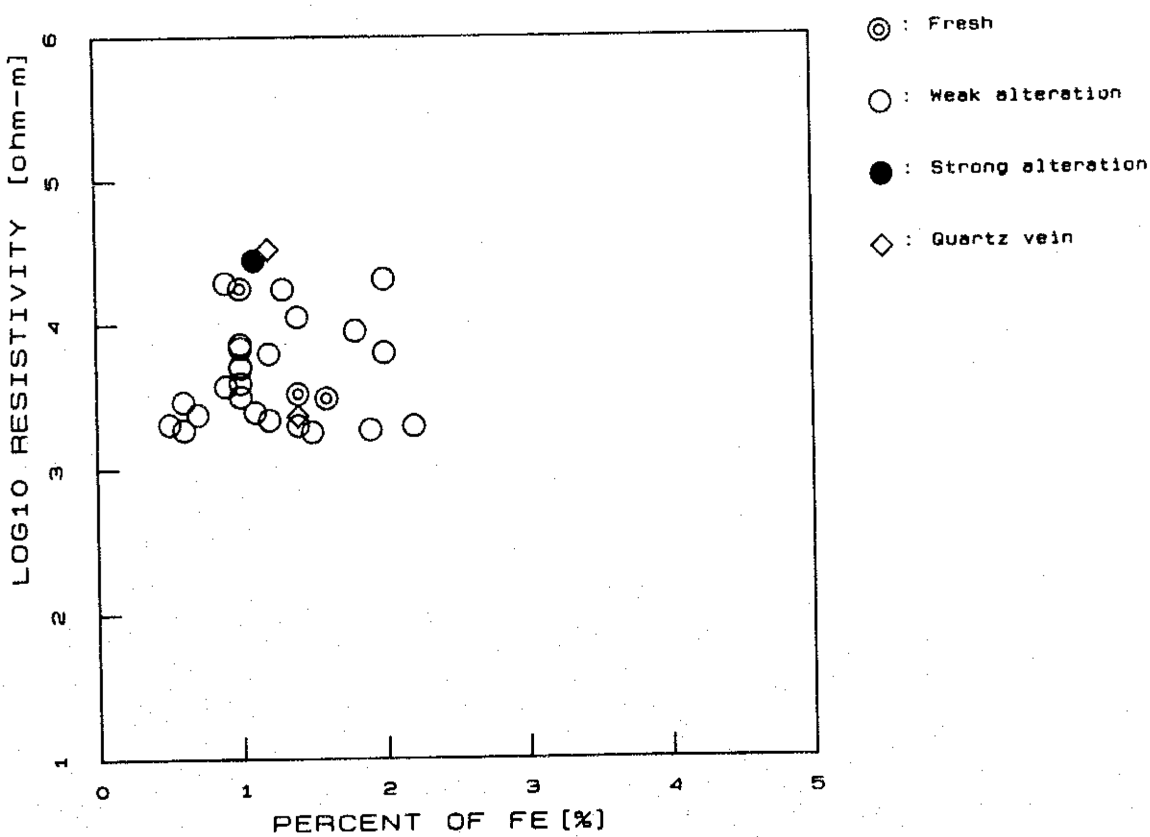


Fig. 26 Plot Relationship of Resistivity and Polarization

Chapter 2 Geochemical Survey

2-1 Sampling, Pathfinder and Analysis of Geochemical Data

After the detailed geological survey, the target area was isolated and stream sediments and soil geochemical surveys were carried out. Stream sediments survey was performed on the whole area except the northwestern portion of the survey area. Grid soil sampling was conducted in the two areas and one area along a ridge with semi-grid soil sampling on a small portion. Random sampling was also executed in one area. Location of sampling points are shown in PL-1.

Pathfinder, method of geochemical analysis and analysis of geochemical data is common for stream sediments and soil geochemical surveys.

2-1-1 Sampling

(1) Stream Sediments Geochemical Survey: Sampling was conducted at about 200m intervals along the river and its tributaries. Samples were taken at the center of streams and were sieved to a -80 mesh fraction taking about 100g sample. A total of 832 stream sediments samples were taken. Samples were air-dried and splitted into two parts, one for Philippine side and the other one for the Japanese side which were analyzed.

(2) Soil Geochemical Survey: Sampling was undertaken at Carorongan Mineral Occurrence and Taganopol Mineral Occurrence in grid pattern in a extent of 300m by 250m and 300m by 240m respectively.

Baseline was established following the strike of the vein and sampling lines had an interval of 30m to 40m with each other, perpendicular to the baseline.

Sampling pattern of 30m to 40m along baseline and 5-10m intervals along picket lines were applied to both mineral occurrences at Carorongan and Taganopol areas.

A 1,200m strike length was established in the Tagbak Area wherein sampling was conducted for every 30m interval. Two areas isolated were sampled in semi-grid pattern following a 5m by 20m style. In the Barinad Area, random sampling was executed.

Samples were taken at the B-horizon of soil, 30cm below the surface as a rule. In each point a 1kg sample was taken. Total number of soil samples were 921. After air-drying, samples were sieved. About 100g of -80 mesh fraction was taken for each sample and they were split in two parts; one side for Philippine and the other one for Japanese side which were analyzed.

Sampling method was undertaken by the use of compass and tape. Base maps of 1:50,000 were utilized in carrying out the survey.

2-1-2 Pathfinder and Method of Chemical Analysis

Au and Cu were expected to occur in this area. So following 11 elements were selected as pathfinder elements; Au, Ag, Cu, As, Fe, Hg, Mo, Pb, S, Sb, Zn.

Neutron activation analysis has been applied for analysis of Au. Induction furnace method has been applied for analysis of S. For other nine elements ICP-AES method has been applied.

The lower detection limit for the elements are as follows; Au 1ppb, Ag 0.2ppm, As, Pb, Sb, Zn 2ppm, Cu, Hg, Mo 1ppm, Fe, S 0.001%.

2-1-3 Analysis of Geochemical Data

We applied monovariant and multivariate analysis (PCA). In the case of stream sediments 51 samples from last year's survey were utilized in addition to this present survey of 882 totaling to 933 samples.

(1) Statistical Processing: Analytical values were converted into natural logarithms. Half of the value of the lower limit has been used for convergence of statistical processing. In basic statistical values of each element, natural value is expressed in maximum and minimum value. The mean is expressed in natural value and logarithmic values, standard deviation is expressed in logarithmic values. Value of Mo is very low and most values are below the detection limit of analysis. So this element was excluded from the data analysis.

(2) Classification of Geochemical Anomaly Values in Monovariant Analysis: In determining the threshold values many methods were proposed; a way using natural turning point in frequency distribution curves, a way using cumulative frequency curves, a way using mean and standard deviation, or a way based on percentile (Lepeltier, 1969; Sinclair, 1976; Govett et al.,1983).

In this survey, mean and standard deviation together with frequency and cumulative frequency curve have been used to establish the threshold value.

2-2 Stream Sediments Geochemical Survey

2-2-1 Monovariant Analysis

Sampling point is shown in PL-1. Basic statistical value is shown in Table 22, correlation coefficients is in Table 23, classification of geochemical anomalies is in Table 24, scatter diagram is in Fig.27, frequency distribution and cumulative frequency distribution is in Fig.28.

Maximum and mean value are; Au 15,980ppb and 289ppb, Cu 776ppm and 131ppm, Pb 26ppm and 5ppm, and Zn 218ppm and 99ppm respectively. Compared with Clarke number, Au is conspicuous in relation with other elements. Maximum values of Au 15,980ppb and 10,610ppb were excluded and 10,000ppb was adapted in Table 22, below.

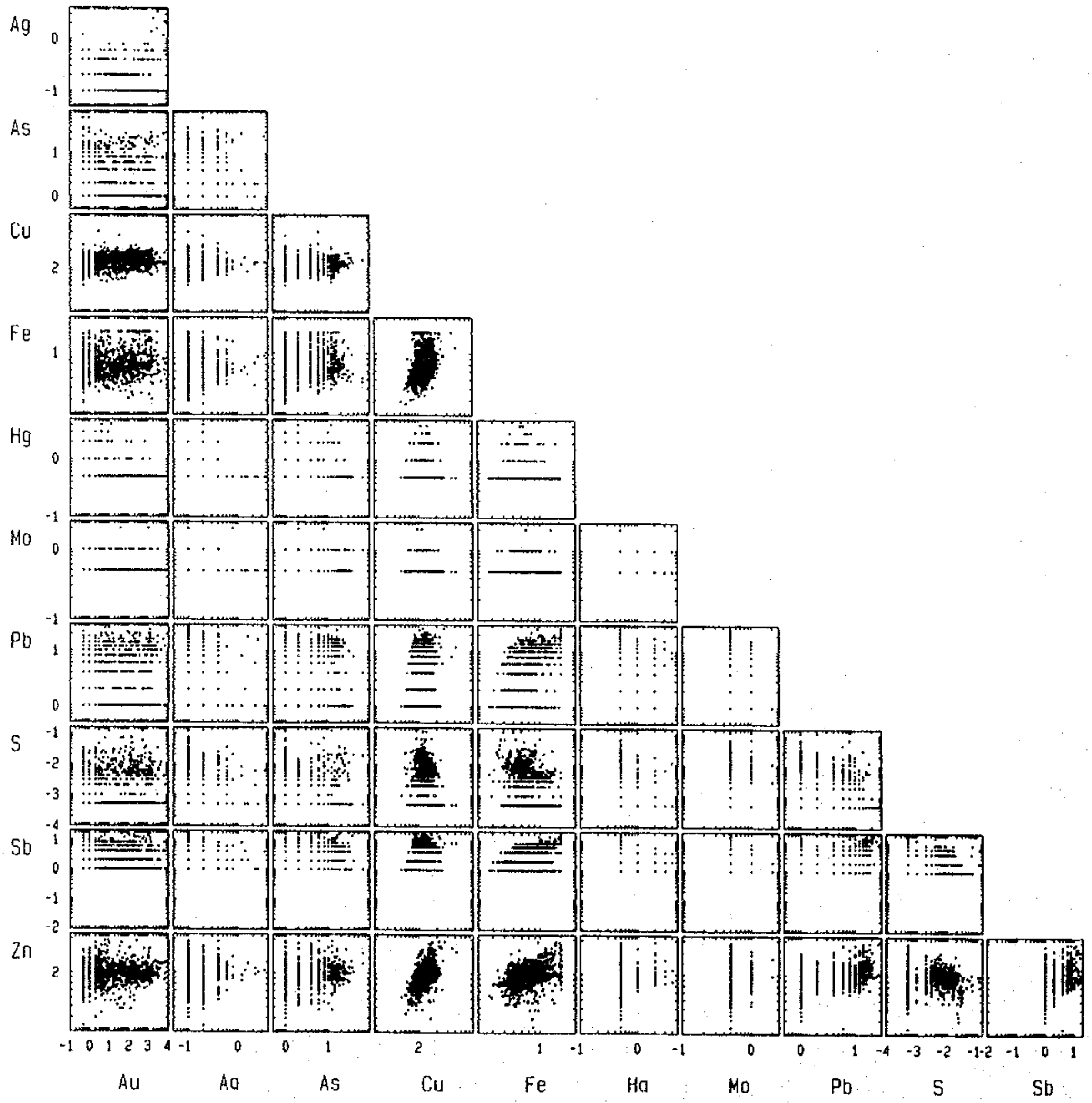


Fig. 27 Scatter Diagram (Stream Sediments)

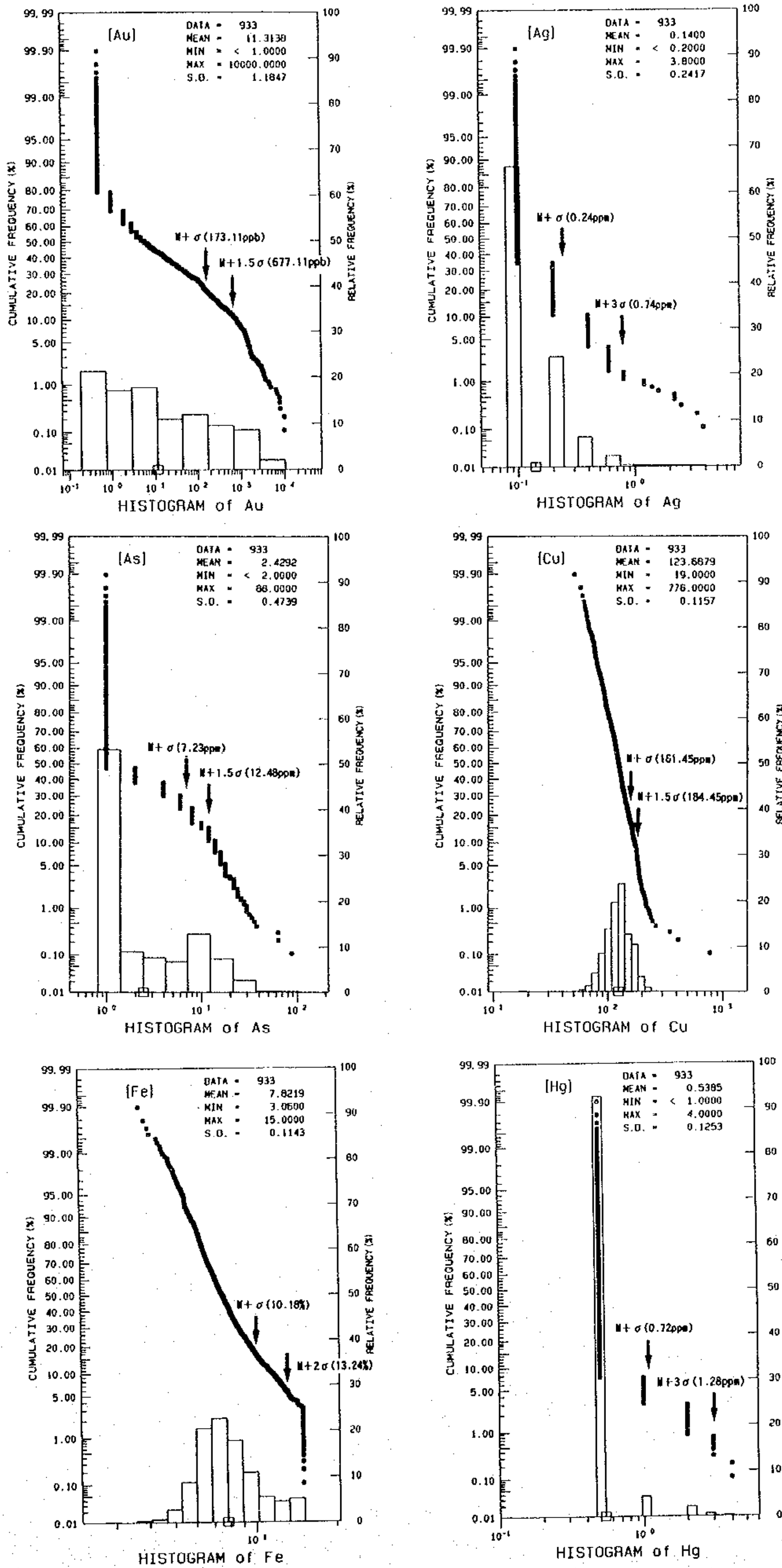


Fig. 28 Frequency Distribution and Cumulative Frequency Distribution (Stream Sediments) (1)

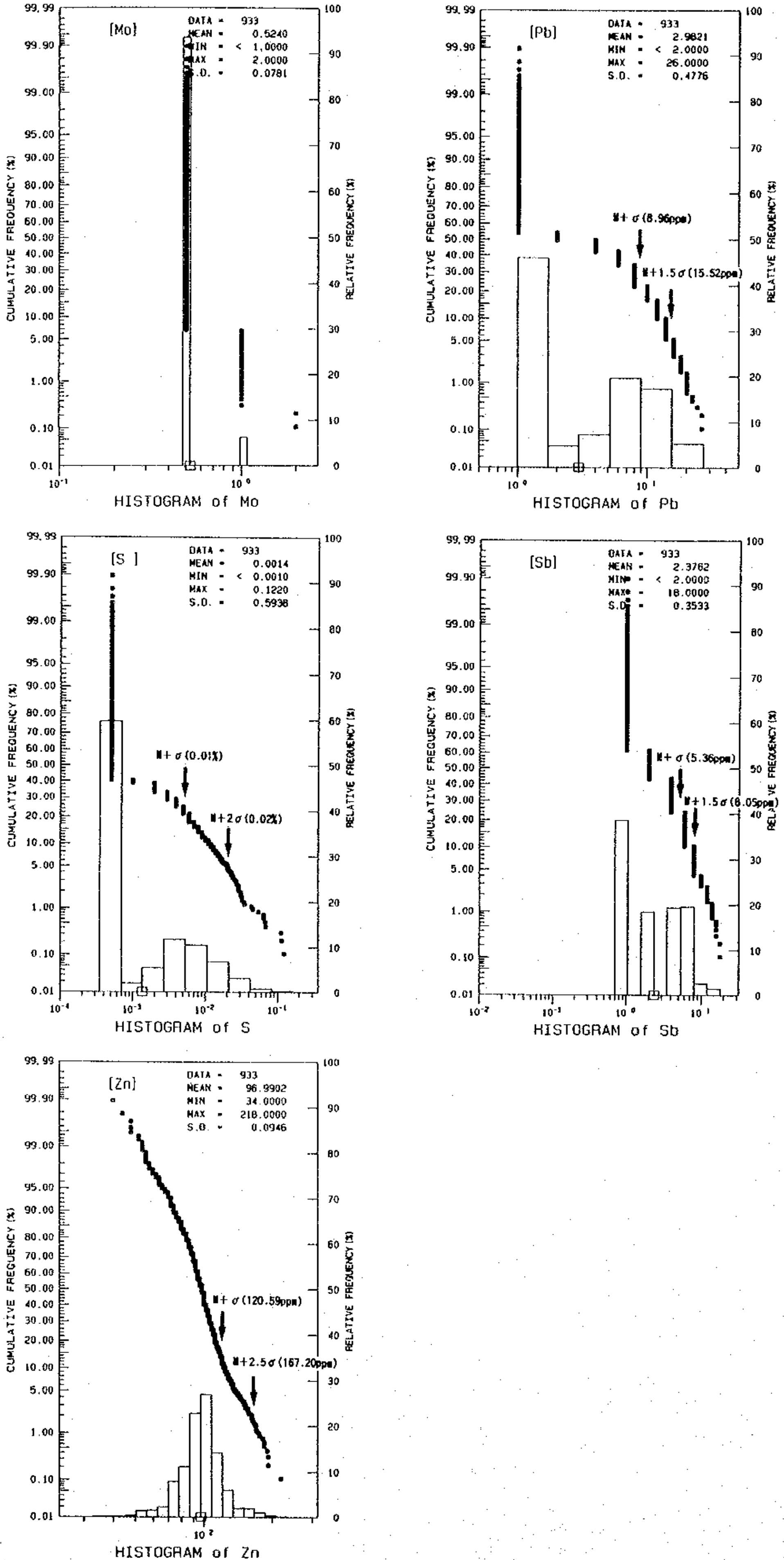


Fig. 28 Frequency Distribution and Cumulative Frequency Distribution (Stream Sediments) (2)

Table 22

Elemant	Unit	Maximum	Minimum	Average	Avg.-log	Std.Dev.
Au	ppb	10000	<1	288.65	1.0536	1.1847
Ag	ppm	3.8	<0.2	0.18	-0.8539	0.2417
As	ppm	88	<0.2	4.33	0.3855	0.4739
Cu	ppm	776	19	130.72	2.0923	0.1157
Fe	%	15	3.06	8.08	0.8933	0.1143
Hg	ppm	4	<1	0.58	-0.2688	0.1253
Mo	ppm	2	<1	0.53	-0.2807	0.0781
Pb	ppm	26	<2	5.04	0.4745	0.4776
S	%	1.22	<0.001	0.0044	-2.8539	0.5938
Sb	ppm	18	<2	3.34	0.3759	0.3533
Zn	ppm	218	34	99.4	1.9867	0.0946

Table 23

Au	1.000									
Ag	0.038	1.000								
As	-0.107	0.168	1.000							
Cu	0.250	-0.103	-0.085	1.000						
Fe	0.206	-0.119	0.096	0.327	1.000					
Hg	-0.125	0.123	0.035	0.023	-0.076	1.000				
Pb	0.046	-0.025	0.208	0.091	0.357	0.185	1.000			
S	0.146	-0.027	-0.105	-0.028	-0.169	-0.022	-0.281	1.000		
Sb	0.015	-0.205	0.163	0.197	0.401	-0.053	0.280	-0.274	1.000	
Zn	0.127	0.034	0.159	0.565	0.433	0.076	0.316	-0.124	0.344	1.000
	Au	Ag	As	Cu	Fe	Hg	Pb	S	Sb	Zn

Table 24

Au	M+ σ(173.11ppb)	M+1.5 σ(677.11ppb)
Ag	M+ σ(0.24ppm)	M+3 σ(0.74ppm)
As	M+ σ(7.23ppm)	M+1.5 σ(12.48ppm)
Cu	M+ σ(161.45ppm)	M+1.5 σ(184.45ppm)
Fe	M+ σ(10.18%)	M+2 σ(13.24%)
Hg	M+ σ(0.72ppm)	M+3 σ(1.28ppm)
Pb	M+ σ(8.96ppm)	M+1.5 σ(15.52ppm)
S	M+ σ(0.01%)	M+2 σ(0.02%)
Sb	M+ σ(5.36ppm)	M+1.5 σ(8.05ppm)
Zn	M+ σ(120.59ppm)	M+2.5 σ(167.20ppm)

(1) Distribution of Geochemical Anomalies: Fig.29 shows distribution of geochemical anomalies.

(Au) High anomalies are located at northeastern part; the Taganopol river, its tributaries the Carorongan creek, the Tinaga creek, the Kampayas creek, central part; the Bikat-bikat creek, the Tabyonan creek and its tributaries the Pinugbyby and the Pinadaysan. Southern part; the Kapipihan river and its tributaries, the Kadlakogod creek. Moreover small anomaly zones are located in the upper reaches of the Kaipa creek and the Maytung creek which are intersected by fracture zones oriented in an East-West direction. In the Barinad

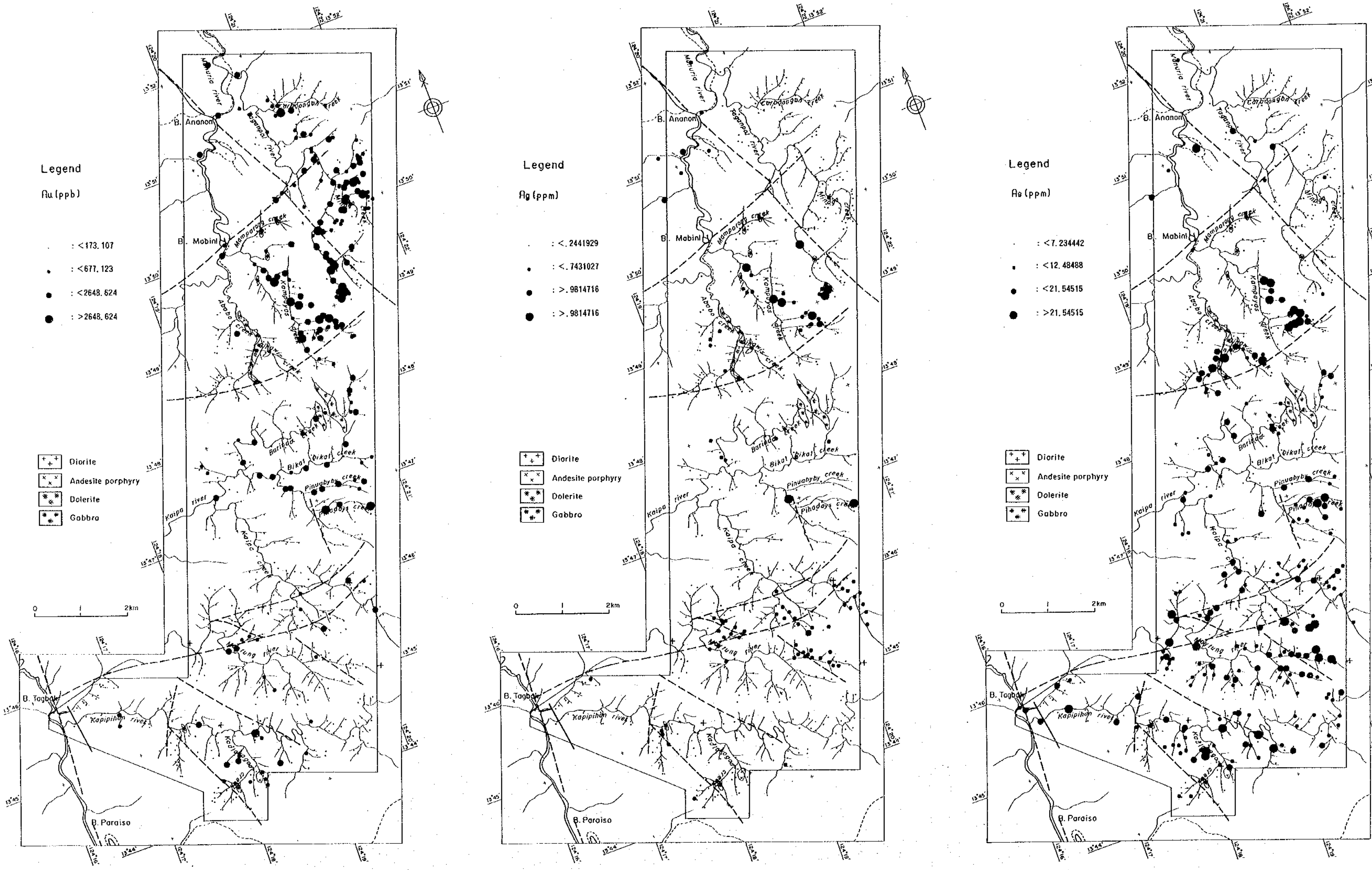


Fig. 29 Distribution of Geochemical Anomalies (Stream Sediments) (1)

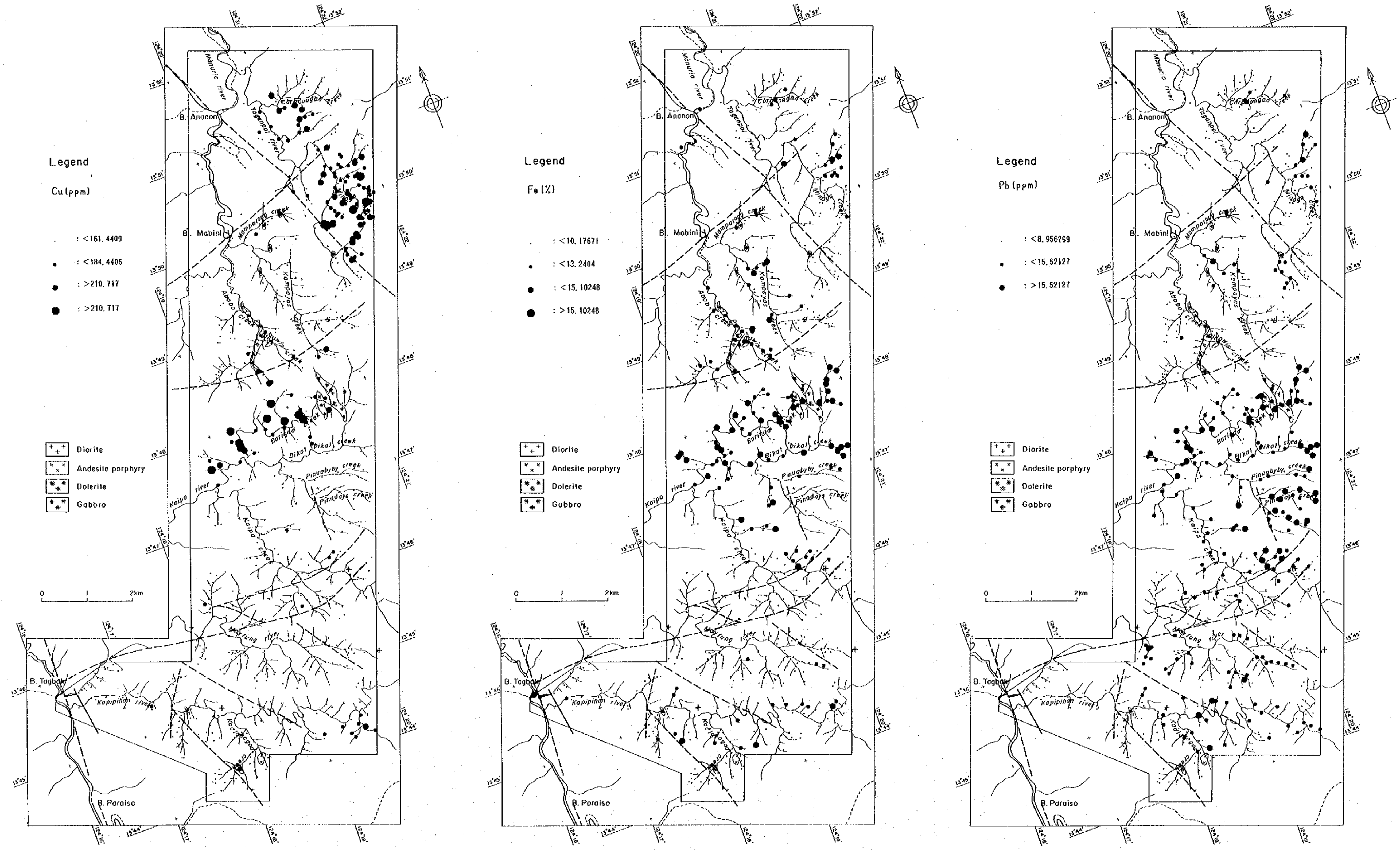


Fig. 29 Distribution of Geochemical Anomalies (Stream Sediments) (2)

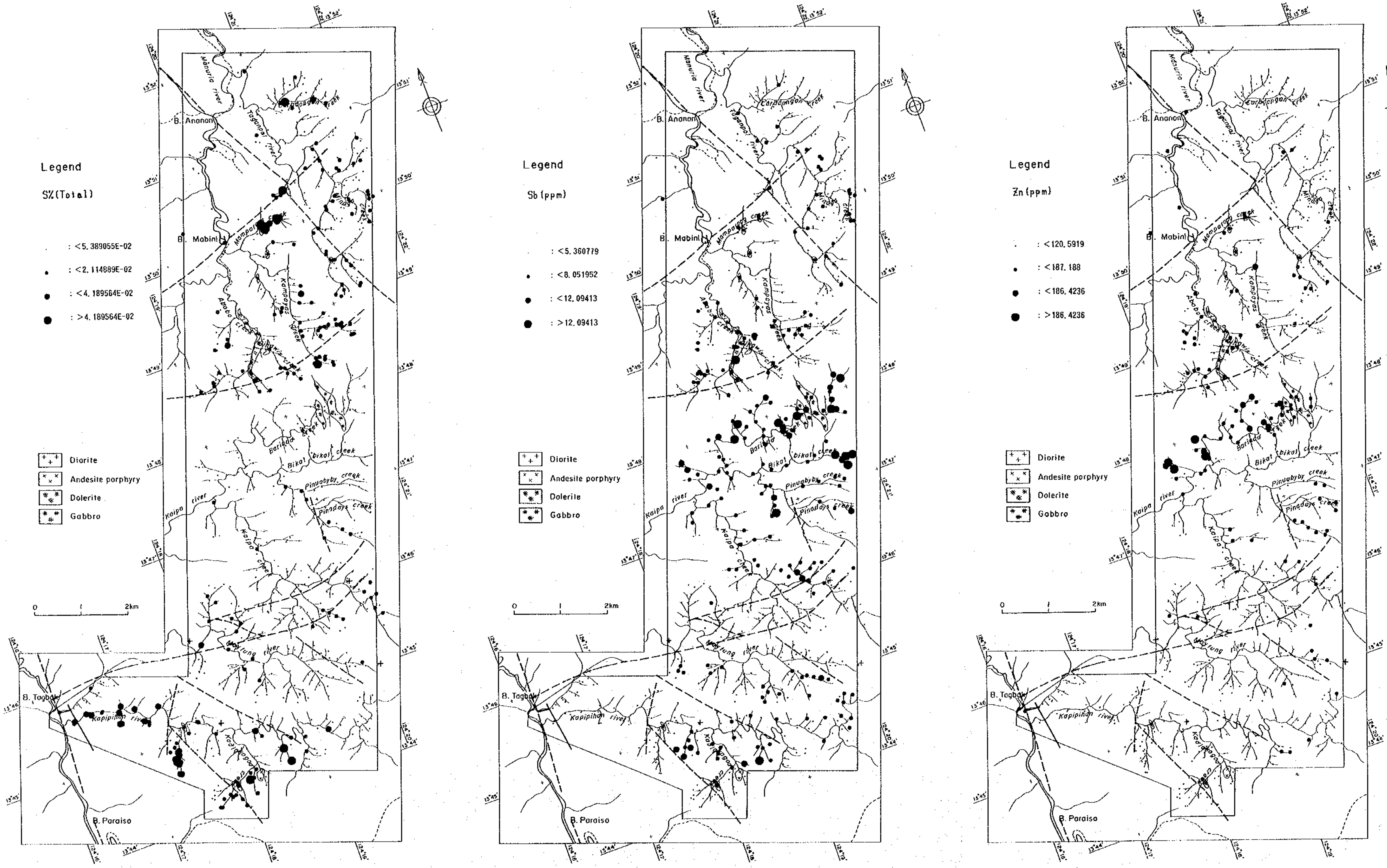


Fig. 29 Distribution of Geochemical Anomalies (Stream Sediments) (3)

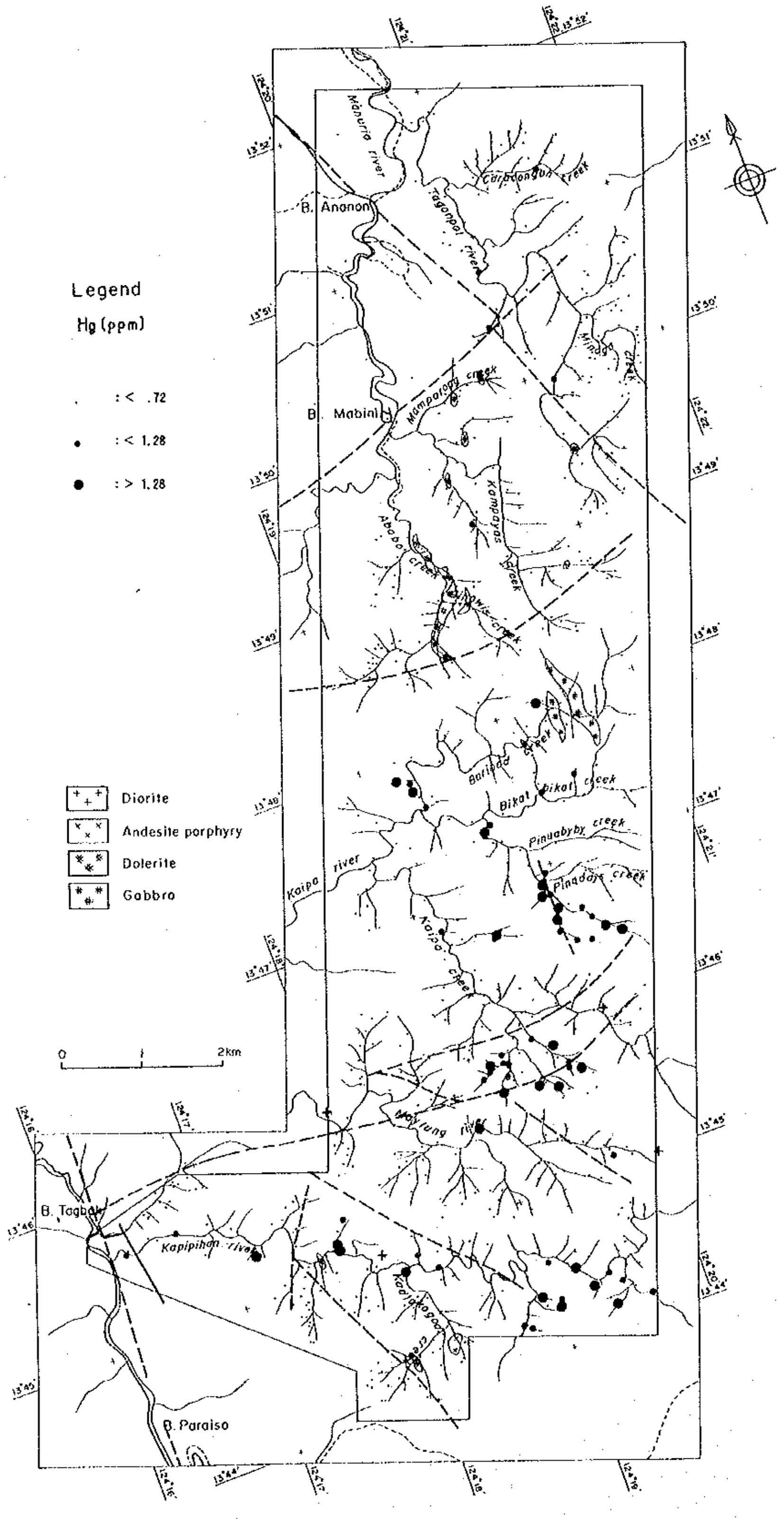


Fig. 29 Distribution of Geochemical Anomalies (Stream Sediments) (4)

creek small anomaly zones were found scattered.

(Ag) Anomaly zones are distributed in the upper reaches of the Taganopol river and the Kampayas creek. Small anomaly zones were likewise identified at the Tabyonan creek, the Kaipa creek, the Maytung creek which are located near intersection of faults.

(As) High anomaly zones are distributed at northeastern section of the Kampayas creek and upper reaches of the Abobo creek, and the Gihawis creek. Small concentrations of As are also widely distributed in the southern part of the survey area.

(Cu) High anomaly zones are concentrated at the Taganopol river area and along the Barinad creek. High concentration of Cu anomalies in the Taganopol river are localized in green-schist unit of Catanduanes Formation.

(Fe) Anomaly zones are distributed at the Barinad creek, the Bikat-bikat creek. In addition, small anomaly zones were also identified at Taganopol and Carorongan Mineral Occurrences, the Kampayas creek, upper reaches of the Abobo creek and along the Kapipihan river.

(Hg) Anomaly zones are not found at the northern part of the Barinad river. Anomaly zones are identified near faults at the Tabyonan creek, the Kaipa creek and the Kapipihan river.

(Pb) Small anomaly zones are identified along the Taganopol river and lower reaches of the Kampayas creek. Pb anomaly zones are widely distributed at the southern part of the survey area. Notable distribution is located at the central part of the survey area. Small anomalies are located at Carorongan and Taganopol Mineral Occurrence.

(S) Anomaly zones are located in Carorongan Mineral Occurrence, the Taganopol river, the Mamparong creek, the Kampayas creek, the Abobo creek and the Kapipihan river.

(Sb) Anomaly zones are distributed along the Barinad creek, uppermost reaches of the Bikat-bikat creek and the Kadlakogod creek. In addition, small anomaly zones are distributed along the Taganopol river and upper reaches of the Kampayas creek and the Abobo creek.

(Zn) Anomaly zones are concentrated along the Barinad creek.

2-2-2 Multivariant Analysis (Principal Component Analysis)

Principal component analysis was accomplished in order to see if there are groups of elements in their behavior and what control their grouping.

The Ogbong fault was used as a boundary because two contrasting lithology are marked by this fault contact zone and mineral associations are somewhat different with each other. So the northern portion of the fault is established as Area A and the southern portion of the fault is established as Area B.

(1) **Area A:** Number of samples used are 173. In the calculation of PCA, we used correlation

coefficient shown in Table 25. Results of PCA and distribution of PCA scores are shown in Table 26 and in Fig 30 respectively. From Table 25, positive correlations are noted between Au, Fe and (Cu), Cu, Zn and (Fe), Fe and Pb, negative correlation between Pb and Sb. As shown in Table 26, Eigenvalue is 2.48 and contribution is 24.8% for first principal component. Up to fifth principal component each eigenvalue is almost over 1.0 and cumulative contribution is 76.8%. Accordingly the first to fifth principal components are enough to explain the important element behavior. Following each principal component has such characters mentioned below.

Table 25

	Au	Ag	As	Cu	Fe	Hg	Pb	S	Sb	Zn
Au	1.000									
Ag	0.127	1.000								
As	0.086	0.126	1.000							
Cu	0.466	-0.032	-0.043	1.000						
Fe	0.514	0.027	0.122	0.492	1.000					
Hg	0.020	-0.021	0.080	-0.073	-0.076	1.000				
Pb	0.230	-0.118	0.140	-0.016	0.543	-0.101	1.000			
S	0.146	-0.010	0.195	0.020	0.210	0.042	0.085	1.000		
Sb	-0.180	0.089	-0.027	0.254	-0.222	0.080	-0.675	-0.037	1.000	
Zn	0.240	0.070	0.096	0.526	0.224	-0.144	-0.091	0.065	0.236	1.000

Table 26

Eigenvalue

P.C.	E.V	Con.	Cum.Con.
Z-01	2.4759	24.7594	24.7594
Z-02	1.9515	19.5153	44.2747
Z-03	1.2540	12.5398	56.8144
Z-04	1.0386	10.3864	67.2008
Z-05	0.9588	9.5882	76.7890
Z-06	0.7996	7.9965	84.7855
Z-07	0.5402	5.4024	90.1879
Z-08	0.5213	5.2131	95.4010
Z-09	0.2615	2.6150	98.0160
Z-10	0.1984	1.9840	100.0000

Factor Loading

	Z-01	Z-02	Z-03	Z-04	Z-05
Fe	**0.8645**	0.0478	-0.0339	-0.0567	0.0652
Au	**0.7398**	-0.1326	0.0582	-0.0286	0.3400
Pb	**0.6005**	**0.6761**	-0.1031	0.0342	-0.0171
Cu	0.6104	-0.6144	-0.2321	-0.1631	0.0689
Zn	0.4208	-0.6332	-0.0624	0.0973	-0.2352
Sb	-0.3393	**-0.8080**	0.1157	-0.1020	-0.0706
As	0.2210	0.0646	**0.7065**	0.1496	-0.2544
Ag	0.0366	-0.1930	0.4179	**0.7210**	0.4033
Hg	-0.1454	0.0082	0.4692	**-0.6147**	**0.5515**
S	0.2907	0.0413	**0.5232**	-0.2586	-0.4920

First principal component: Fe, Au, Pb, Cu, (Zn) have large factor loadings. This component denote Au related mineralization. High score areas are located along the Taganopol river, especially high in Carorongan and Taganopol Mineral Occurrences.

Second principal component: Pb, Cu, Zn, Sb have large factor loadings. Pb and other elements show opposite behavior. High score zone is distributed along the Taganopol river, especially in the northeastern portion of the river.

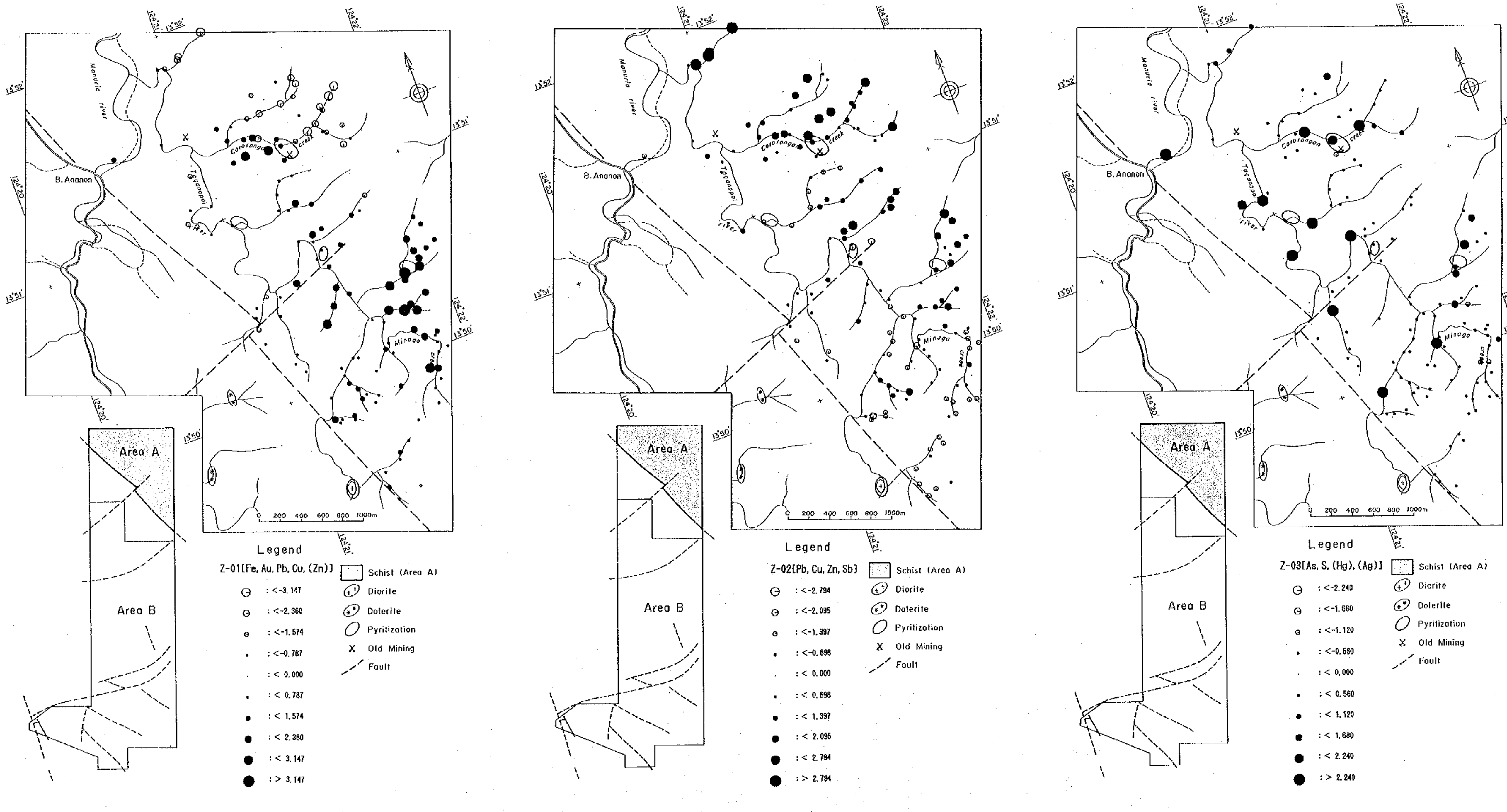
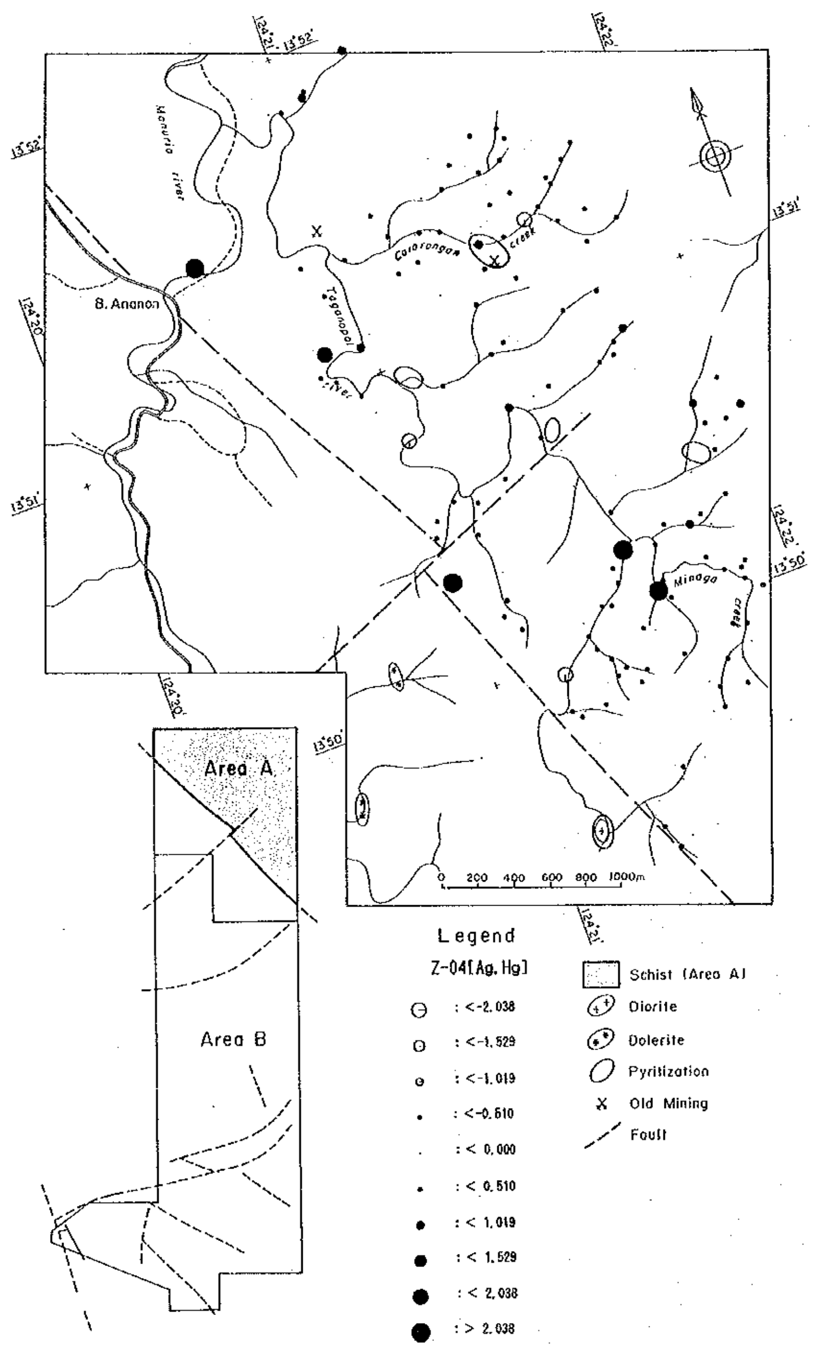


Fig. 30 Distribution of PCA Scores (Stream Sediments, Area A) (1)



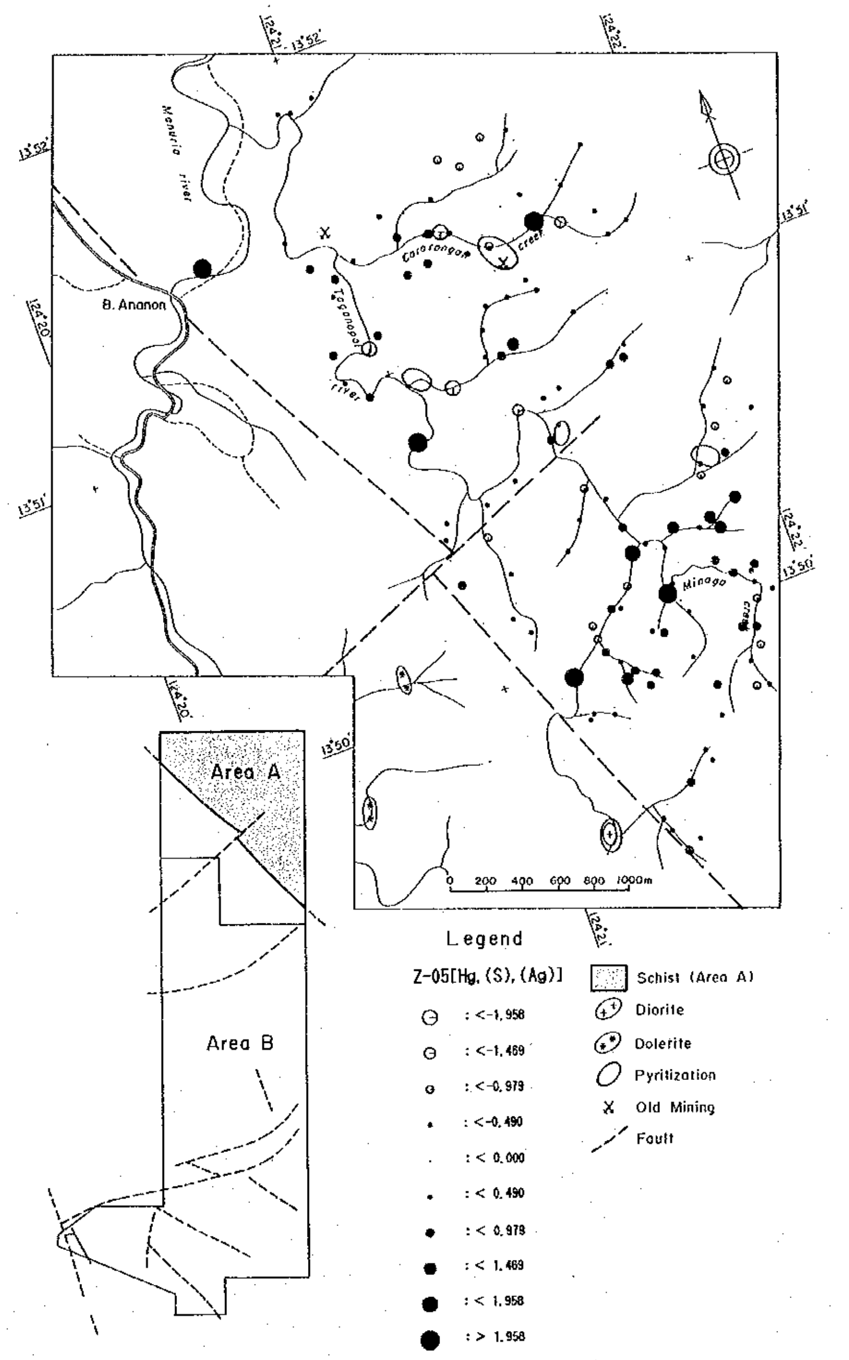


Fig. 30 Distribution of PCA Scores (Stream Sediments, Area A) (2)

Third principal component: As, S, (Hg), (Ag) have large factor loadings. High scours are distributed along the Taganopol river.

Forth principal component: Ag, Hg have large factor loadings. They show opposites behavior. High scours are scattered in the Taganopol river.

Fifth principal component: Hg, (Ag), (S) have a large factor loadings. Hg ,Ag and S show opposite behavior. High score area is concentrated in the upper reach of the Taganopol river.

On the whole, Au related mineralization is represented by first principal component and high scour area is rather concentrated in Carorongan and Taganopol area. The result of PCA is consistent with the results of the geological survey.

(2) Area B: Five hundred eighty-seven samples were used for the analysis of this area. Correlation coefficients shown in Table 27 was used for the calculation of PCA. Results of PCA is shown in Table 28, and distribution of PCA scores is shown in Fig.31.

Table 27

Au	1.000									
Ag	0.138	1.000								
As	-0.010	0.091	1.000							
Cu	0.093	-0.009	0.042	1.000						
Fe	0.172	-0.131	0.104	0.323	1.000					
Hg	-0.106	0.103	0.000	0.076	-0.077	1.000				
Pb	0.086	-0.069	0.173	0.196	0.338	0.192	1.000			
S	0.158	-0.031	-0.140	-0.037	-0.223	-0.027	-0.346	1.000		
Sb	0.077	-0.261	0.164	0.240	0.493	-0.071	0.426	-0.313	1.000	
Zn	0.126	0.032	0.171	0.628	0.455	0.085	0.367	-0.145	0.359	1.000
	Au	Ag	As	Cu	Fe	Hg	Pb	S	Sb	Zn

Table 28

Eigenvalue

P.C.	E.V	Con.	Cum.Con.
Z-01	2.7736	27.7358	27.7358
Z-02	1.3349	13.3494	41.0851
Z-03	1.2752	12.7519	53.8370
Z-04	1.0838	10.8376	64.6746
Z-05	0.9069	9.0688	73.7434
Z-06	0.8231	8.2306	81.9740
Z-07	0.5499	5.4991	87.4731
Z-08	0.4788	4.7878	92.2609
Z-09	0.4486	4.4859	96.7468
Z-10	0.3253	3.2532	100.0000

Factor Loading

	Z-01	Z-02	Z-03	Z-04	Z-05
Zn	0.7616	0.3605	0.0956	0.1625	-0.2243
Fe	0.7294	0.0280	-0.2666	-0.0641	0.0646
Sb	0.7269	-0.2881	-0.2553	-0.0645	0.0927
Pb	0.6704	-0.2060	0.2376	-0.0292	0.3774
Cu	0.6026	0.4652	0.0202	0.3614	-0.3190
Au	0.1660	0.5925	-0.2682	-0.4189	0.4994
S	-0.4322	0.5394	-0.2929	0.2128	-0.0865
Hg	0.0630	0.0407	0.6925	0.4648	0.3219
Ag	-0.1370	0.4530	0.5823	-0.4358	0.0285
As	0.2890	-0.1159	0.3107	-0.5393	-0.4882

As shown in Table 27. Positive correlation is noted between Cu and Zn, weak positive correlation between Fe and Sb, Fe and Zn, Pb and Sb. Eigenvalue is 2.77 and contribution 27.7% for first principal component. Up to fifth principal component each eigenvalue is almost over 1.0 and cumulative contribution is

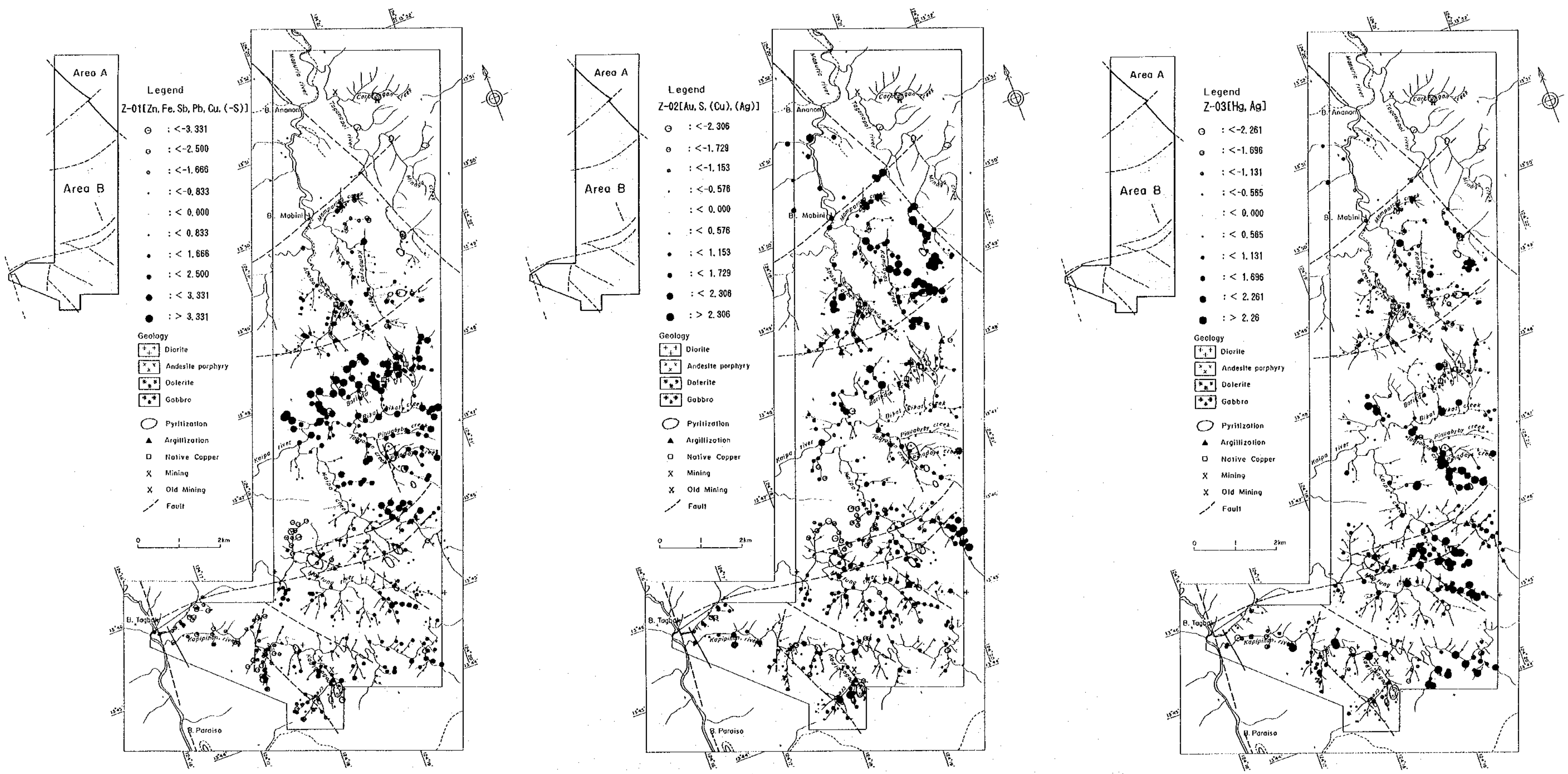
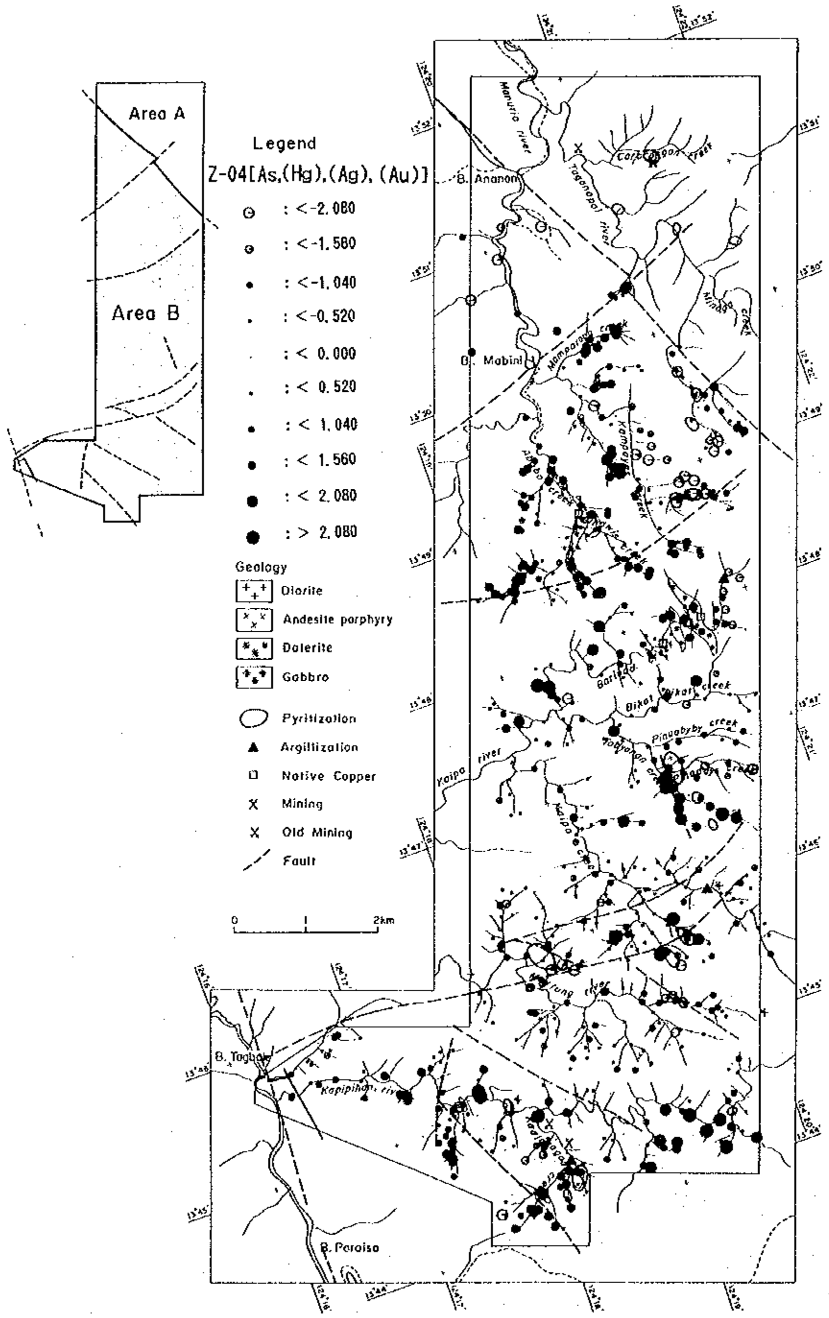


Fig. 31 Distribution of PCA Scores (Stream Sediments, Area B) (1)



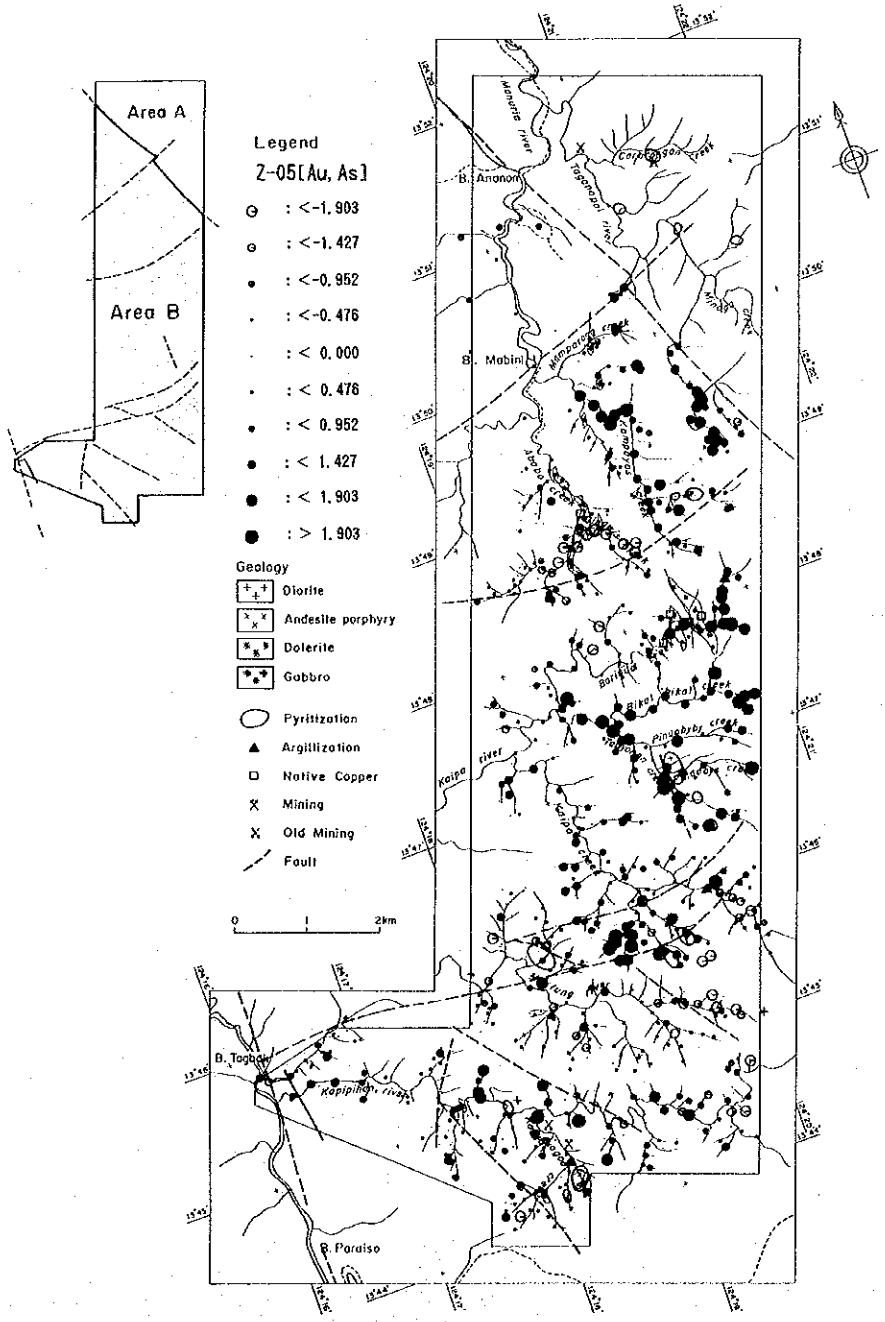


Fig. 31 Distribution of PCA Scores (Stream Sediments, Area B) (2)

73.7%. Accordingly, first to fifth principal components are enough to explain the important element behavior. Following each principal component has such characters mentioned below.

First principal component: Zn, Fe, Sb, Pb, Cu (S) have large factor loadings. S and other elements display opposite behavior. High score areas are prominent in central part of the survey area. Among them most conspicuous is along the Barinad creek, the Tabyonan creek and the Kaipa creek. Along the Barinad creek, outcrops and floats of gabbro are noted. Native copper is found in gabbro outcrop and surrounding graywacke in small cracks.

First principal component is related with rocks and base metal mineralization.

Second principal component: Au, S, (Cu), (Ag) have large factor loadings. This component represents factor related of Au and sulfide mineralization. High score areas are distributed along the Kampayas creek and upper reach of the Taganopol river. In addition, there are small high scores in the Abobo creek, the Barinado creek, the Kaipa creek and the Kadlakogod creek.

Third principal component: Hg and Ag have large factor loadings. High score areas are distributed mainly in the southern part of the Area B.

Forth principal component: As, (Hg), (Ag), (Au) have large factor loadings. Hg and other elements shows opposite behavior. Negative high score areas at the Kampayas creek and upper reach of the Taganopol river corresponds to the anomaly area of gold.

Fifth principal component: Au, (As) have large factor loadings. Au and As show opposite behavior. High score areas are distributed at the Kampayas creek, upper reaches of the Taganopol river, the Barinad creek, the Tabyonan creek, the Kaipa creek and the Kapipihan river. Some small high score zones are found overlapping the silicified zones and along fracture zones.

2-2-3 Discussion

Compared with mean value and Clarke number, content of gold is 72 times higher than Clarke number, Sb 17 times, Ag 7 times, other elements 3-0.4 times. This data and that of the geological survey, disclosed that Au has the highest potential in the survey area.

As shown in Fig.29, Au concentrated areas are located at the Taganopol river and northeast side of the Kampayas creek, the Barinad creek, the Tabyonan creek, the Kaipa creek, the Maytung creek and the Kadlakogod creek. Among them the Taganopol river area and northeast side the Kampayas creek are the best.

As the results of PCA, first principal component in Area A, second, forth and fifth components in Area B was selected as the factor showing gold related mineralization.

On the whole, the Taganopol river area in Area A, and the upper reach of the Taganopol river and, the Kampayas creek offer the most promising potential gold related mineralization in Area B. In addition, small promising areas are located at the lower reach of the Barinad creek, middle part of the Tabyonan creek and the Maytung creek located along fracture zones and silicified zones.

Au related mineralization in silicified zones and near fracture zones may be attributed to deep seated intrusion and/or related mineralization.

Other elements aside from gold did not display geochemical anomalies which would suggest workable deposits at least at the shallow depth.

2-3 Soil Geochemical Survey

Potential areas were selected on the result of geological survey. They were Carorongan Mineral Occurrence, Taganopol Mineral Occurrence, Tagbak Area, and Barinad Area.

2-3-1 Carorongan Mineral Occurrence

(1) Monovariant Analysis: Total number of soil samples were 321. Sampling points are shown in Fig.32. Basic statistical values is shown in Table 29, correlation coefficients is in Table 30, classification of geochemical anomalies is in Table 31, scatter diagram is in Fig.33, frequency distribution and cumulative frequency distribution is in Fig.34 and distribution of geochemical anomalies is in Fig.35.

Maximum value of Au in soil was 1,870ppb and 5 samples were over 1,000ppb in the contents of Au. Mean values of contents are Au 156ppb, Cu 168ppm and Zn 65ppm.

Fig. 35 shows the distribution of geochemical anomalies in the occurrence.

(Au) Anomaly zone is distributed parallel to the silicified vein and its width is about 50m to 100m and length is about 150m. In addition, there are anomalies in the western part of the vein and in the southern corner of the survey area. Au contents are low in the area of Payo Formation.

(Cu) Anomaly zone is distributed in the northeastern side of Au anomaly zone.

(Pb) Anomaly points were distributed scattering in the southeastern part of picket line KYB-01.

(Zn) Anomaly zone is mainly distributed in the eastern part of the Au anomaly zone. Zn contents tends to be high in the area of Payo Formation.

(2) Multivariant Analysis (PCA): Correlation coefficients shown in Table 30 was used in the calculation of PCA. The results of PCA is shown in Table 32, and distribution of PCA scores is in Fig.36.

As shown in Table 30, positive correlation is noted between Cu and Zn, negative weak correlation is noted between Au and Zn.

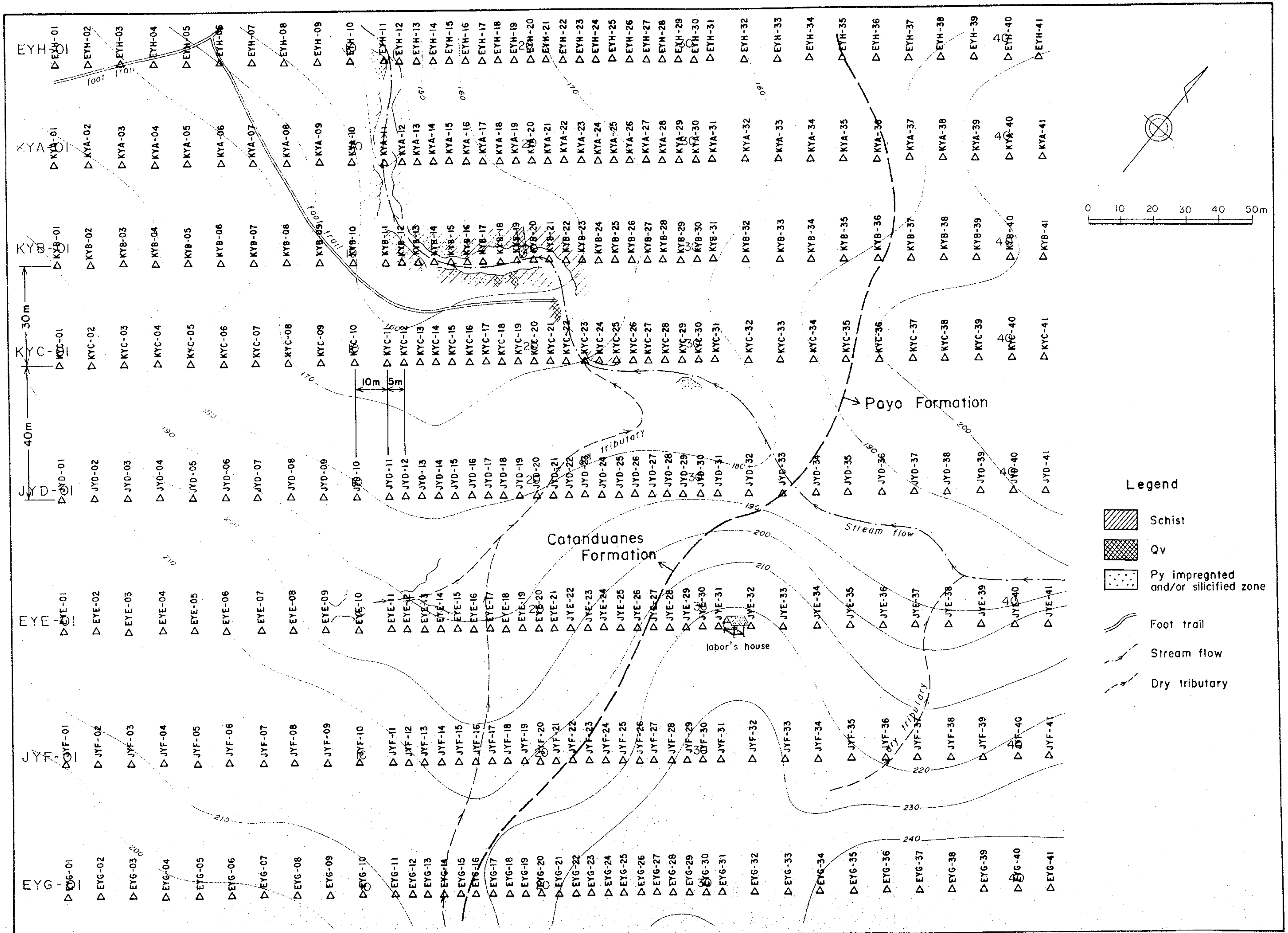


Fig. 32 Locality Map of Soil Samples (Carorongan Mineral Occurrence)

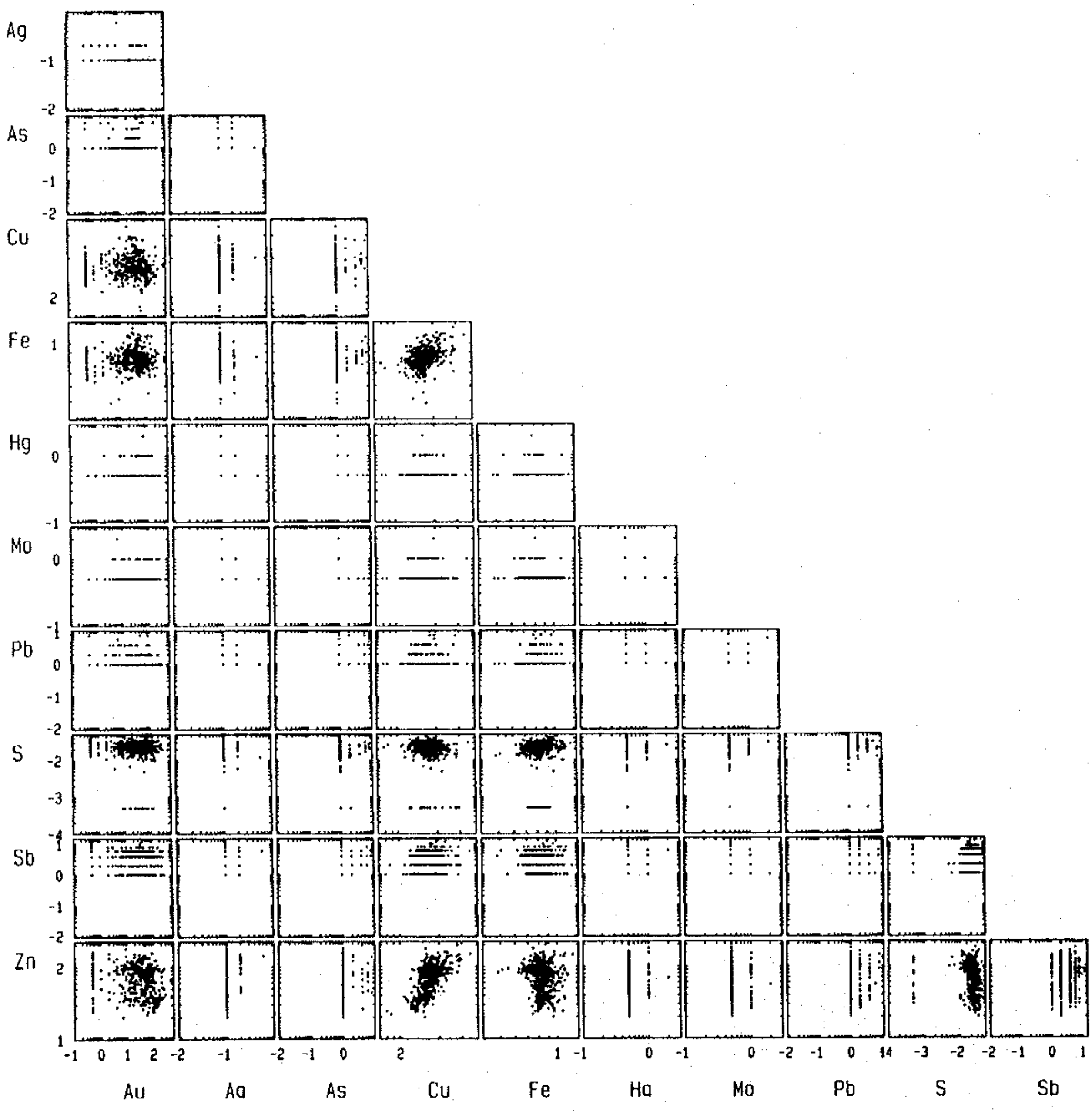


Fig. 33 Scatter Diagram (Soil, Carorongan Mineral Occurrence)

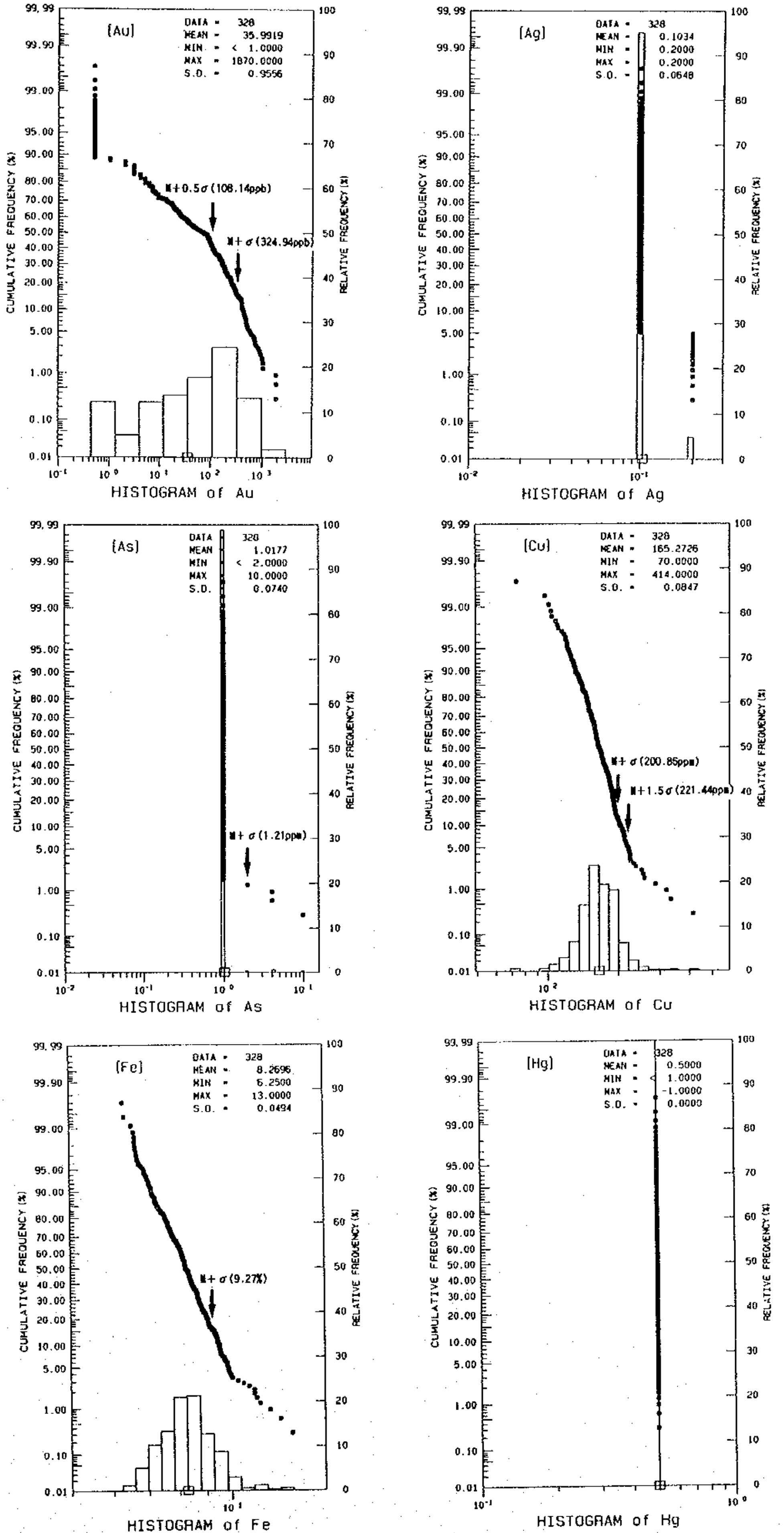


Fig. 34 Frequency Distribution and Cumulative Frequency Distribution (Soil, Carorongan Mineral Occurrence) (1)

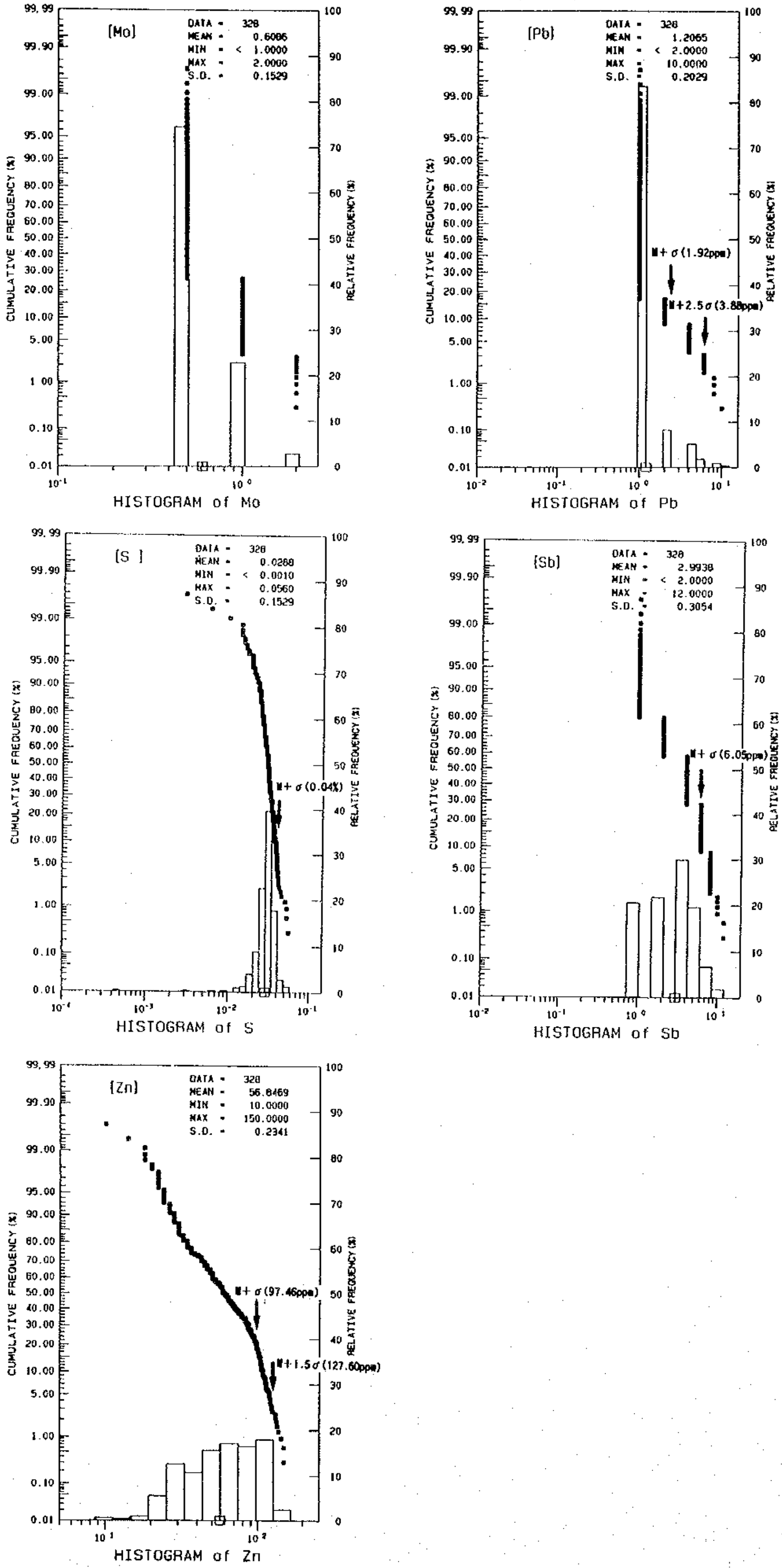


Fig. 34 Frequency Distribution and Cumulative Frequency Distribution (Soil, Carorongan Mineral Occurrence) (2)

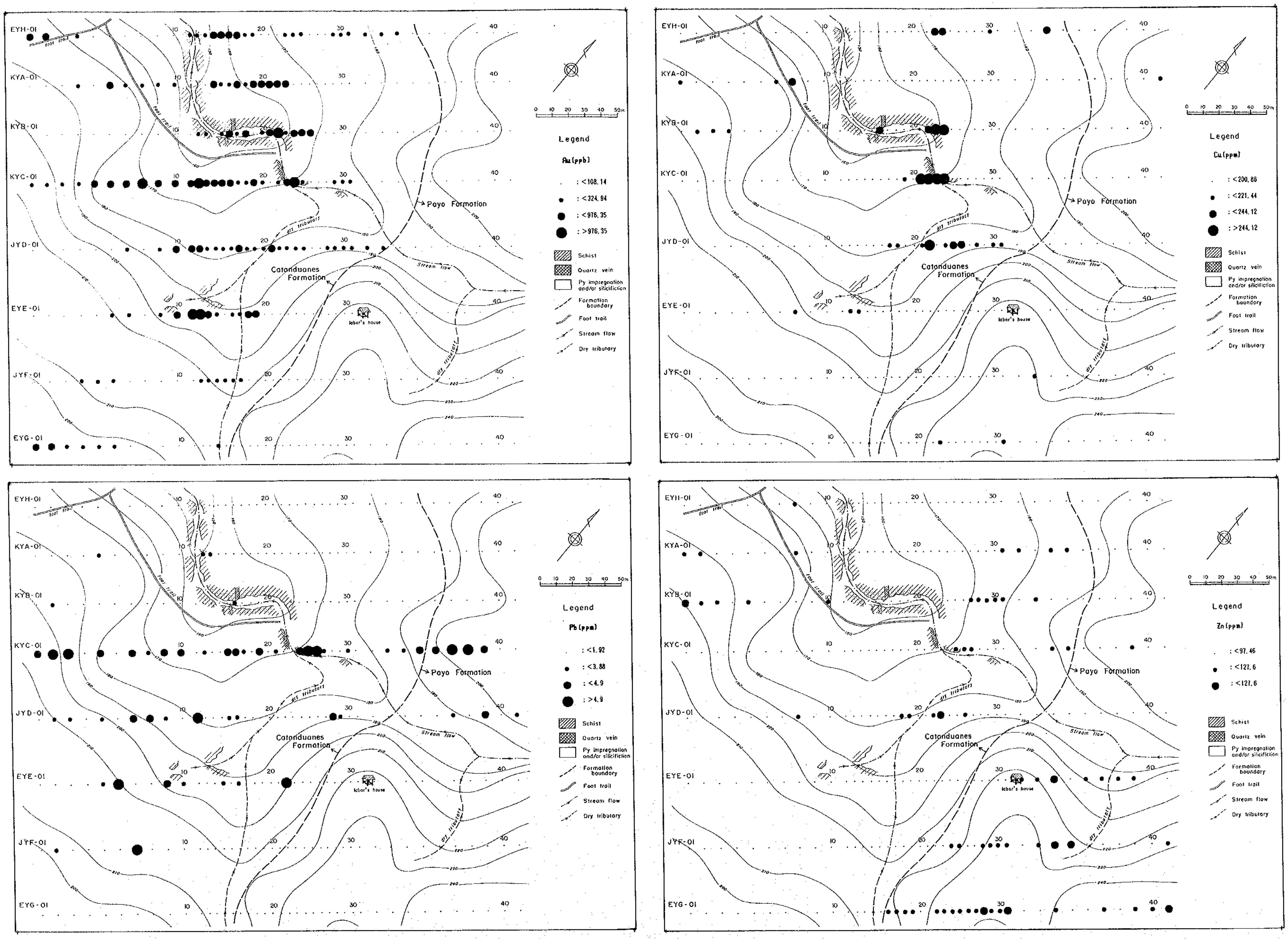


Fig. 35 Distribution of Geochemical Anomalies (Soil, Carorongan Mineral Occurrence)

Table 29

Elemant	Unit	Maximum	Minimum	Average	Avg.-log	Std.Dev.
Au	ppb	1870	<1.00	155.89	1.5562	0.9556
Ag	ppm	0.2	<0.20	0.1	-0.9855	0.0648
As	ppm	10	<2.00	1.05	0.0076	0.074
Cu	ppm	414	70	168.48	2.2182	0.0847
Fe	%	13	6.25	8.32	0.9175	0.0494
Hg	ppm	0.5	<1.00	0.5	-0.301	0
Mo	ppm	2	<1.00	0.66	-0.2157	0.1529
Pb	ppm	10	<2.00	1.42	0.0815	0.2029
S	%	0.06	<0.001	0.03	-1.5406	0.1529
Sb	ppm	12	<2.00	3.73	0.4762	0.3054
Zn	ppm	150	10	64.92	1.7547	0.2341

Table 30

Au	1.0000							
As	0.0072	1.0000						
Cu	-0.0043	-0.0891	1.0000					
Fe	0.2606	0.0238	0.2766	1.0000				
Pb	0.1704	-0.0231	-0.0588	0.0221	1.0000			
S	0.0779	0.0462	0.0068	0.0140	0.0566	1.0000		
Sb	0.0101	-0.0186	0.0336	0.1609	0.1362	-0.1338	1.0000	
Zn	-0.4656	-0.0496	0.5732	-0.2412	-0.0447	-0.1618	0.0599	1.0000
	Au	As	Cu	Fe	Pb	S	Sb	Zn

Table31

Au	M+0.5 σ(108.14ppb)	M+ σ(324.94ppb)
As	M+ σ(1.21ppm)	
Cu	M+ σ(200.86ppm)	M+1.5 σ(221.44ppm)
Fe	M+ σ(9.27%)	
Pb	M+ σ(1.92ppm)	M+2.5 σ(3.88ppm)
S	M+ σ(0.04%)	
Sb	M+ σ(6.05ppm)	
Zn	M+ σ(97.46ppm)	M+1.5 σ(127.60ppm)

As shown in Table 32, eigenvalue is 1.84 and contribution is 23.0% for first principal component. Up to fifth principal component, each eigenvalue is almost over 1.0 and cumulative contribution is 80.3%. Accordingly, the first to fifth principal component is enough to explain the important behavior of elements. Following each principal component has such characters mentioned below.

First principal component: Zn, Au and Cu have large factor loadings. Au and other elements show opposite behavior. This component show Au mineralization in negative high scores and the difference of the geology of the two Formations.

Second principal component: Factor loadings of Fe, Cu, (Sb) and (Au) are large in this principal component. This component explains Au mineralization. High score zone is in the silicified zone and in the

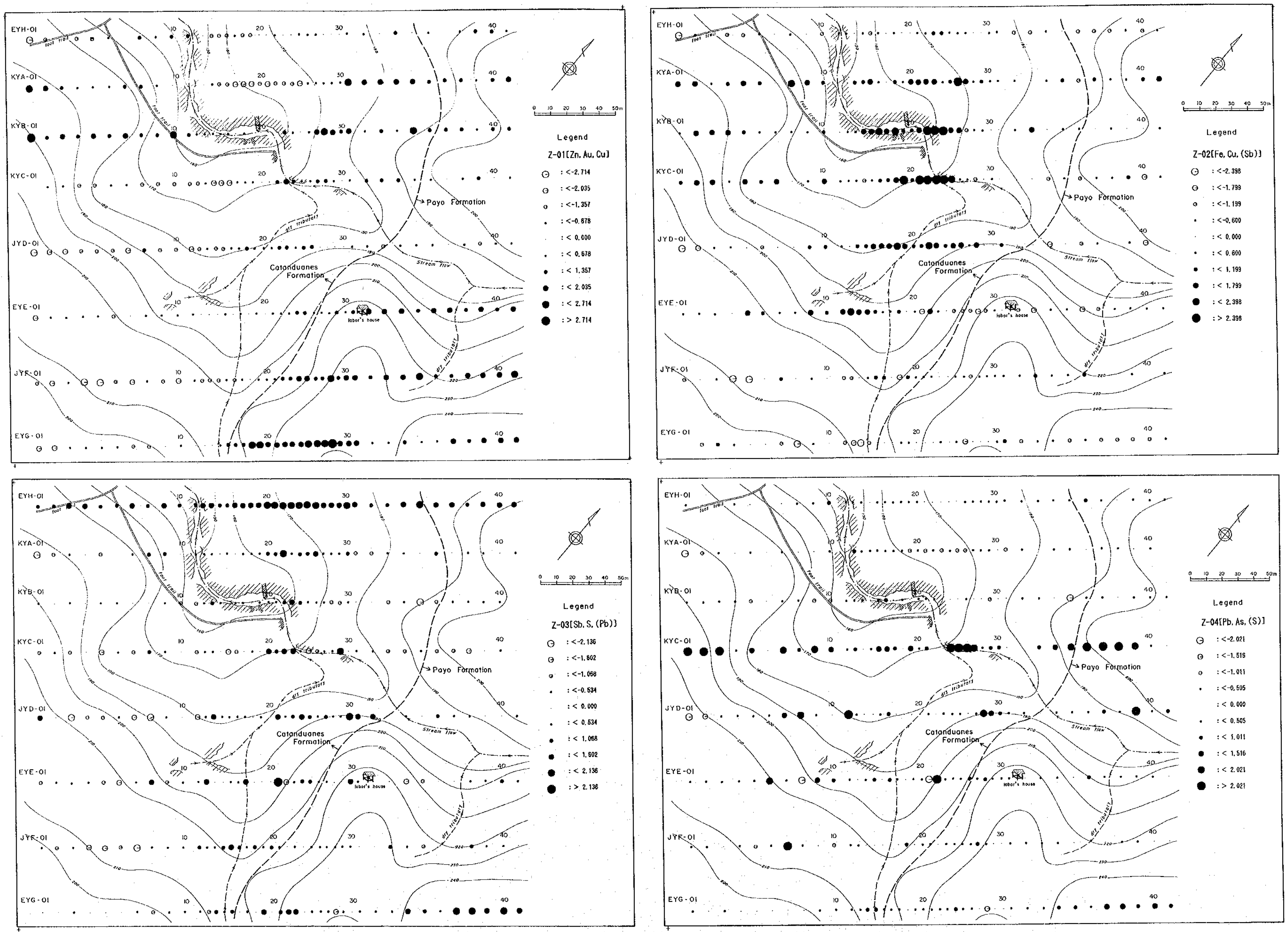


Fig. 36 Distribution of PCA Scores (Soil, Carorongan Mineral Occurrence) (1)

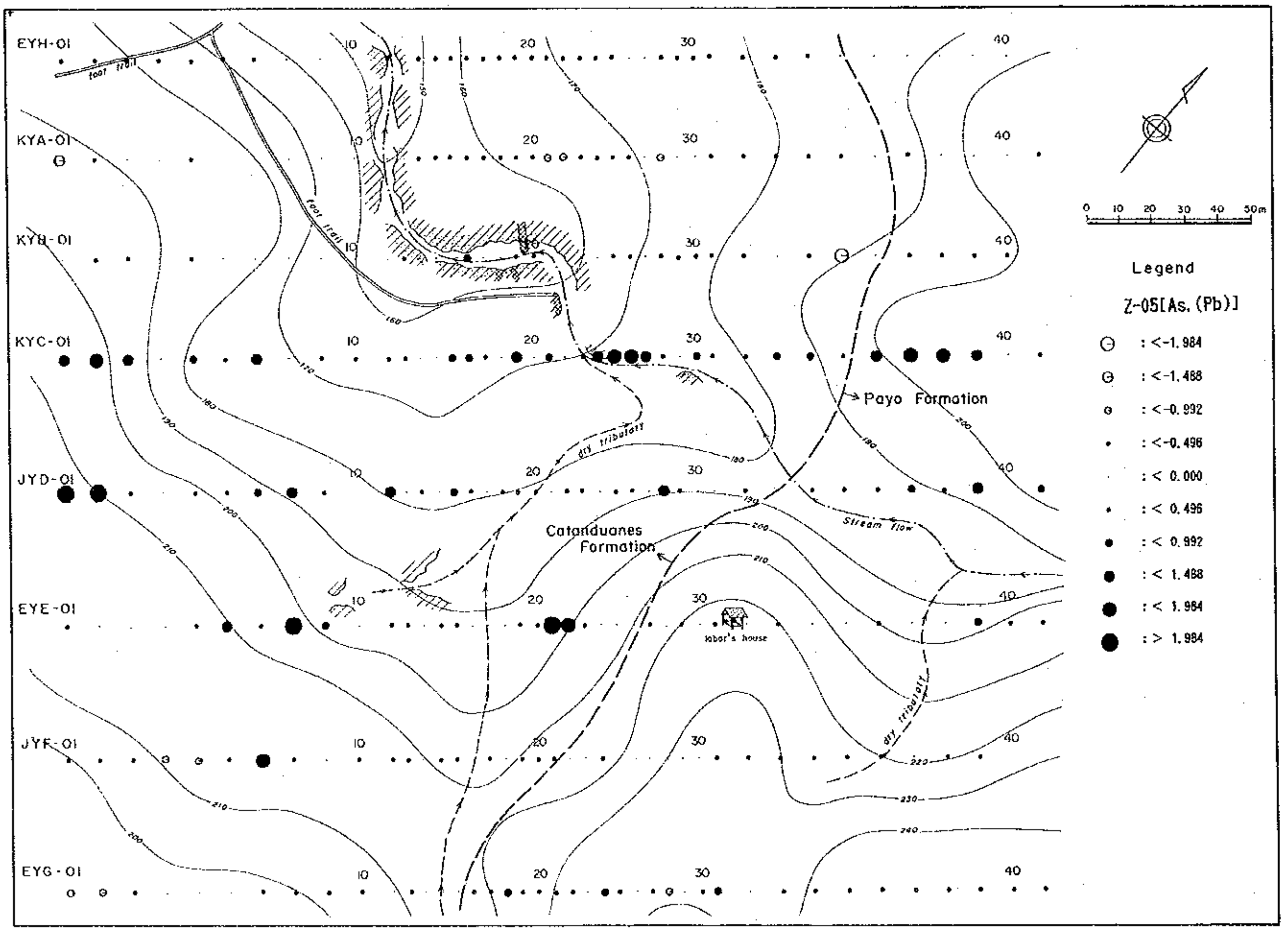


Fig. 36 Distribution of PCA Scores (Soil, Carorongan Mineral Occurrence) (2)

silicified green-schist and roughly parallel to the geological boundary of the two Formations. This is consistent well with the result of geological survey.

Third principal component: Factor loadings of S, Sb, (Pb) and (Cu) are large in this principal component. S and other elements show opposite behavior. This component denotes sulfide mineralization. High score anomalies coincide roughly with that of second principal component and are located parallel to the boundary of the two formations.

Forth principal component: Pb, As and (S) have large factor loadings. As and other elements show opposite behavior.

Fifth principal component: Factor loadings of As and (Pb) are large in this principal component. High score anomalies coincide roughly with those of forth principal component.

The first and second principal component, especially second component, show the Au mineralization. The third principal component shows indirectly the Au mineralization in the existence of sulfide associated with Au mineralization. The high score anomalies are distributed in the silicified zone and located near the boundary between two Formations. These results are harmonious with those of geological survey.

Table 32

Eigenvalue

P.C.	E.V	Con.	Cum.Con.
Z-01	1.8412	23.0149	23.0149
Z-02	1.4379	17.9743	40.9891
Z-03	1.1407	14.2593	55.2484
Z-04	1.0211	12.7641	68.0125
Z-05	0.9842	12.3022	80.3147
Z-06	0.7977	9.9713	90.2860
Z-07	0.6021	7.5264	97.8124
Z-08	0.1750	2.1876	100.0000

Factor Loading

	Z-01	Z-02	Z-03	Z-04	Z-05
Zn	**0.9141**	0.1261	0.0075	0.1323	0.1763
Au	**-0.6752**	0.3867	0.1029	0.0614	-0.1206
Fe	-0.2965	**0.7462**	0.1988	-0.2930	-0.0599
Cu	**0.5591**	**0.6645**	0.3788	0.0832	0.0422
S	-0.2672	-0.0661	**0.5772**	0.4705	0.3207
Sb	0.0289	0.4471	**-0.6460**	-0.1345	0.1928
Pb	-0.2418	0.2238	-0.4207	**0.6342**	0.3936
As	-0.1359	-0.1403	0.1403	**-0.5152**	**0.7989**

2-3-2 Taganopol Mineral Occurrence

(1) Monovariant Analysis: Total number of samples were 366. Sampling points are shown in Fig.37. Basic statistical values is shown in Table 33, correlation coefficients is in Table 34, classification of geochemical anomalies is in Table 35, scatter diagram is in Fig.38 and frequency distribution and cumulative frequency distribution is in Fig.39.

The maximum and mean values of elements are Au 504ppb and 50.9ppb, Cu 350ppm and 174.6ppm, Pb 10ppm and 1.4ppm, Zn 200ppm and 74.2ppm. Compared with Clarke number of the earth crust, Au is 12 times, Cu 3 times and Pb 1/10 times higher than that and Zn is almost same level. Accordingly, the mineralization is inferred to be gold related. Fig.40 shows distribution of geochemical anomalies.

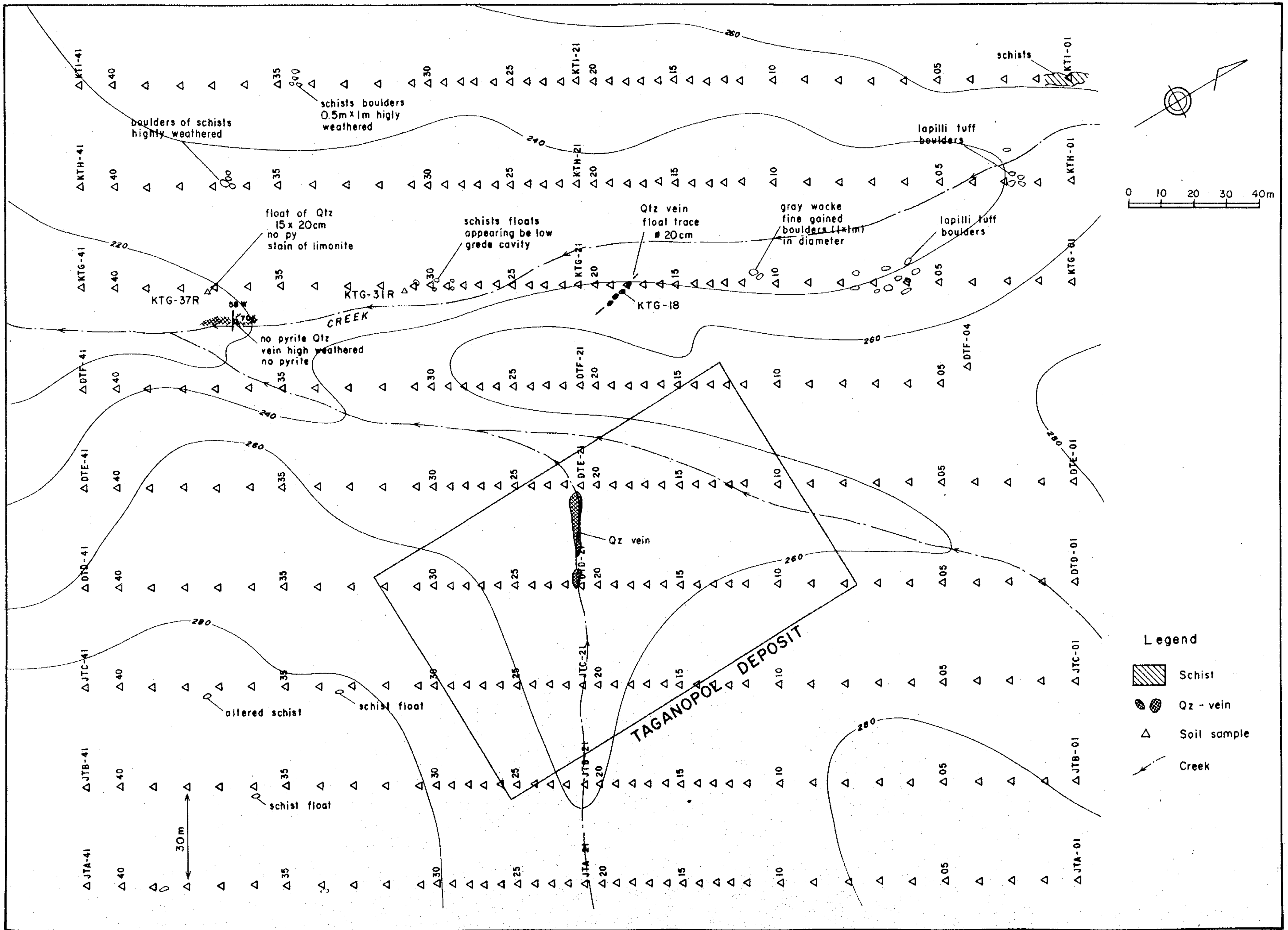


Fig. 37 Locality Map of Soil Samples (Soil, Taganopol Mineral Occurrence)

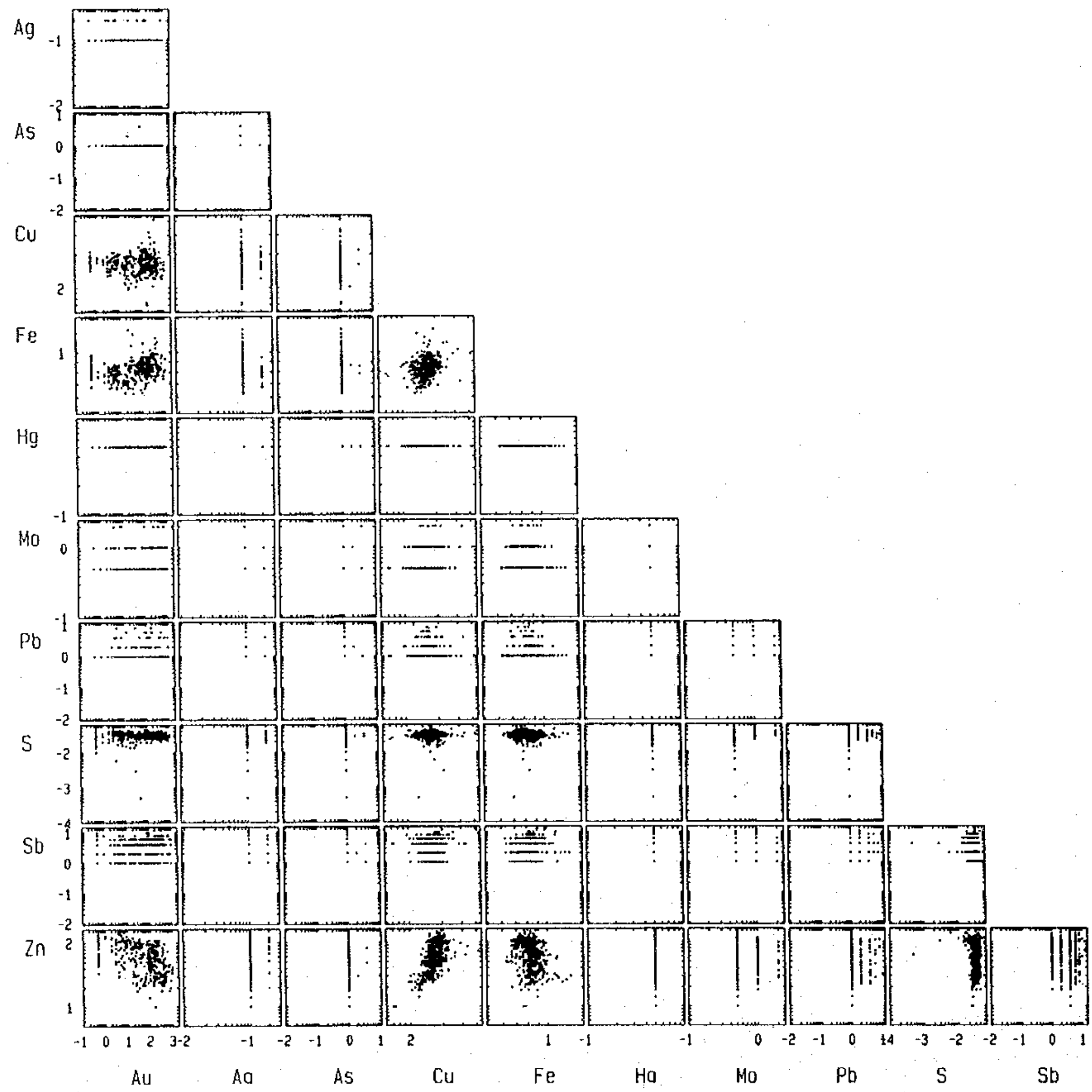


Fig. 38 Scatter Diagram (Soil, Taganopol Mineral Occurrence)

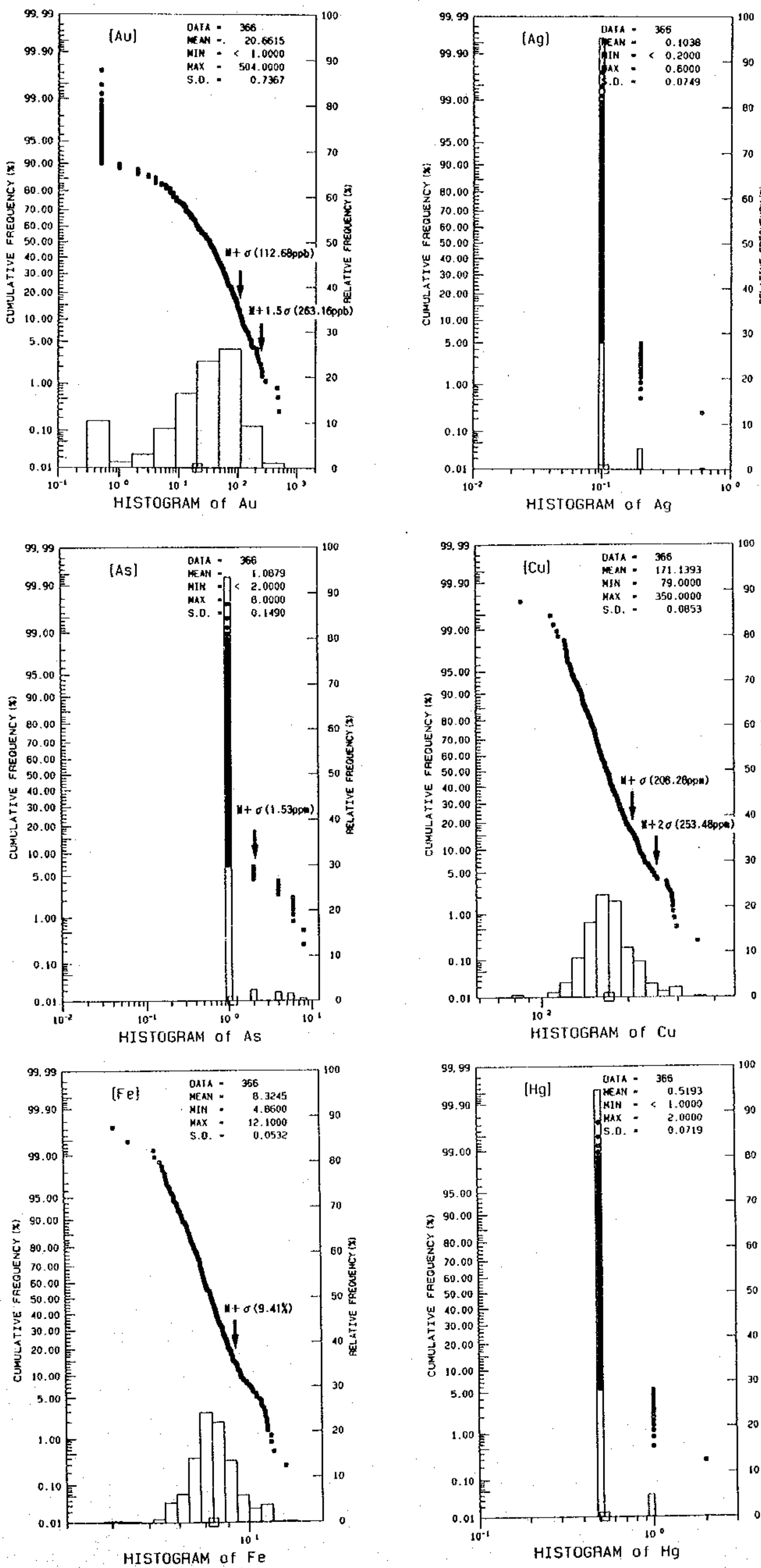


Fig. 39 Frequency Distribution and Cumulative Frequency Distribution (Soil, Taganopol Mineral Occurrence) (1)

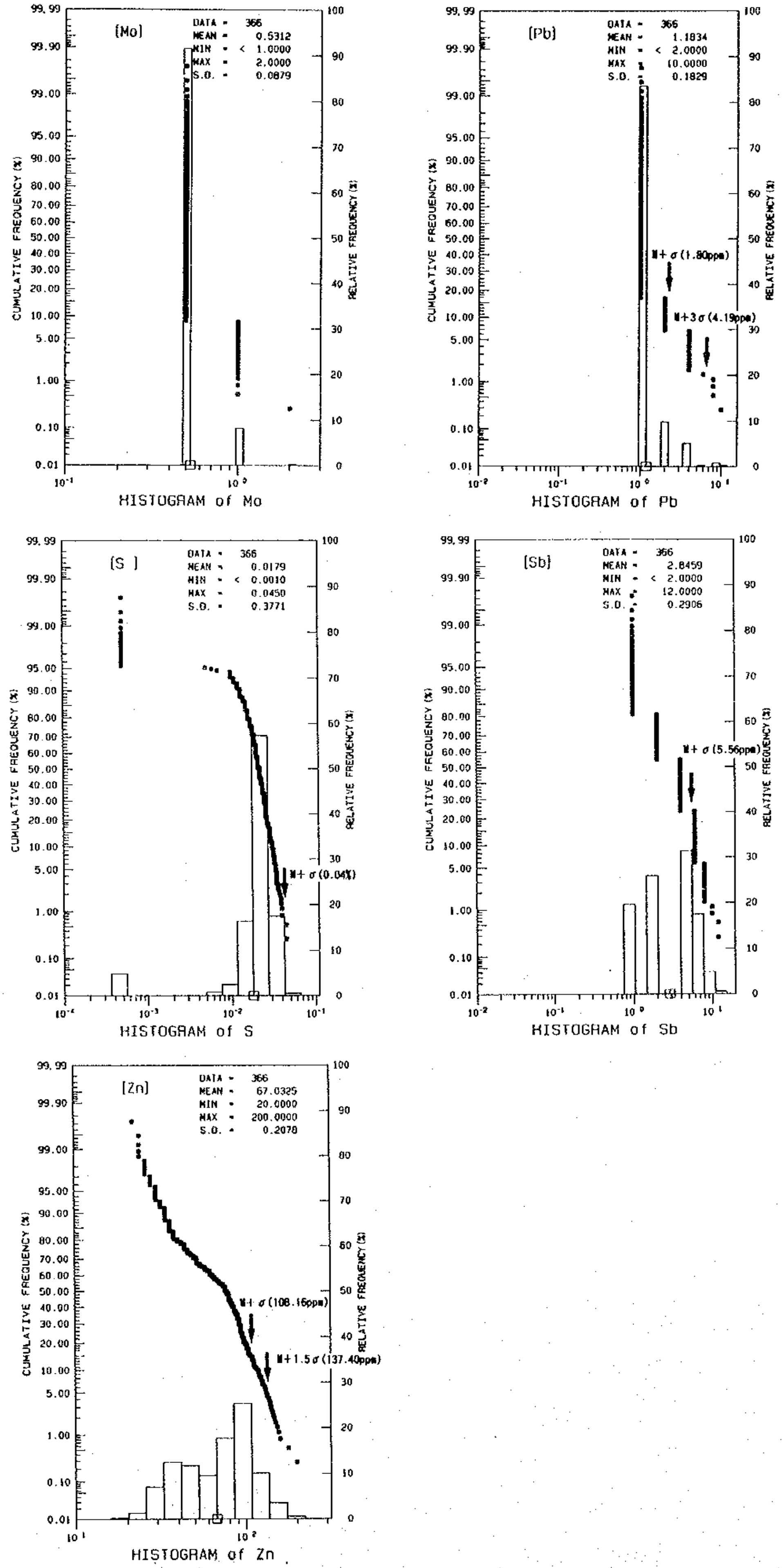


Fig. 39 Frequency Distribution and Cumulative Frequency Distribution (Soil, Taganopol Mineral Occurrence) (2)

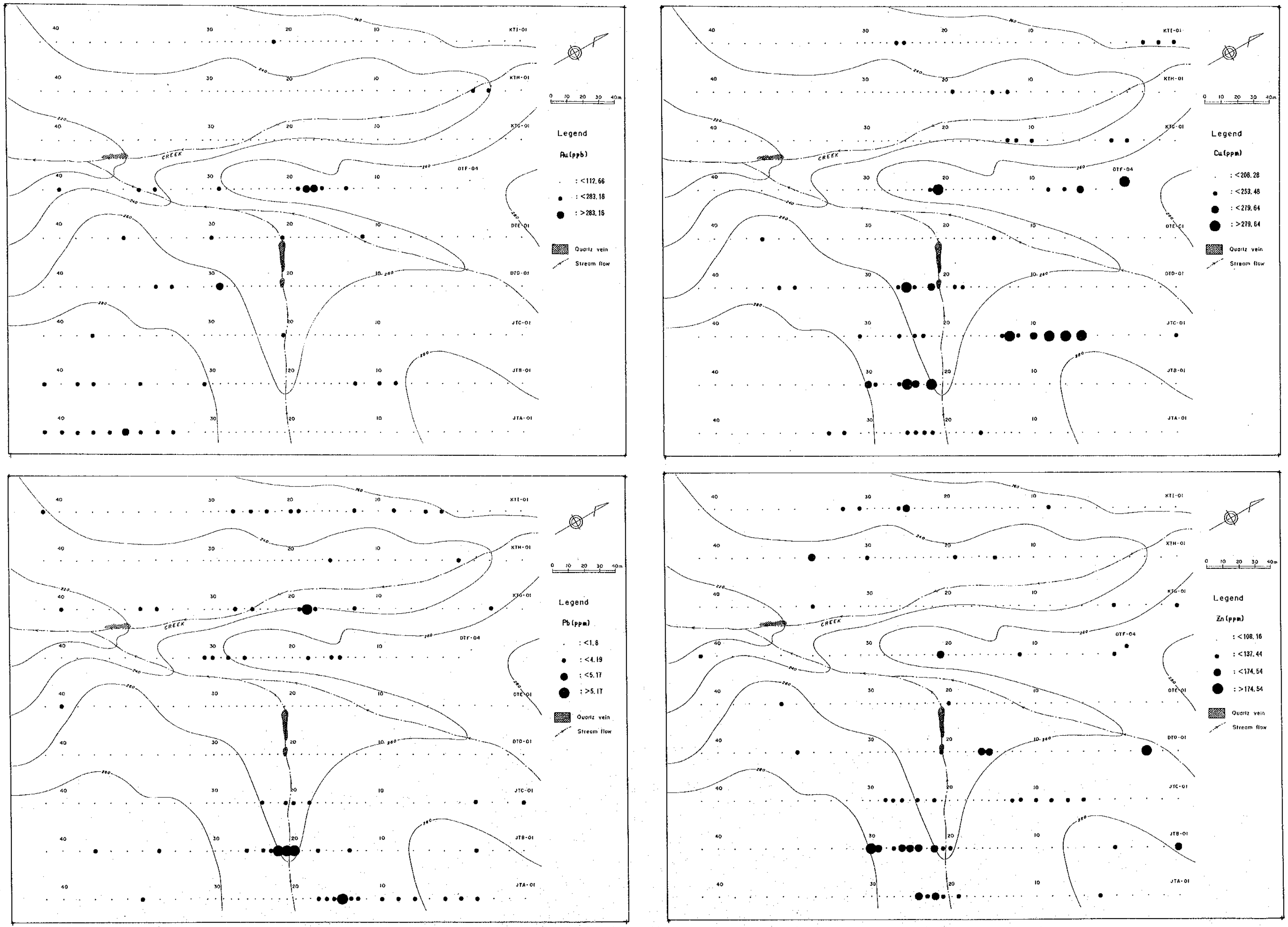


Fig. 40 Distribution of Geochemical Anomalies (Soil, Taganopol Mineral Occurrence)

Table 33

Elemant	Unit	Maximum	Minimum	Average	Avg.-log	Std.Dev.
Au	ppb	504	<1.00	50.94	1.3152	0.7367
Ag	ppm	0.6	<0.20	0.11	-0.9838	0.0749
As	ppm	8	<2.00	1.2	0.0366	0.149
Cu	ppm	350	79	174.55	2.2333	0.0853
Fe	%	12.1	4.86	8.39	-1.2741	0.0532
Hg	ppm	2	<1.00	0.53	-0.2846	0.0719
Mo	ppm	2	<1.00	0.55	-0.2747	0.0879
Pb	ppm	10	<2.00	1.35	0.0731	0.1829
S	%	0.05	<0.001	0.02	-1.7471	0.3771
Sb	ppm	12	<2.00	3.49	0.4542	0.2906
Zn	ppm	200	20	74.21	1.8263	0.2078

Table 34

Au	1.0000							
As	-0.0193	1.0000						
Cu	-0.0342	0.1056	1.0000					
Fe	0.0730	0.0848	0.4005	1.0000				
Pb	-0.0643	0.1608	-0.0113	0.0476	1.0000			
S	-0.1078	0.0293	-0.2187	0.0623	0.0587	1.0000		
Sb	-0.1678	0.1003	0.1525	-0.0115	-0.1451	-0.0140	1.0000	
Zn	-0.1693	0.0489	0.6448	-0.1344	-0.0055	-0.1289	0.1701	1.0000
	Au	As	Cu	Fe	Pb	S	Sb	Zn

Table 35

Au	M+σ(112.68ppb)	M+1.5 σ(263.16ppb)
As	M+σ(1.53ppm)	
Cu	M+σ(208.28ppm)	M+2 σ(253.48ppm)
Fe	M+σ(9.41%)	
Pb	M+σ(1.80ppm)	M+3 σ(4.19ppm)
S	M+σ(0.04%)	
Sb	M+σ(5.56ppm)	
Zn	M+σ(108.16ppm)	M+1.5 σ(137.40ppm)

(Au) Anomalies areas are distributed in the southern part of the quartz veins and in the northwestern part of the veins. However, the anomaly is not distributed in proximity of the veins.

(Cu) Anomalies are distributed in the southeastern and eastern parts of the vein and in the northeastern to northwestern part of the veins.

(Pb) Anomalies are distributed in the southeastern and northwestern parts of the veins. But there is no anomalies near by the veins.

(Zn) Zn anomalies are distributed in the southeastern part of the veins. These anomalies are roughly similar to those of Pb pattern except nearby the veins.

(2) Multivariant Analysis (PCA): Correlation coefficients shown in Table 34 was used in the calculation of PCA. The results of PCA is shown in Table 36 and distribution of PCA scores are shown in Fig.41.

From the Table 34, positive correlation is noted between Cu and Zn, and weak positive correlation is noted between Cu and Fe.

Eigenvalue is 1.87 and contribution is 23.3% for first principal component. Up to fifth principal components, each eigenvalue is almost over 1.0 and cumulative contribution is 79.9%. Accordingly, the first to fifth principal components are enough to explain the important behavior of elements.

Table 36

Eigenvalue

P.C.	E.V	Con.	Cum.Con.
Z-01	1.8665	23.3314	23.3314
Z-02	1.2915	16.1437	39.4752
Z-03	1.2326	15.4069	54.8821
Z-04	1.0564	13.2049	68.0869
Z-05	0.9490	11.8625	79.9494
Z-06	0.7695	9.6191	89.5685
Z-07	0.6719	8.3990	97.9675
Z-08	0.1626	2.0325	100.0000

Factor Loading

	Z-01	Z-02	Z-03	Z-04	Z-05
Cu	**0.9018**	0.2304	0.1573	0.0196	-0.1622
Zn	**0.8046**	-0.2634	-0.0281	-0.2806	-0.1667
Fe	0.2666	**0.7450**	0.0855	0.4856	-0.1970
Au	-0.2103	0.3663	**0.6309**	-0.0331	0.3376
S	-0.3031	0.1108	**-0.5618**	0.3922	-0.3344
Sb	0.3891	-0.3764	-0.2491	0.4839	0.3921
Pb	-0.0324	0.4442	-0.4652	**-0.5884**	-0.0985
As	0.2149	0.3585	-0.4556	-0.0780	**0.6833**

First principal component: The factor loadings of Cu, Zn and (Sb) are large. High score anomalies are widely distributed except the southern and southwestern areas.

Second principal component: Fe, (Pb), (Sb), (Au) and (As) have large factor loadings. Sb and other elements show opposite behavior. Anomalies are distributed widely except in the northeastern part, and southwestern parts of the survey area.

Third principal component: The factor loadings of Au, S, (Pb) and (As) are large. Au and other elements show opposite behavior. High score anomalies are distributed in the southeastern part of the picket line OTF.

Forth principal component: Pb, (Fe), (Sb) and (S) have large factor loadings. Pb and other elements shows opposite behavior. High score zones are seemed to be distributed parallel to the extension of the veins.

Fifth principal component: The factor loadings of As and (Sb) are large. High scores seem to be located in an area higher than 260m in elevation. This distribution is roughly similar to that of third principal component.

The survey area is thought to be located in the vicinity of the geological boundary between the green-schist of Catanduanes Formation and the volcanic rocks of the Payo Formation. Mixture of floats of both of Formation and their weathered products i.e. soil may make the geochemical results unclear. The results of

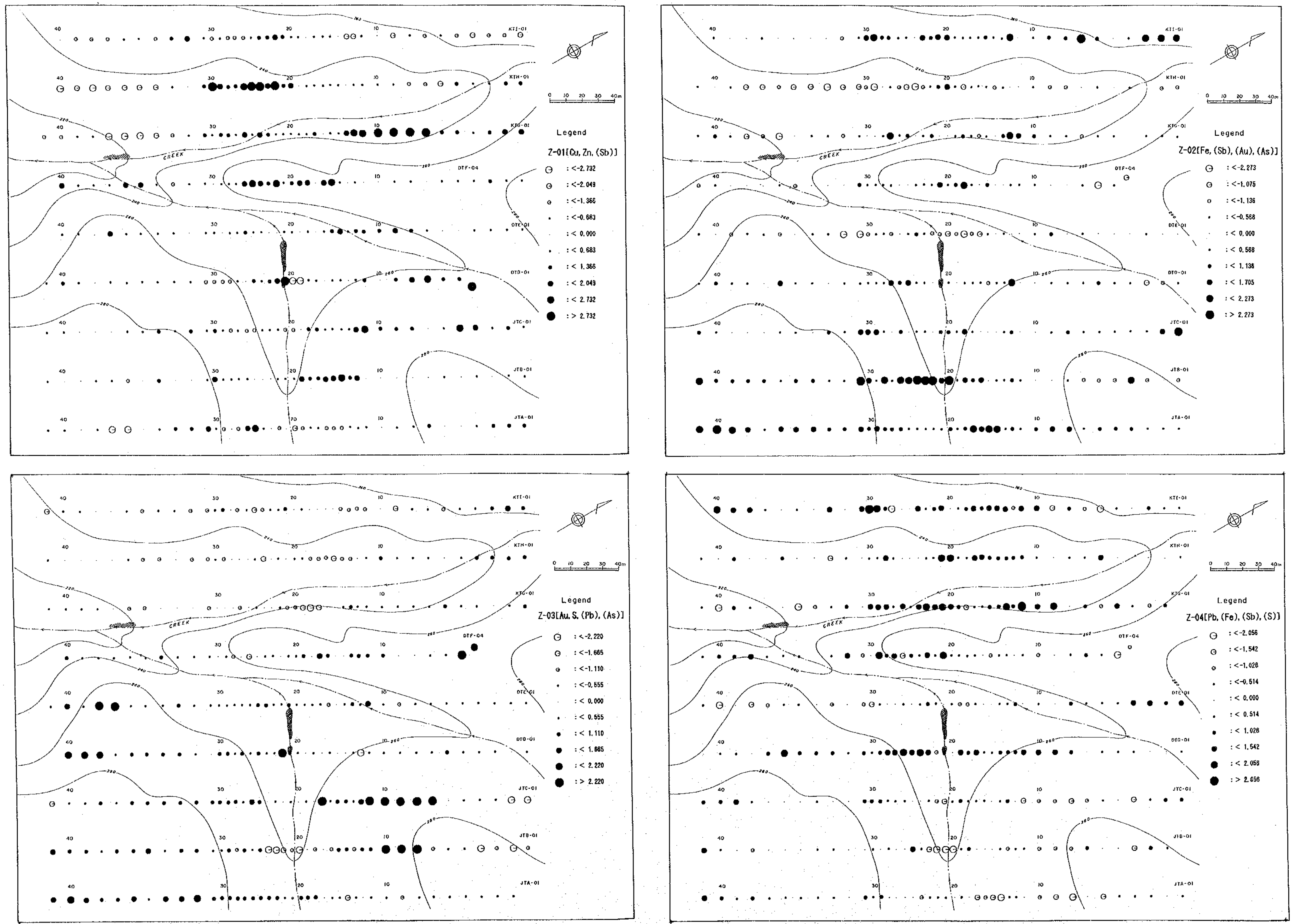


Fig. 41 Distribution of PCA Scores (Soil, Taganopol Mineral Occurrence) (1)

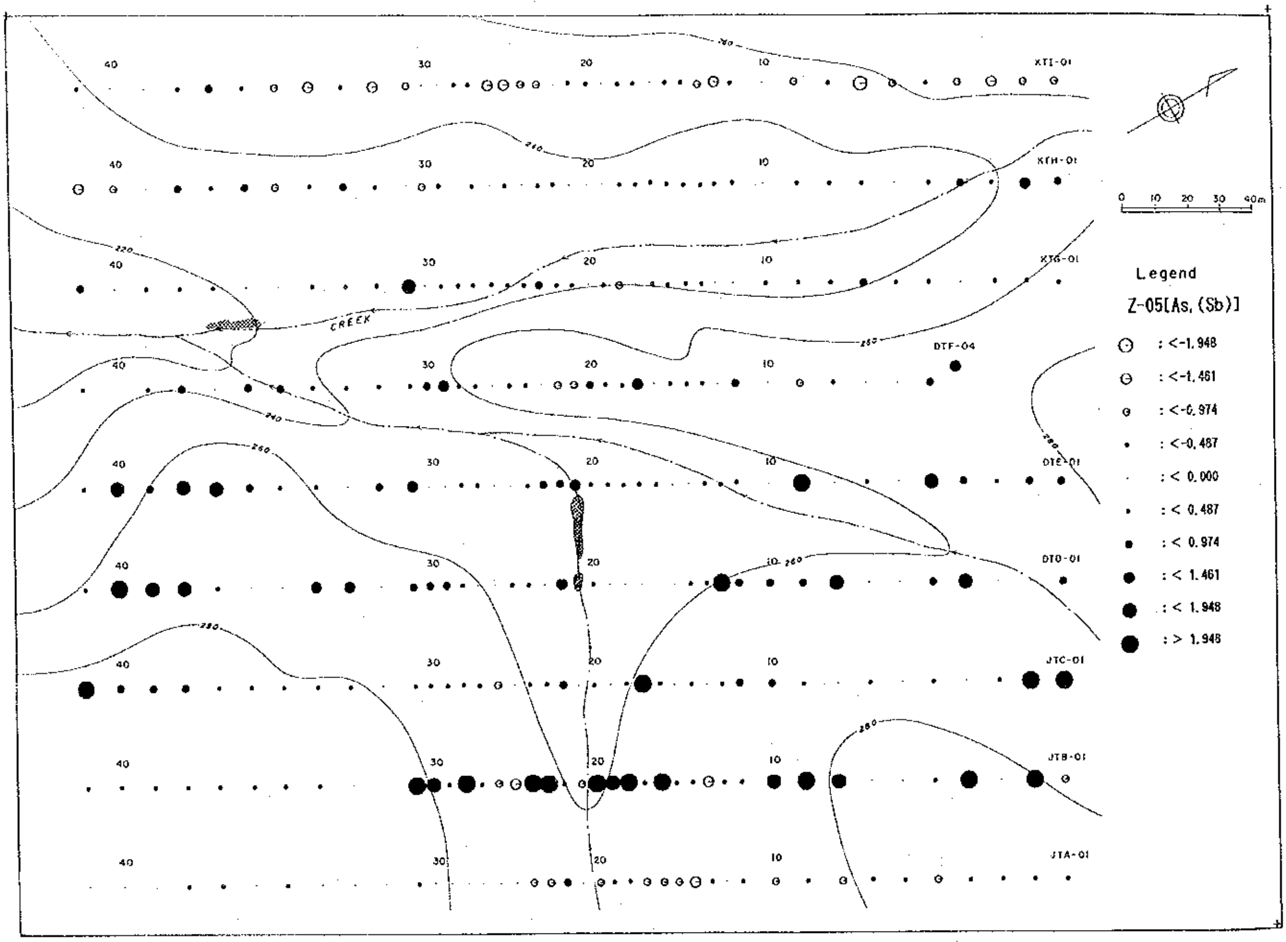


Fig. 41 Distribution of PCA Scores (Soil, Taganopol Mineral Occurrence) (2)

geochemical survey may show the boundary of the geology at the elevation of 260m through the third and fifth principal component, but geological evidences were not obtained.

2-3-3 Tagbak Area

(1) Monovariant Analysis: Total number of samples were 103. Sampling points are shown in Fig.42. Basic statistical values is shown in Table 38, classification of geochemical anomalies is in Table 39, scatter diagram is in Fig.43, frequency distribution and cumulative frequency distribution is in Fig.44, and distribution of geochemical anomalies is in Fig.45.

Maximum content of elements were Au 63ppb, Cu 281ppm, As 12ppm and Zn 132ppm. These contents are lower than that of Carorongan and Taganopol Mineral Occurrences. Mean content of Au is 2.9ppb. Fig.45 shows the distribution of geochemical anomalies in this area.

Table 37

Elemant	Unit	Maximum	Minimum	Average	Avg.-log	Std.Dev.
Au	ppb	63	<1.00	2.91	0.1566	0.4438
Ag	ppm	0.4	<2.00	0.12	-0.9446	0.1241
As	ppm	12	<2.00	1.22	0.0239	0.1514
Cu	ppm	281	30.0	142.41	2.1342	0.1324
Fe	%	8.85	5.13	6.96	0.8387	0.0574
Hg	ppm	<1.00	<1.00	0.5	-0.301	0
Mo	ppm	1	<1.00	0.56	-0.263	0.1
Pb	ppm	4	<2.00	1.03	0.0059	0.059
S	%	0.07	<0.001	0.02	-2.041	0.6297
Sb	ppm	4	<2.00	1.17	0.0468	0.1241
Zn	ppm	132	36.0	79.34	1.8816	0.1285

Table 38

	Au	As	Cu	Fe	Pb	S	Sb	Zn
Au	1.0000							
As	-0.0426	1.0000						
Cu	0.2985	-0.0007	1.0000					
Fe	-0.0341	0.0881	0.2002	1.0000				
Pb	0.1666	-0.0156	-0.0278	0.0310	1.0000			
S	0.2744	0.1198	-0.1038	0.3209	0.0862	1.0000		
Sb	0.1007	-0.0594	0.0218	0.0528	0.4429	-0.0271	1.0000	
Zn	0.0058	0.0373	0.5114	0.0421	-0.0581	-0.3354	0.0446	1.0000

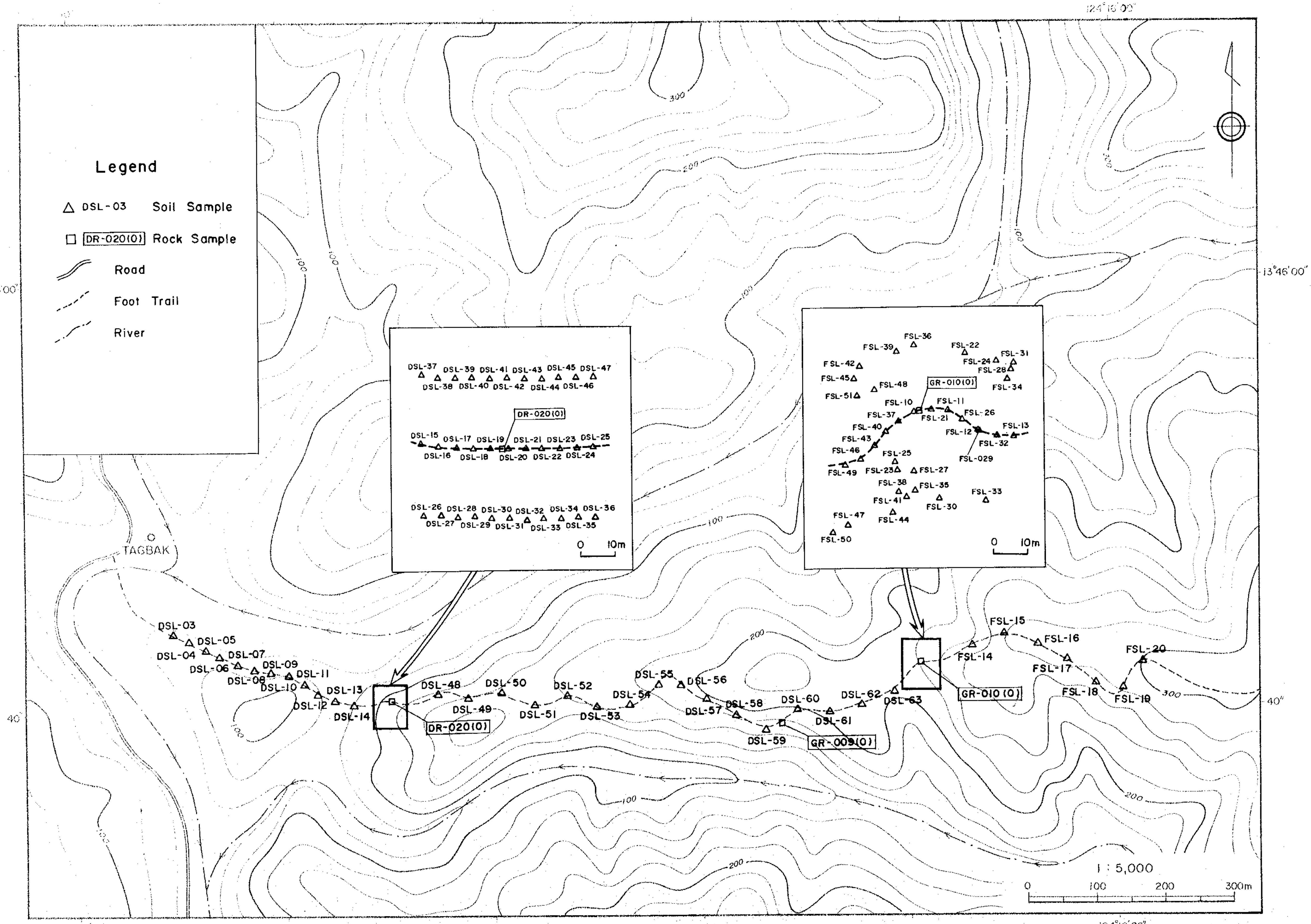


Fig. 42 Locality Map of Soil Samples (Tagbak Area)

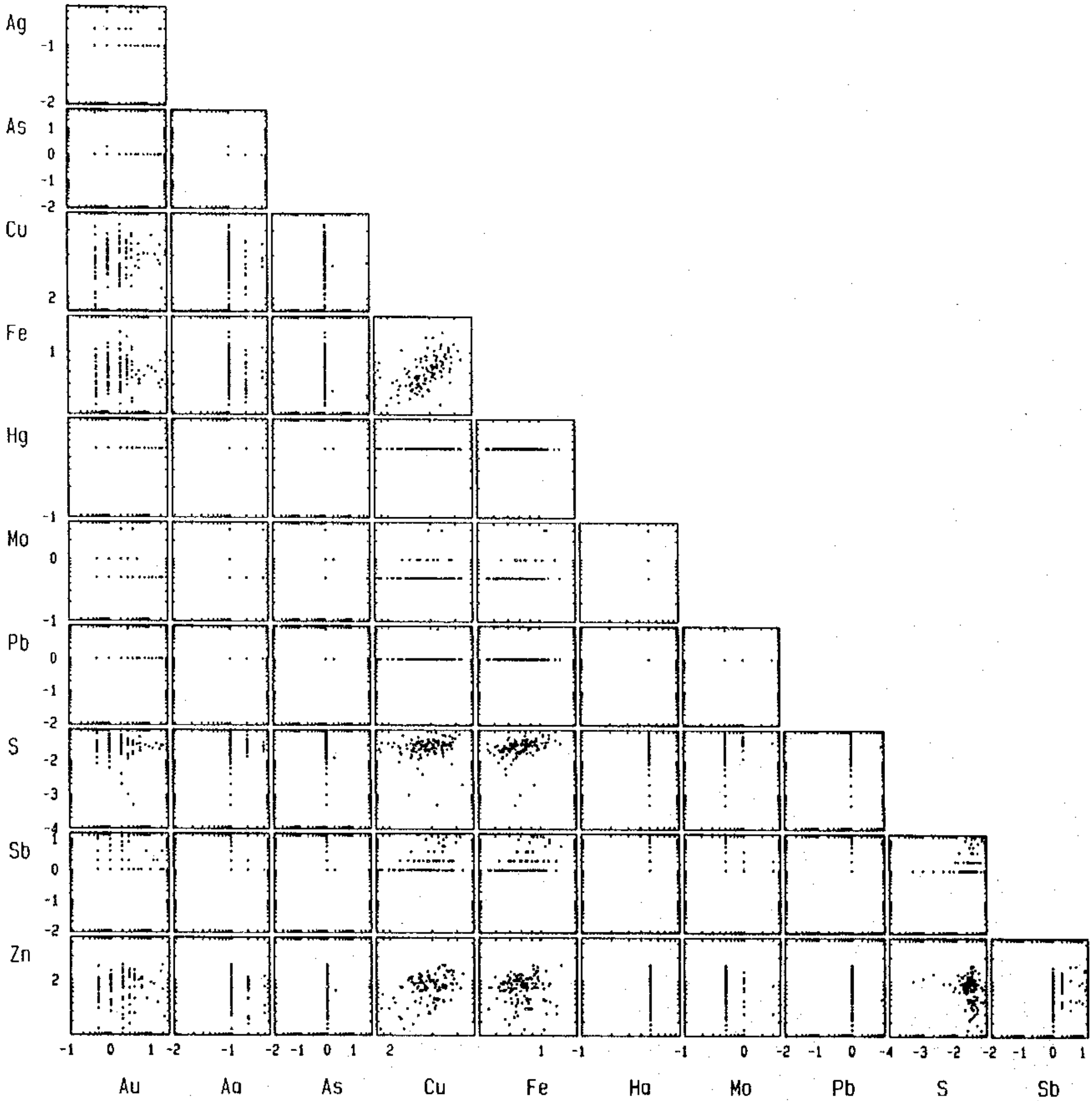


Fig. 43 Scatter Diagram (Soil, Tagbak Area)

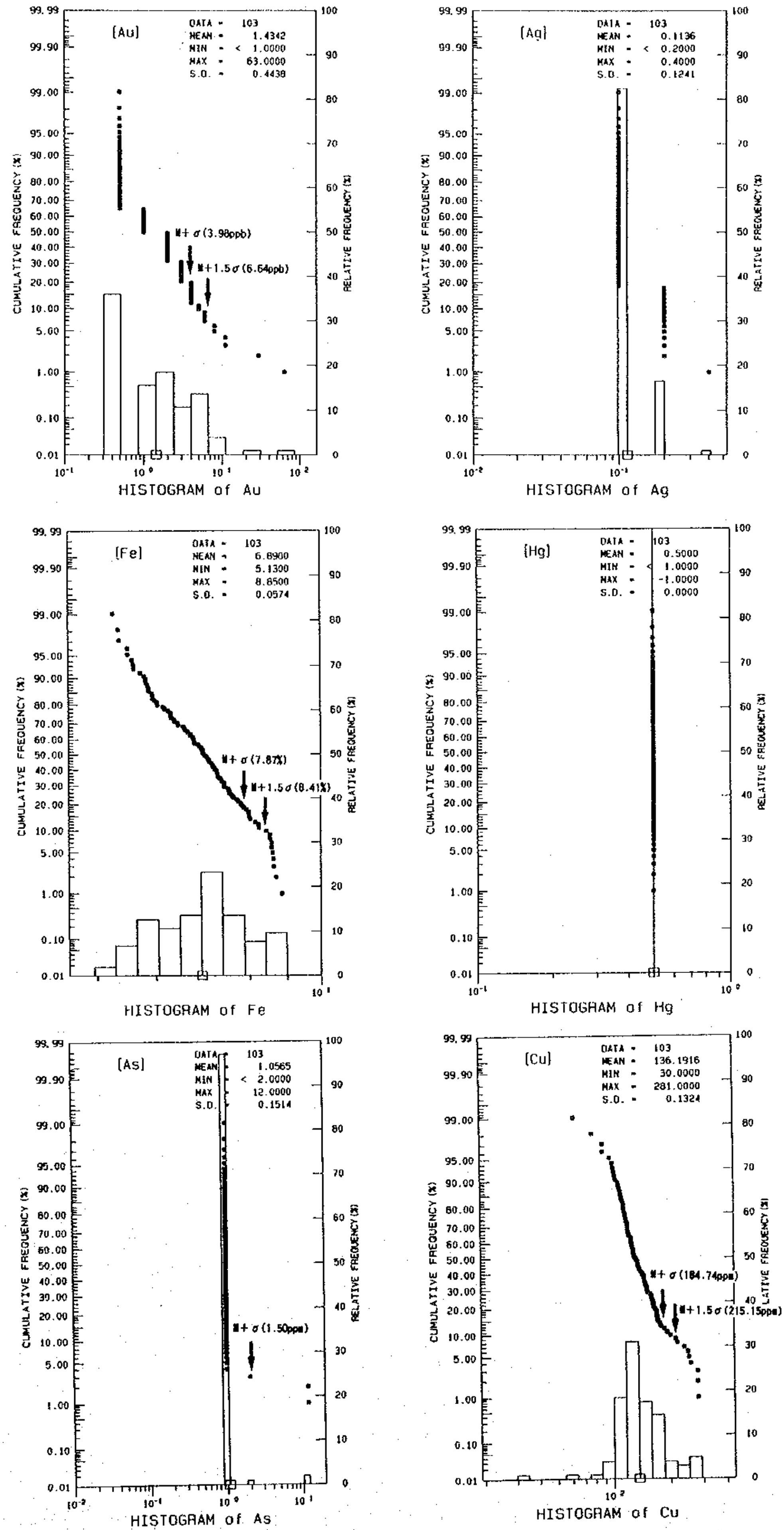


Fig. 44 Frequency Distribution and Cumulative Frequency Distribution (Soil, Tagbak Area) (1

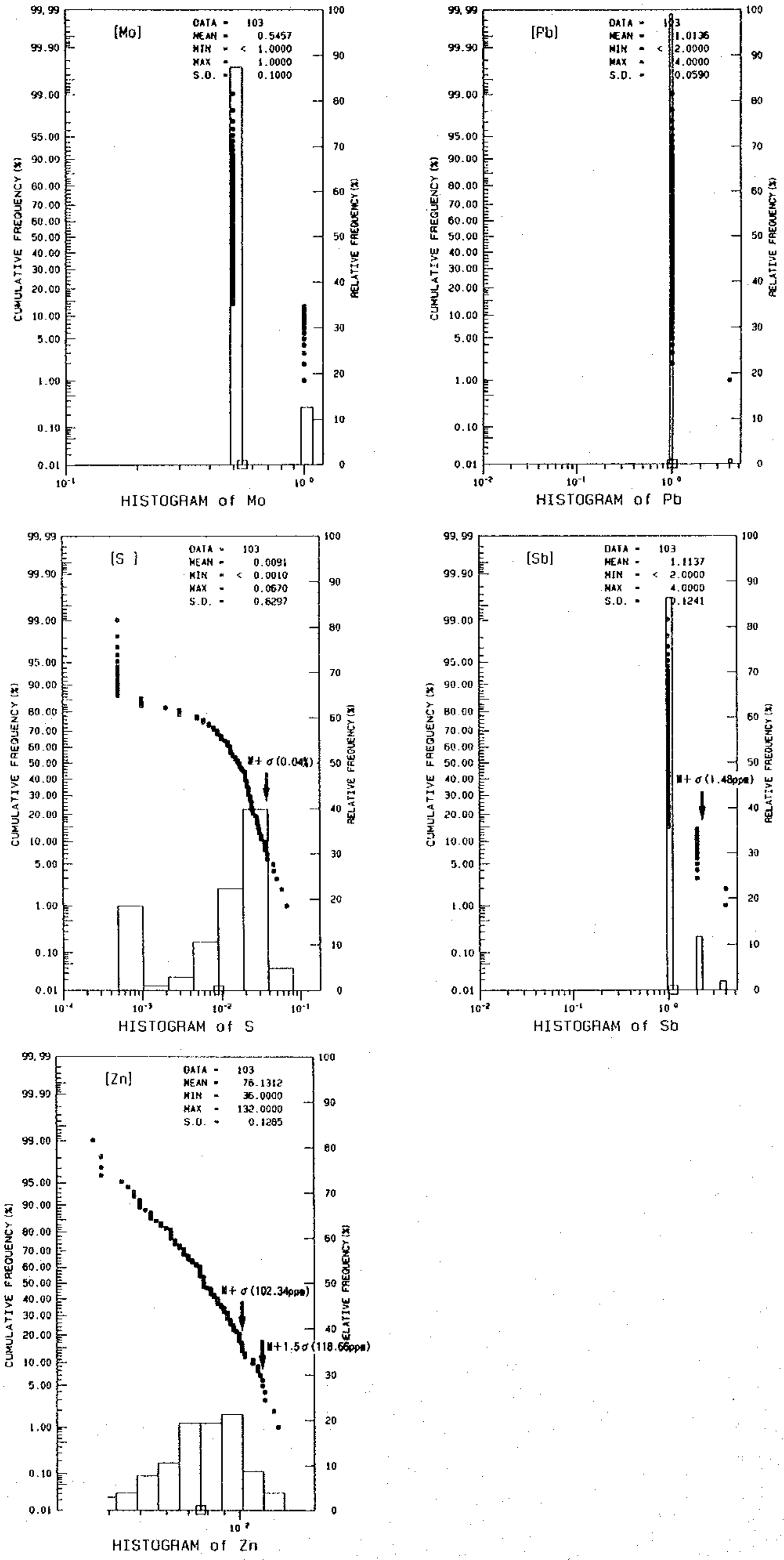


Fig. 44 Frequency Distribution and Cumulative Frequency Distribution (Soil, Tagbak Area) (2)

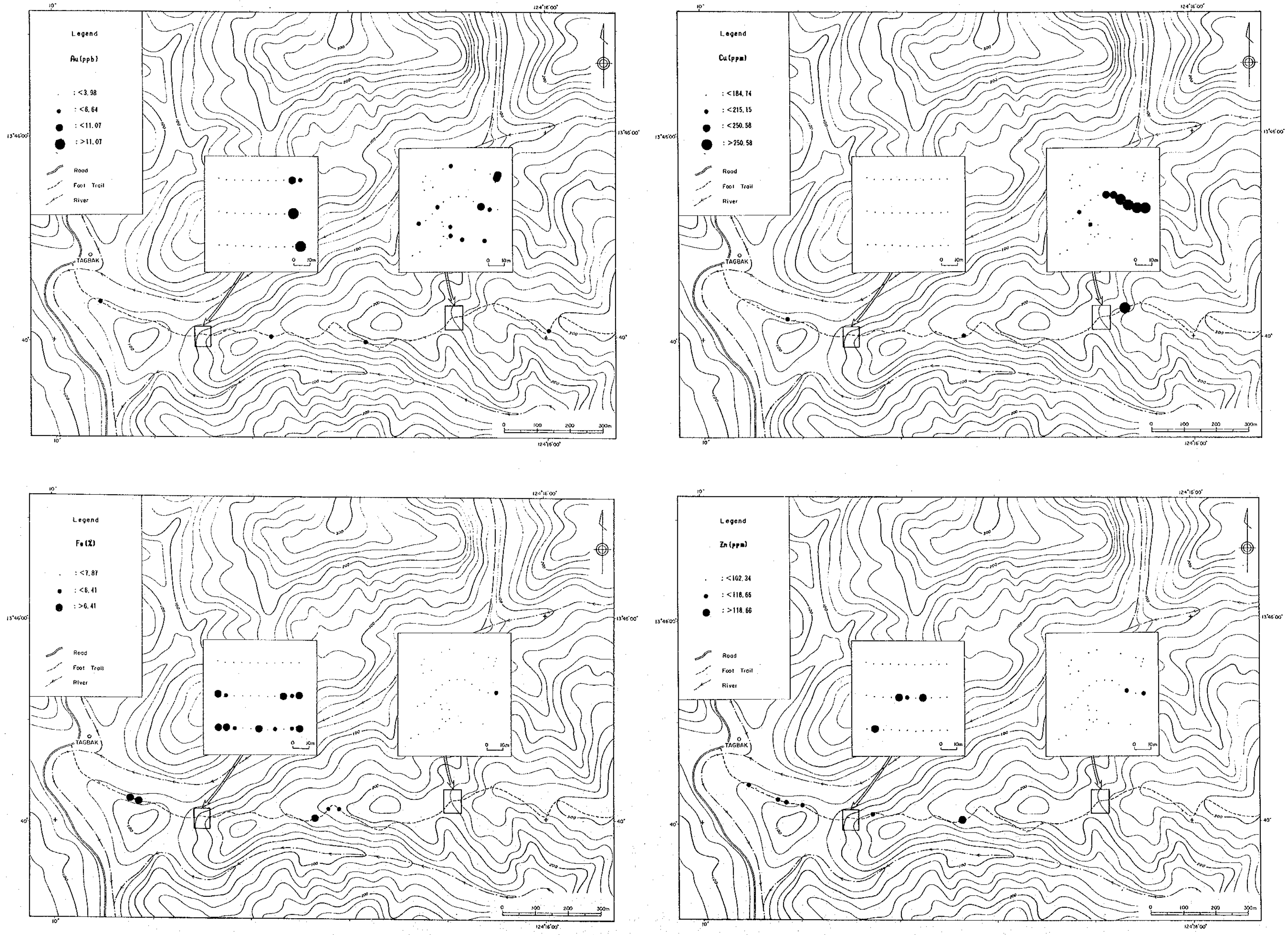


Fig. 45 Distribution of Geochemical Anomalies (Soil, Tagbak Area)

Table 39

Au	M+ σ(3.98ppb)	M+1.5 σ(6.64ppb)
As	M+ σ(1.50ppm)	
Cu	M+ σ(184.74ppm)	M+1.5 σ(215.15ppm)
Fe	M+ σ(7.87%)	
S	M+ σ(0.04%)	
Sb	M+ σ(1.48ppm)	
Zn	M+ σ(102.34ppm)	M+1.5 σ(118.66ppm)

(Au) No strong and definite anomalies were distributed. However, small anomalies are found in the two semi-grid sampling blocks.

(Cu) Cu anomalies are distributed in the western part of the survey area.

(Fe) Fe anomalies are distributed in the western part of the survey area.

(Zn) Zn anomalies are distributed scatter in the western part of the survey area.

(2) Multivariant Analysis (PCA): Correlation coefficients shown in Table 38 was used in the calculation of PCA. The results of PCA is shown in Table 40 and distribution of PCA scores is shown in Fig.46. From Table 38, positive correlations between Cu and Zn, weak positive correlation between Pb and Sb are noted. Eigenvalue is 1.68 and contribution is 21.0% for first principal component. Up to fifth principal component, each eigenvalue is almost over 1.0 and cumulative contribution is 83.4%. Accordingly, the first to fifth principal components are enough to explain the important behavior of elements. Following each principal component has such character mentioned below;

First principal component: Zn, Cu and (S) have large factor loading. S and other elements show opposite behavior. High scores are distributed in the eastern and western part of the area. This component shows behaviors of Zn and Cu. As the high scores are distributed nearly the quartz network zone, this component may have some relation with the formation of the quartz network zones.

Second principal component: Pb, Au, S, Sb and (Fe) have large factor loading. This component shows the mineralization of Au and related sulfide. However, high scores are not many and are scattered.

Third principal component: The factor loading of Sb, Pb, Fe, S and (As) are large in this component. Pb, Sb and other elements show opposite behavior. High scores are distributed in the eastern and western part of the survey area. And they tend to the located nearby the network zones.

Forth principal component: Au, As and (Fe) have large factor loading. High scores are scattered except in the eastern semi-grid sampling block where high score are concentrated. There is quartz network zone adjacent to this high score zone.

Fifth principal component: As and Fe have large factor loading. As and Fe show opposite behavior. High scores are scattered in the eastern semi-grid sampling block, in the central part and western part of the

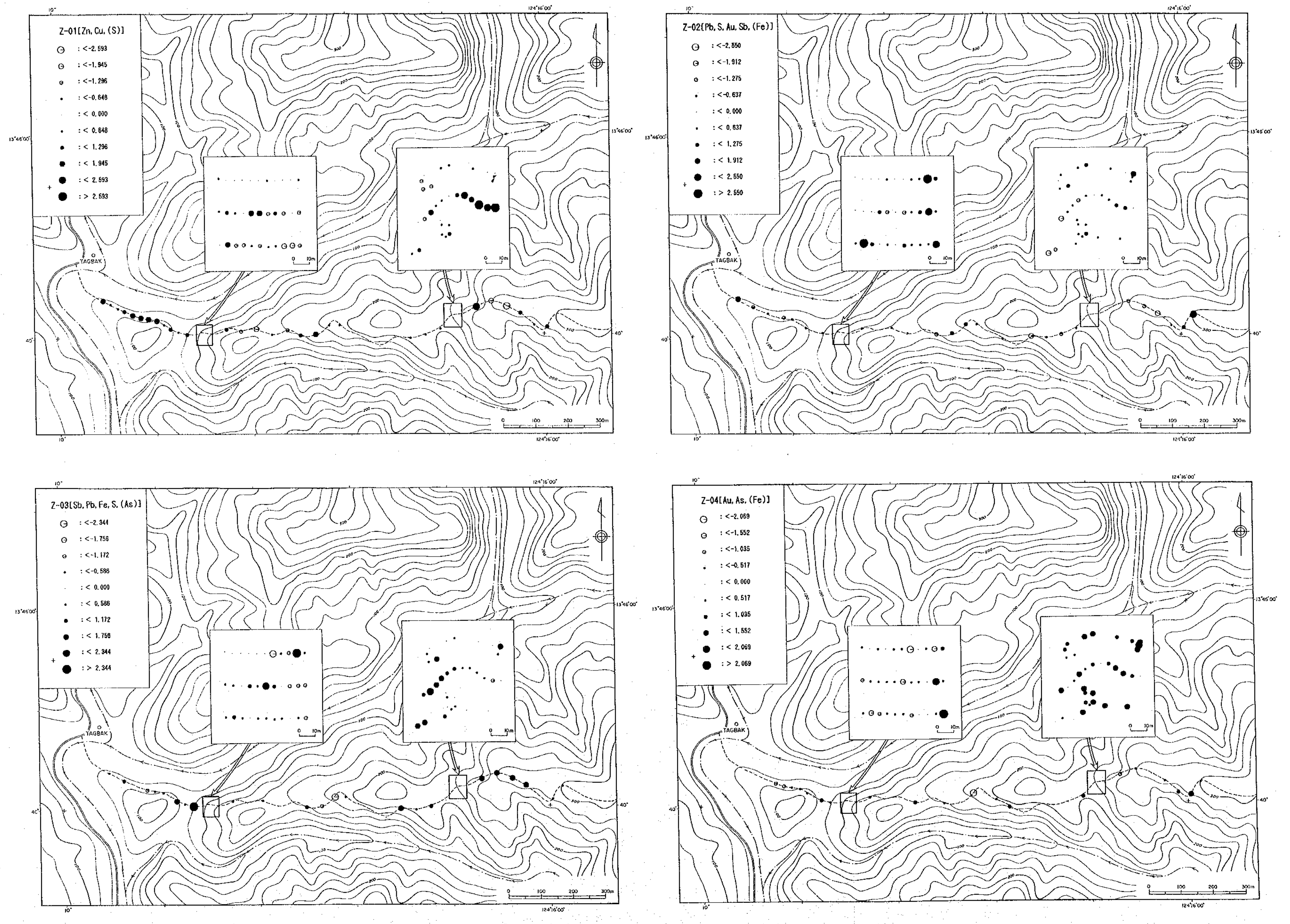


Fig. 46 Distribution of PCA Scores (Soil, Tagbak Area) (1)

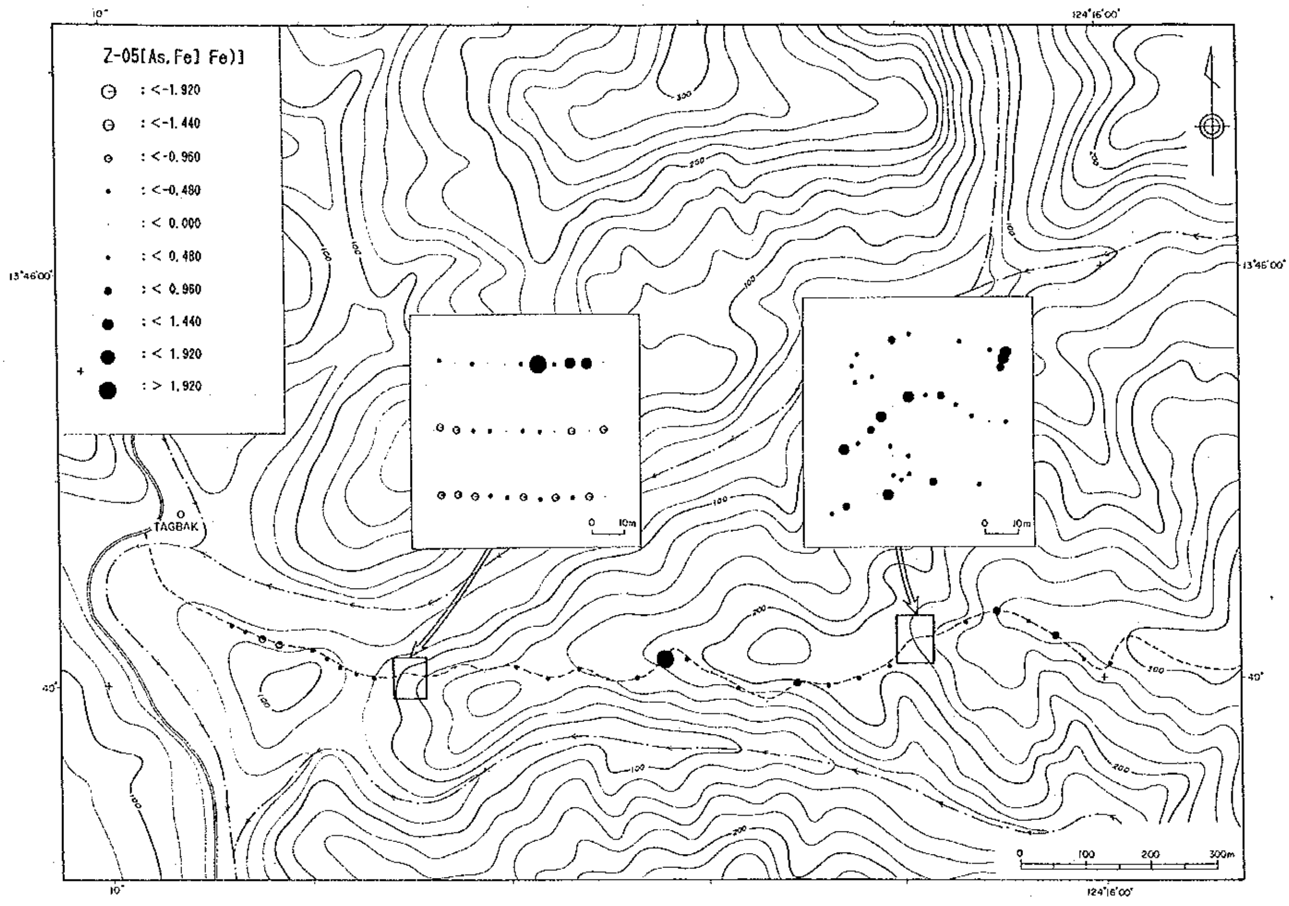


Fig. 46 Distribution of PCA Scores (Soil, Tagbak Area) (2)

survey area. High scores are located nearby the quartz network zones.

This area was selected as the potential area and deep-seated intrusion and/or related mineralization was expected because of the existence of quartz network zone. However, geochemical survey and geological surveys revealed that this area has not big potential for mineral at least in the shallow part.

Table 40

Eigenvalue

P.C.	E.V	Con.	Cum.Con.
Z-01	1.6807	21.0081	21.0081
Z-02	1.6255	20.3186	41.3267
Z-03	1.3736	17.1704	58.4972
Z-04	1.0706	13.3824	71.8796
Z-05	0.9217	11.5210	83.4006
Z-06	0.5379	6.7233	90.1239
Z-07	0.4337	5.4216	95.5455
Z-08	0.3564	4.4545	100.0000

Factor Loading

	Z-01	Z-02	Z-03	Z-04	Z-05
Zn	0.8578	-0.1129	-0.0167	-0.1638	0.0407
Cu	0.8246	0.2142	-0.2652	0.1294	-0.0309
Pb	-0.0398	0.6503	0.5048	-0.1954	0.1013
S	-0.4543	0.5654	-0.5104	0.1243	-0.0381
Sb	0.1127	0.5595	0.5731	-0.3008	-0.0514
Fe	0.0728	0.4055	-0.5414	-0.4374	-0.5120
Au	0.1919	0.5870	-0.1135	0.6503	0.2836
As	-0.0454	0.0491	-0.3917	-0.5184	0.7498

2-3-4 Barinad Area

This random soil geochemical survey was carried out mainly to evaluate the gabbro area with native copper and subordinarily to get geochemical information at the Kadlakogod Area.

As sampling was primarily concentrated in Barinad Area, this area is called Barinad Area.

(1) Monovariant Analysis: Total number of samples were 113. Sampling points are shown in PL-1. Basic statistical values is shown in Table 41, correlation coefficients is in Table 42, classification of geochemical anomalies is in Table 43, scatter diagram is in Fig.47, and frequency distribution and cumulative frequency distribution is in Fig.48.

Maximum and mean values of elements are; Au 29ppb and 3.3ppb, Cu 330ppm and 193.0ppm, Pb 8ppm and 1.1ppm, Zn 334ppm and 86.7ppm. Mean content of Cu is 4 times larger than that of Clarke number and those of Cu and Zn are almost equal and Pb is about one tenth to the number.

Table 41

Elemant	Unit	Maximum	Minimum	Average	Avg.-log	Std.Dev.
Au	ppb	29	<1.00	3.32	0.2516	0.4358
Ag	ppm	0.4	<2.00	0.13	-0.9333	0.1484
As	ppm	40	<2.00	1.35	0.0168	0.1524
Cu	ppm	330	79	192.96	2.2692	0.1218
Fe	%	12.55	4.86	8.19	0.9065	0.0754
Hg	ppm	<1.00	<1.00	0.5	-0.301	0
Mo	ppm	3	<1.00	0.6	-0.2526	0.1371
Pb	ppm	8	<2.00	1.06	0.008	0.0846
S	%	0.07	<0.00	0.03	-1.6253	0.3053
Sb	ppm	14	<2.00	2.19	0.1737	0.3133
Zn	ppm	334	20	86.74	1.9019	0.1818

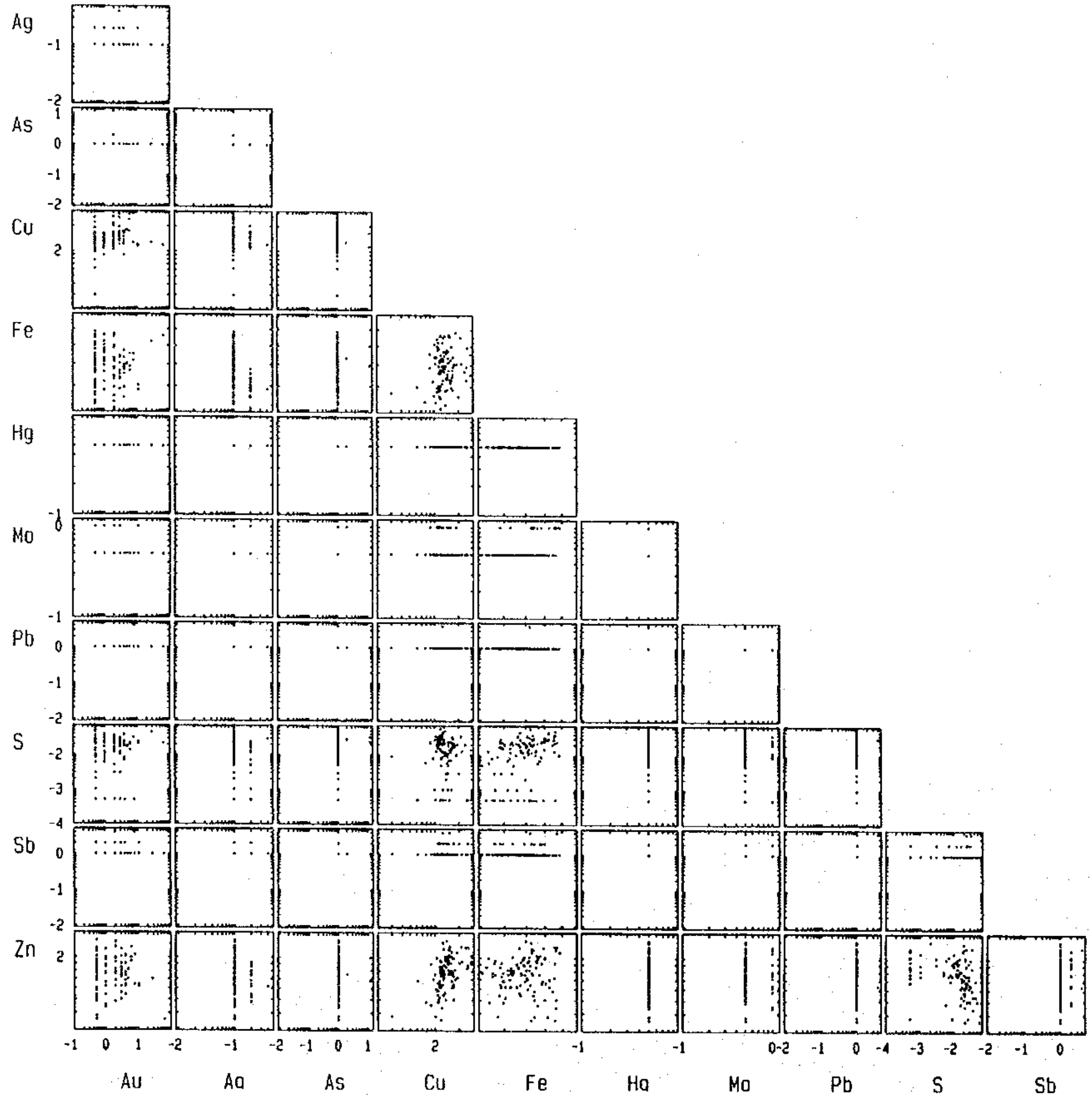


Fig. 47 Scatter Diagram (Soil, Barinad Area)

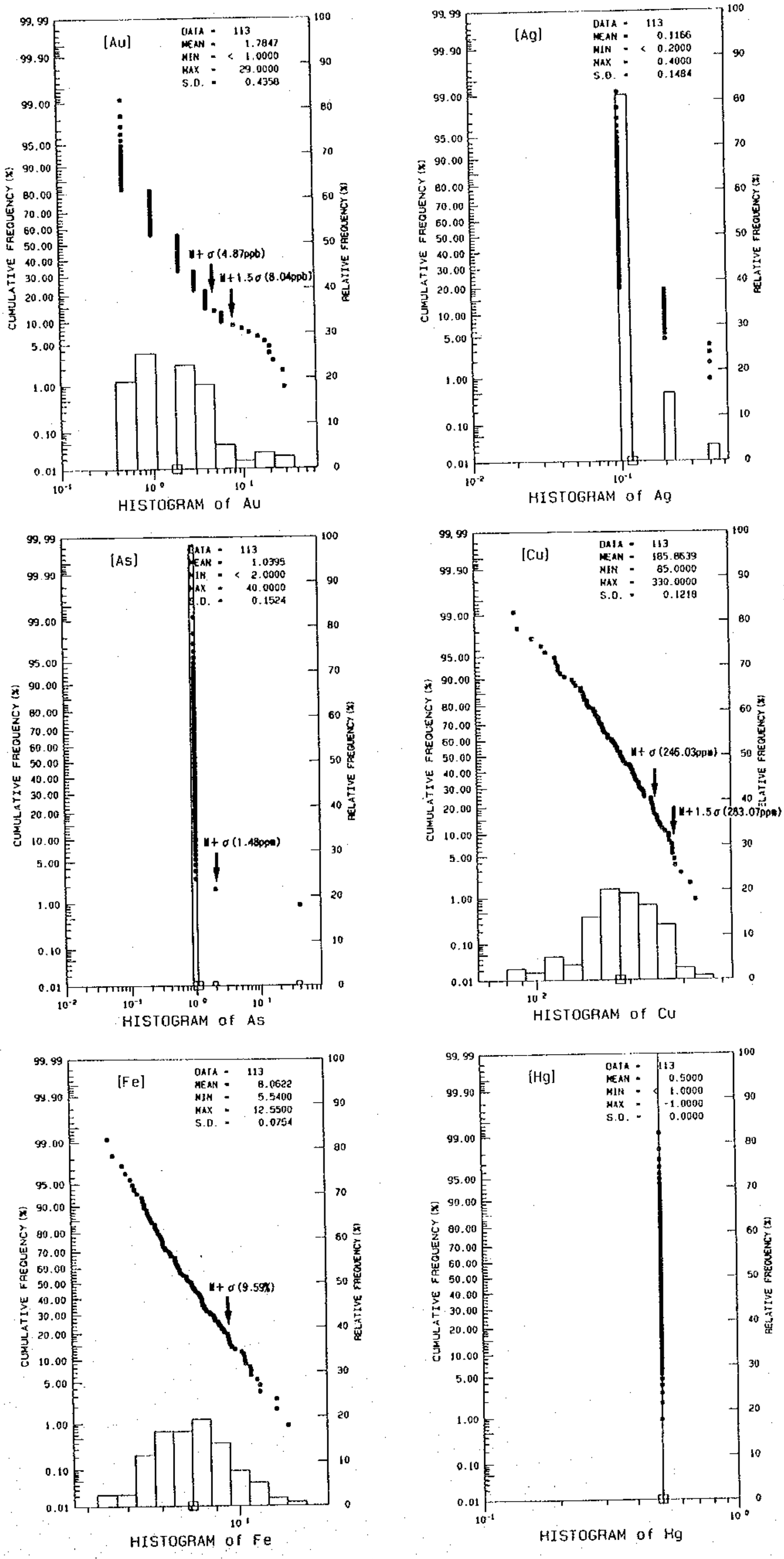


Fig. 48 Frequency Distribution and Cumulative Frequency Distribution (Soil, Barinad Area) (1)

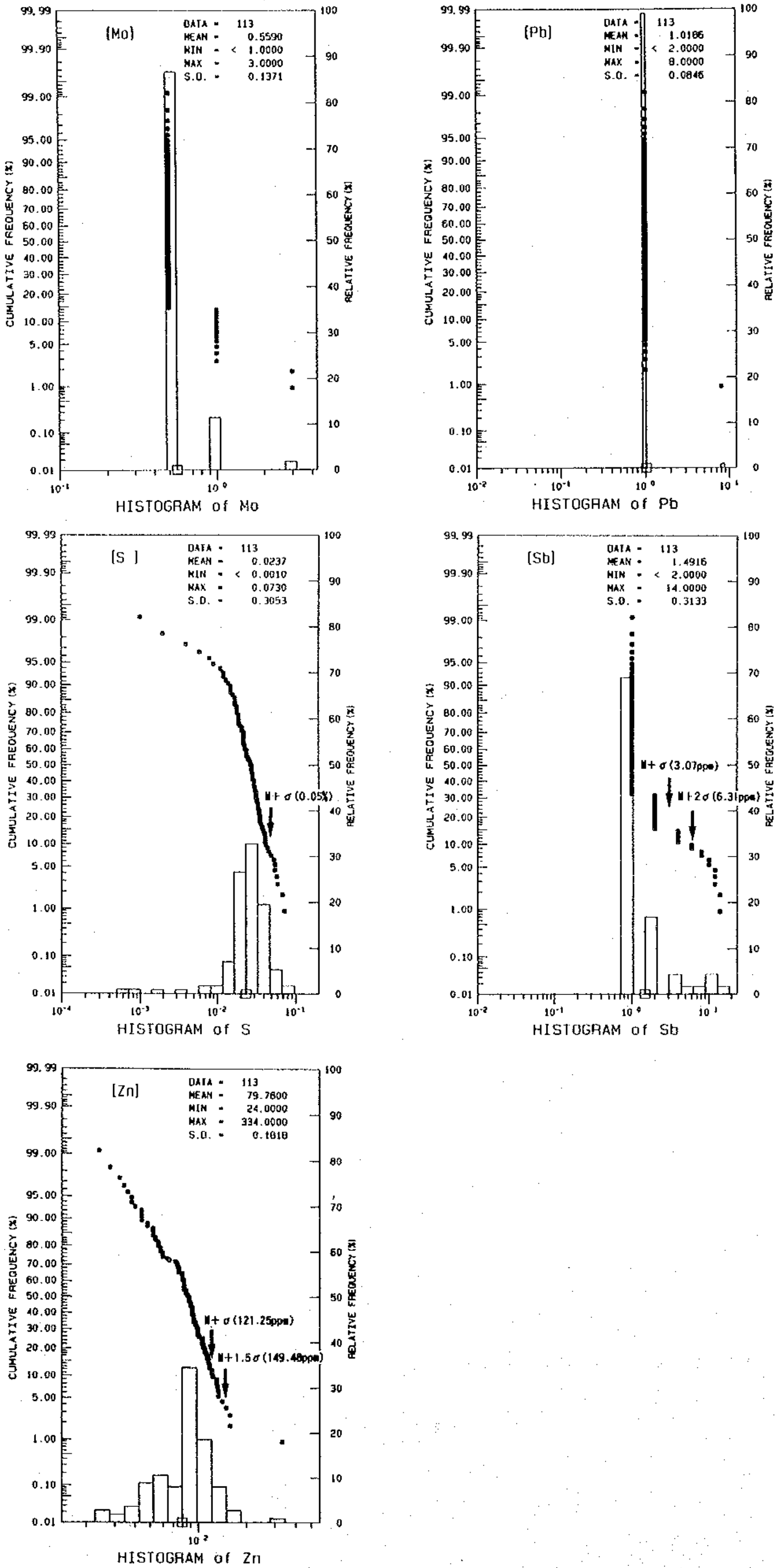


Fig. 48 Frequency Distribution and Cumulative Frequency Distribution (Soil, Barinad Area) (2)

Table 42

Au	1.0000							
As	-0.1280	1.0000						
Cu	0.2258	-0.0203	1.0000					
Fe	0.1119	-0.1658	0.5329	1.0000				
Pb	0.0489	-0.0104	0.0629	0.0470	1.0000			
S	-0.0391	0.0055	0.0880	0.3342	0.0227	1.0000		
Sb	-0.0330	-0.0612	0.2507	0.3819	0.2200	0.2400	1.0000	
Zn	0.0879	0.0030	0.4247	0.0623	-0.0720	-0.2674	0.1536	1.0000
	Au	As	Cu	Fe	Pb	S	Sb	Zn

Table 43

Au	M+ σ(4.87ppb)	M+1.5 σ(8.04ppb)
As	M+ σ(1.48ppm)	
Cu	M+ σ(246.03ppm)	M+1.5 σ(283.07ppm)
Fe	M+ σ(9.59%)	
S	M+ σ(0.05%)	
Sb	M+ σ(3.07ppm)	M+2 σ(6.31ppm)
Zn	M+ σ(121.25ppm)	M+1.5 σ(149.48ppm)

Fig.49 shows distribution of geochemical anomalies of the survey area.

(Au) Au content is low. Anomalies are distributed in the gabbro area of the Barinad creek. There is no anomalies in the Kadlakogod creek, except one point of high Au anomaly.

(Cu) Cu anomalies are distributed only in the gabbro area of the Barinad creek. Cu content in soil is not high to suggest the existence of the promising copper deposit at least in the shallow part.

(Sb) Anomalies are mainly distributed in the gabbro area of the Barinad creek and in the Tabyonan creek. Sb anomalies in the upper reaches of the Kadlakogod creek is small.

(Zn) Anomalies are distributed mainly in the Barinad creek. Anomalies in the Tabyonan creek and the Kadlakogod creek are single anomaly respectively.

(2) Multivariant Analysis (PCA): Correlation coefficients shown in Table 42 was used in the calculation of PCA. The results of PCA is shown in Table 44 and distribution of PCA scores is shown in Fig.50.

From Table 42, positive correlation was noted between Cu and Fe, and weak positive correlation was noted between Cu and Zn. The eigenvalue is 2.09 and contribution is 26.11% for the first principal component. Up to fifth principal component, each eigenvalue is almost over 1.0 and cumulative contribution is 82.11%. Accordingly the first to fifth principal components are enough to explain the important behavior of elements. Each principal component has character as describe below.

First principal component: The factor loadings of Fe, Cu, Sb, (Zn) and (S) are large in this component. This component shows the sulfide mineralization and possibly show the rock of gabbro. High

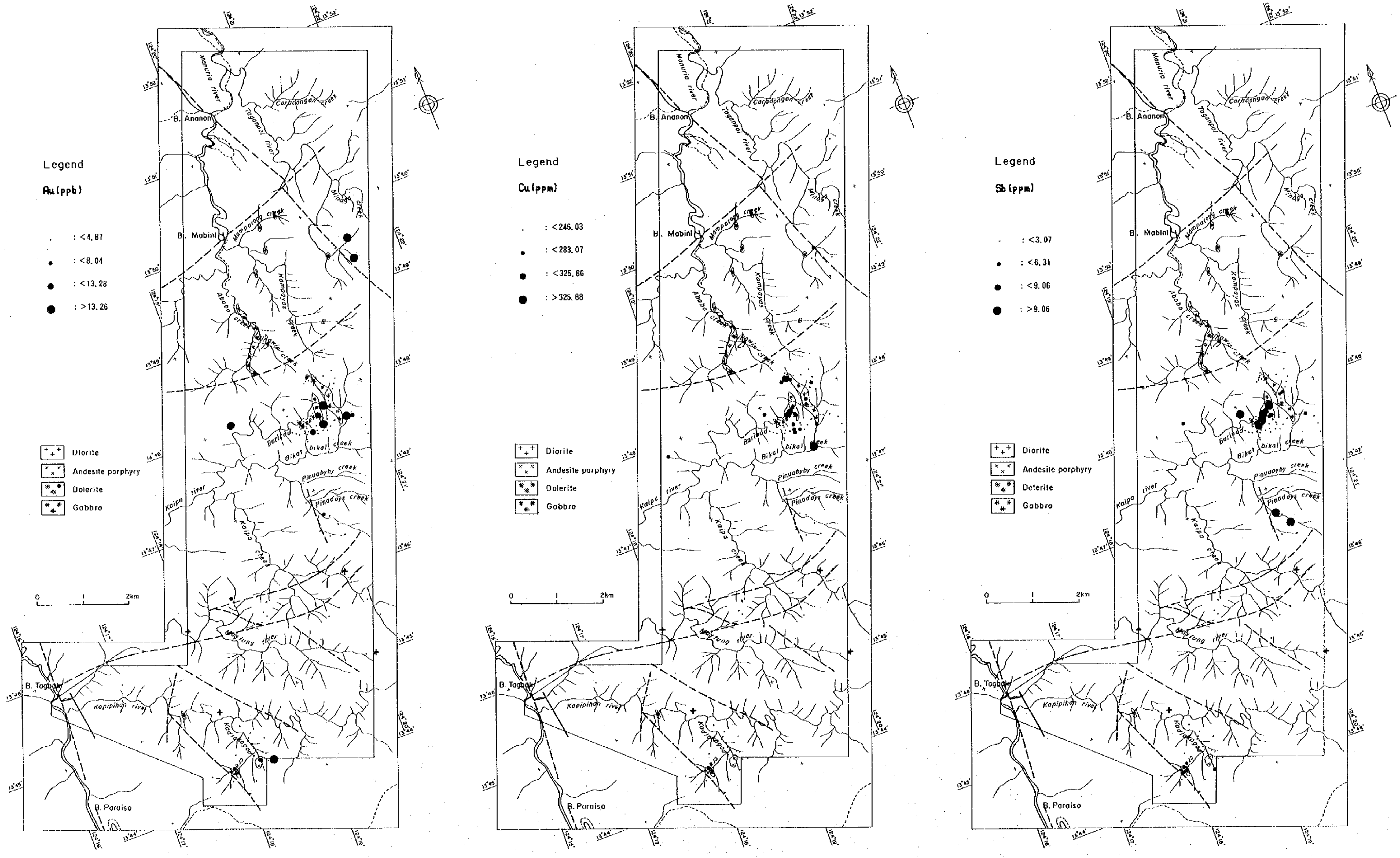


Fig. 49 Distribution of Geochemical Anomalies (Soil, Barinad Area) (1)

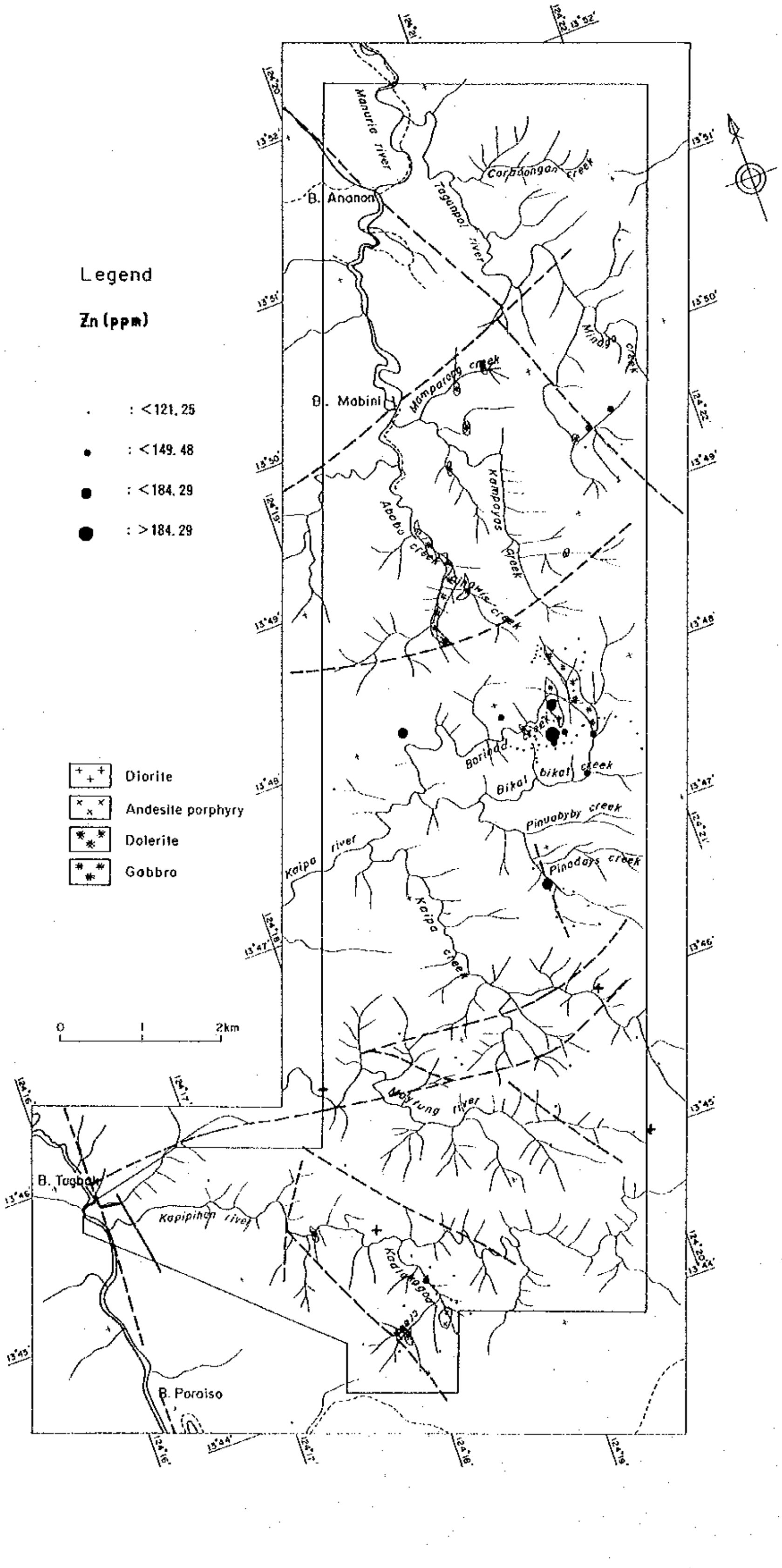


Fig. 49 Distribution of Geochemical Anomalies (Soil, Barinad Area) (2)