

## Chapter 4 Geochemical Survey

### 4 - 1 Method of Survey

A total of 817 sites were selected for geochemical sampling in the survey area covering 2,000km<sup>2</sup>, stream sediments with grain size below 80 mesh were sampled, and the elements shown in Table 1-2 were analyzed. Also overlapping samples were collected at 40 localities in order to check the error of sampling. In the selection of stream sediment sampling sites, confluence of the main drainage and branch streams, and 1 sampling point for every 1km<sup>2</sup> were aimed at. The collected samples were sifted by 80 mesh sieves and sent for analysis.

### 4 - 2 Results of Geochemical Survey

#### (1) Results of analysis

The results are appended in Table A-8. The statistics of the components are laid out in Table 2-8.

#### (2) Sampling errors

As seen in Table A-8 for duplicate samples, the analytical results of the elements with the exception of Au are judged to be within analytical errors. The analysis of overlapping samples of individual sampling sites shows very close values with the exception of Au. The reason for the large fluctuation of Au values is inferred to be the "nugget effect".

#### (3) Correlation among elements

- Au: As seen in Table 2-9, Au has weak positive correlation with Na, Mg, Ni, Sr, but does not show notable correlation with As, Hg, Pb, Zn, Cu. And there is no correlation with Pb, Zn, and Cu.
- Cu: Positive correlation is observed with Pb and As. Also positive correlation exists with K, Al, and Mg. This probably reflects alteration.
- Pb: Positive correlation exists with Cu, Zn, and As.
- Zn: Positive correlation is observed with Cd, Bi, Pb, and strong positive correlation exists with Ti, Cr, Mn, Fe, and Co indicating that Zn reflects not only mineralization, but also alteration of the host rock.
- Mo: Weak positive correlation exists with Cu, and correlation coefficient of Mo is generally low.
- Other elements: Correlation among the so-called siderophile elements (Fe, Ni, Co, V, Cr, and Mn), and that among the components of rock-forming minerals (K, Al, and Mg) are inferred to reflect the nature and alteration of the host rock.

#### (4) Distribution of anomalies of the elements

From the analytical results, Au, Cu, Pb, As are considered to be the most effective indicator elements for Au, Ag, Cu, Mo, Pb, Zn mineralization of the survey area. Also Hg, Zn, and Mo are also considered to be effective pathfinders. The distribution of the anomalies of these elements is as follows.

- Au: The content of Au in stream sediments is generally low, and thus threshold value of 38ppb was used. Anomalies of over 38ppb were detected at 10 localities, namely (a) Tegalombo – Slahung district, (b) south of Slahung district, (c) Lorog River district, (d) east of Punung, (e) Wonocoyo district, and (f) Kedungwedi River district. Anomalies occur in 2 sites in (a),(c), and (e) districts.

Of the above, anomalies exceeding 50ppb are; A003S (66ppb), A49S (67ppb), A111S (96ppb), A114S (219ppb), E126S (69ppb), F043S (132ppb), and F089 (60ppb). And those exceeding 16ppb ( $> \text{mean} + 1 \times \text{standard deviation}$ ) amount to 34 sites, and are abundant in (a) Tegalombo – Slahung district.

- Ag: 12 samples exceeding 17 ppm ( $> \text{mean} + 3 \times \text{standard deviation}$ ) were defined as anomalies. They are concentrated in (a) Tegalombo - Slahung district and (b) south of Slahung. Sample A024S contains overlapping anomalies of Pb, Zn, and Cu, and F056S with Mo, and thus these Ag anomalies are considered to be related to mineralization.
- Cu: 3 samples exceeding 116ppm ( $> \text{mean} + 3 \times \text{standard deviation}$ ) were defined as anomalies. The anomalies occur in (a) Tegalombo - Slahung district (A024S), (c) Lorog River district (B094), and (e) Candi-Pule district (D042S). These samples also show anomalies of Ag, Pb, Zn, As, Mo, and Mo-Hg.
- Pb: 4 samples exceeding 58ppm ( $> \text{mean} + 3 \times \text{standard deviation}$ ) were defined as anomalies. The anomalies occur in (a) Tegalombo - Slahung district (A010S and A024S), (c) Lorog River district(B040S), and (d) east of Punung (E112S). Of these, A024S overlaps with Ag, Cu, Pb, Zn, and As anomalies and E112S with Zn, while A010S and B040S are isolated anomalies.
- As: 8 samples exceeding 44ppm ( $> \text{mean} + 3 \times \text{standard deviation}$ ) were defined as anomalies. These anomalies occur in (a) near Tegalombo - Slahung district (A24S and B32S) , (b) south of Slahung (D079S and F078S), (c) near Lorog River (B092S), (d) east of Punung (E117S), and (e) east of Pule (B046S and D057S). Of these 5 samples also show weak Au anomalies ( $2 \sim 6$ ppb). The As anomalies are scattered, but are relatively concentrated from the southern part of Ponorogo to the Lorog River and this is correlated largely to the distribution of mineral showings.

- Hg: 7 samples exceeding 166ppb ( $> \text{mean} + 3 \times \text{standard deviation}$ ) were defined as anomalies. These anomalies are distributed in (b)south of Slahung (E047S), (e)east of Pule (D042S and D043S), west of Ponorogo, and west of Wonogiri (F113S), east of Pacitan (B084), (d)east of Punung (D150S). Two of these samples also show Au anomalies.
- Mo: 9 samples exceeding 2.3ppm ( $> \text{mean} + 3 \times \text{standard deviation}$ ) were defined as anomalies. Anomalies occur in (c) near Lorog River (B094S and 052S), (e) east of Pule (D042S), (f) Wonocoyo district (F056S, F072S), central-northern part (C019S and C043S), and (d) east of Punung (D138S and E109S). Of these samples, F056S shows Ag anomaly, B094S Cu anomaly, and C019 Hg anomaly, they do not show Au, Ag, Cu, Pb, nor Zn anomalies.
- Zn: 10 samples exceeding 271ppm ( $> \text{mean} + 3 \times \text{standard deviation}$ ) were defined as anomalies. As mentioned above, Zn content is controlled by the lithology of the host rocks and thus whether the anomaly is due to mineralization or not needs to be checked, and it is possible to clarify the relation with mineralization by examining the relation with other elements. These anomalies occur at the following 10 sites. (a) Tegalombo - Slahung district (A010S and A024S), (b) south of Slahung (E006S and E029S), (c) along the Lorog River (A051S), (e) east of Punung (A071S), (f) north of Pule (C143S and C155S), and Kedungwedi River district (E126S and E141S).

第2-8表 地化学探査試料分析結果の統計値

	Au	Be	Na	Mg	Al	P	K	Ca	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	As	Sr	Mo	Ag	Cd	Sb	Ba	W	Hg	Pb	Bi	
	ppb	ppm	%	%	%	%	%	%	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppb	ppm	ppm
number	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817
minimum	0.5	0.25	0.005	0.11	0.61	0.005	0.005	0.04	0.02	84	8	433	2.03	6	1	7.1	26.5	1.5	3.7	0.5	0.1	0.5	2.5	10	5	2.5	1	0.5	
maximum	219	9.2	0.29	2.05	5.98	0.12	0.22	12.5	1.28	1180	185	3920	23.2	61	51	477	580	241	1040	8	8.3	7	9	745	5	1120	398	35	
average(av)	3.963	0.3636	0.0533	0.585	2.044	0.018	0.068	0.704	0.3508	366.9	35.71	1270.4	8.4823	22.51	12.2	33.01	121.2	4.65	59.67	0.6	0.25	0.65	2.51	92.07	5	17.629	8.528	8.76	
standard deviation(std)	11.52	0.3561	0.0393	0.393	0.919	0.011	0.035	1.043	0.2372	174.8	19.48	380.93	3.441	8.172	6.62	27.84	50.06	13.2	55.95	0.55	0.69	0.66	0.23	65.81	0	49.641	16.37	7.67	
average+std	15.49	0.7197	0.0926	0.979	2.963	0.029	0.103	1.747	0.588	541.6	55.19	1651.3	11.923	30.68	18.8	60.85	171.3	17.9	115.6	1.15	0.94	1.31	2.74	157.9	5	67.27	24.9	16.4	
average+2std	27.01	1.0758	0.1319	1.372	3.881	0.04	0.138	2.789	0.8251	716.4	74.67	2032.2	15.364	38.85	25.4	88.68	221.4	31.1	171.6	1.71	1.63	1.97	2.96	223.7	5	116.91	41.27	24.1	
average+3std	38.53	1.4319	0.1712	1.765	4.8	0.051	0.174	3.832	1.0623	891.2	94.15	2413.2	18.805	47.02	32	116.5	271.4	44.3	227.5	2.26	2.32	2.63	3.19	289.5	5	166.55	57.64	31.8	
number for samples >av+2Xstd	15									39	0	23		29	42	16	33	15		23	15	46		29		7	12	46	
number for samples >av+3Xstd	10									5	0	9		15	6	3	10	8		9	12	23		11		7	4	3	

Reference

Crustal Abundance	3	2	2.5	1.7	8.1	0.09	2.5	3.3	2	150	100	1000	4.65	25	75	50	80	2	300	1.5	0.05	0.1	0.1	580		20	10	0.1
Mafic rock	3.2															72	94	1.5		1.5	0.1	0.2		330		0.01	4	0.05
Granitic rock	2.3															12	51	2.1		1.3	0.04	0.1		840		0.04	18	0.3



Table 2-9 Correlations between Elements of Geochemical Samples

	Au	Be	Na	Mg	Al	P	K	Ca	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	As	Sr	Mo	Ag	Cd	Sb	Ba	W	Hg	Pb	Bi	
Au	1.000	0.001	0.231	0.190	0.145	0.132	0.101	0.039	-0.009	0.007	0.022	-0.042	-0.026	0.077	0.195	0.084	-0.059	-0.031	0.118	-0.028	0.053	0.009	-0.008	-0.036	-	-0.024	-0.036	0.039	
Be		1.000	0.020	0.022	0.044	0.023	0.004	-0.018	0.007	0.035	0.020	0.004	0.034	0.050	0.041	0.010	-0.005	-0.028	0.010	-0.007	-0.001	0.003	-0.011	0.011	-	0.003	-0.019	0.025	
Na			1.000	0.345	0.422	0.241	0.209	0.367	-0.015	-0.074	0.067	-0.091	-0.170	0.000	0.320	0.059	-0.261	-0.048	0.409	-0.030	0.006	-0.072	-0.021	0.059	-	-0.027	-0.190	0.096	
Mg				1.000	0.764	0.207	0.529	0.050	-0.222	-0.171	0.053	-0.045	-0.164	0.180	0.585	0.443	-0.095	-0.116	0.371	-0.038	-0.024	-0.091	0.005	-0.120	-	-0.042	-0.157	-0.078	
Al					1.000	0.073	0.432	0.187	-0.168	-0.165	0.065	0.061	-0.161	0.220	0.501	0.341	-0.306	-0.102	0.525	-0.045	-0.018	-0.110	-0.013	0.210	-	-0.044	-0.214	-0.075	
P						1.000	0.235	0.240	-0.376	-0.337	-0.144	-0.191	-0.314	-0.255	-0.128	0.165	-0.041	0.190	0.047	0.015	0.090	-0.035	0.038	-0.063	-	-0.023	0.086	-0.177	
K							1.000	-0.036	-0.463	-0.459	-0.103	-0.176	-0.427	-0.222	0.139	0.333	-0.142	-0.021	0.160	-0.013	-0.033	-0.121	0.091	-0.088	-	-0.022	0.061	-0.300	
Ca								1.000	-0.087	-0.100	0.046	0.044	-0.119	-0.042	0.098	-0.021	-0.169	0.145	0.424	0.089	0.022	-0.065	-0.011	0.231	-	-0.018	-0.083	-0.029	
Sc									-0.022	0.008	0.121	0.190	0.017	0.366	0.469	0.317	-0.130	-0.123	0.407	-0.085	-0.035	-0.013	-0.031	0.182	-	-0.045	-0.182	-0.052	
Ti									1.000	0.913	0.503	0.392	0.877	0.654	0.370	-0.212	0.523	-0.107	-0.060	-0.072	-0.066	0.216	-0.047	-0.080	-	-0.003	-0.088	0.740	
V										1.000	0.613	0.387	0.917	0.726	0.431	-0.155	0.517	-0.069	-0.065	-0.077	-0.056	0.236	-0.056	-0.116	-	0.001	-0.075	0.680	
Cr											1.000	0.190	0.533	0.556	0.534	-0.001	0.304	-0.006	0.049	-0.041	-0.088	0.231	-0.023	-0.161	-	0.005	-0.062	0.385	
Mn												1.000	0.426	0.536	0.183	-0.028	0.362	-0.055	0.064	-0.055	-0.011	0.186	0.008	0.515	-	-0.016	0.041	0.294	
Fe													1.000	0.651	0.416	-0.109	0.576	0.002	-0.076	-0.035	-0.028	0.095	-0.050	-0.134	-	0.009	-0.029	0.775	
Co														1.000	0.513	0.109	0.358	-0.085	0.119	-0.092	-0.093	0.534	-0.054	0.083	-	-0.032	-0.089	0.362	
Ni															1.000	0.231	0.142	-0.073	0.337	-0.056	-0.047	-0.051	-0.011	-0.128	-	-0.025	-0.170	0.419	
Cu																1.000	0.153	0.280	0.157	0.163	0.019	0.079	-0.011	-0.023	-	0.015	0.438	-0.113	
Zn																	1.000	0.147	-0.182	-0.027	-0.004	0.253	0.022	-0.176	-	0.008	0.432	0.459	
As																		1.000	0.017	0.113	0.058	0.072	-0.004	0.092	-	0.030	0.510	-0.039	
Sr																			1.000	-0.005	-0.007	-0.056	-0.019	0.321	-	-0.035	-0.163	0.004	
Y																					-0.053	0.027	-0.068	-0.018	0.450	-	-0.004	-0.092	-0.202
Zr																					-0.080	-0.071	-0.006	-0.038	0.387	-	-0.024	-0.160	0.083
Mo																					1.000	0.071	-0.028	-0.006	-0.011	-	0.048	0.008	-0.003
Ag																						1.000	-0.028	-0.008	-0.001	-	-0.013	0.082	0.030
Cd																							1.000	-0.008	-0.019	-	-0.021	0.149	-0.183
Sb																								1.000	-0.004	-	-0.008	0.104	-0.029
Ba																									1.000	-	-0.014	0.076	-0.082
La																										-	-0.031	0.083	-0.424
W																										-	-	-	-
Hg																										-	1.000	0.016	-0.021
Pb																												1.000	-0.085
Bi																													1.000

Tabel 2-10 Summary of Geochemical Anomaly Data

Geochemical Anomaly Area		No.	Sample No.	Au	Cu	Zn	As	Mo	Ag	Hg	Pb
				ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppm
C1	Tegalombo – Saluhung Area	1	A003S	66	60.6	80.6	1.5	0.5	0.2	5	1
		2	B040S	0.5	50.9	161	1.5	0.5	0.1	14	64
		3	B032S	1	40.9	57.4	60	2	0.2	17	7
		4	A022S	16	19.3	87.4	1.5	1	5.4	2.5	5
		5	A024S	6	453	580	217	0.5	2.3	6	398
		6	A018S	39	57.5	60.6	1.5	0.5	0.2	6	1
		7	A020S	16	30.1	95.4	1.5	0.5	8.3	13	5
		8	A010S	13	33.4	272	5	0.5	0.3	7	77
C2	South of Saluhung	1	E022S	0.5	13.2	52	1.5	0.5	3.5	12	1
		2	E006S	7	17	286	1.5	1	0.6	12	8
		3	E020S	15	28.1	91	7	0.5	6	12	18
		4	E029S	1	17.5	305	9	0.5	0.4	15	10
		5	E005S	6	24.9	78.6	9	0.5	7.7	14	4
		6	E001S	4	13.6	102	7	0.5	6.3	9	5
		7	A099S	44	41.2	77.8	1.5	0.5	0.2	16	1
		8	E047S	0.5	18.8	101	1.5	0.5	0.1	584	6
		9	F078S	1	33.7	153	63	2	0.3	34	7
		10	D079S	3	40.4	173	51	0.5	0.1	11	40
		11	E042S	0.5	29.6	116	1.5	0.5	2.3	7	10
C3	K. Lorog Area	1	B092S	4	35.8	136	48	0.5	0.4	22	27
		2	B094S	5	477	103	1.5	5	0.3	77	7
		3	A114S	219	54.7	74.8	1.5	0.5	0.2	7	1
		4	A052S	1	46.8	99.2	1.5	4	0.2	8	4
		5	A051S	3	38.8	283	13	0.5	0.2	5	8
		6	A049S	67	67.5	81.8	1.5	0.5	0.3	5	1
C4	East of Punung	1	C155S	5	91	272	9	0.5	0.5	16	14
		2	C143S	0.5	51.5	278	1.5	0.5	0.2	13	29
		3	F089S	60	59.3	71.1	1.5	0.5	0.3	41	1
		4	D150S	2	23.6	144	5	0.5	0.1	1120	6
		5	E117S	2	41.1	136	47	0.5	0.3	5	15
		6	D139S	14	15.5	88.1	1.5	0.5	3.6	35	12
		7	D138S	1	17.3	134	28	8	0.3	10	5
		8	E109S	0.5	9.2	102	1.5	8	0.1	8	8
		9	E112S	0.5	32	295	1.5	0.5	0.6	15	106
C5	North of Pule	1	B064S	4	9.7	98	241	1	0.1	55	7
		2	D043S	0.5	16.3	120	1.5	0.5	0.1	467	14
		3	D042S	0.5	124	71.4	12	3	0.1	200	9
		4	D070S	4	9.6	90.2	1.5	0.5	3.6	21	4
		5	D057S	0.5	41.9	121	49	0.5	0.3	12	16
		6	A071S	2	62.2	356	1.5	0.5	0.3	27	40
		7	C057S	2	24.3	47.7	16	0.5	4.1	17	7
C6	Wonocoyo Area	1	F056S	1	22.2	122	1.5	4	7.6	19	1
		2	C095S	0.5	21.6	65.2	4	0.5	5.1	13	7
		3	F043S	132	56	80.3	1.5	0.5	0.2	12	1
		4	F072S	4	28.5	112	10	3	0.1	9	5
		5	F039S	46	12.4	194	1.5	0.5	0.2	7	6
		6	F042S	14	27.5	127	1.5	0.5	4.6	10	7
C7	West of Ponorogo	1	C043S	0.5	34.7	101	1.5	7	0.1	36	1
		2	C019S	5	91.3	129	31	3	0.1	206	42
C8	East of Pacitan	1	B084S	1	19.1	90.9	1.5	0.5	0.1	233	8
C9	Northeast of Pacitan	1	A111S	96	57.4	74.1	1.5	0.5	0.3	2.5	1
C10	K. Kedungwedi Area	1	E126S	69	14.9	171	1.5	0.5	0.4	6	4
		2	E141S	1	20.5	293	1.5	0.5	0.3	9	8
C11	West of Wonogiri	1	F113S	1	35.5	166	12	0.5	0.2	234	26

### 4 - 3 Discussions

The above relation between the anomalies and the mineral showings is summarized in Table 2-11.

**Table 2-11 Distribution of Geochemical Anomalies**

District	Geochemical Anomaly	Mineral Showings on the Surface	Expected Mineralization
C1. Tegalombo- Slahung	Au,Ag,Cu,Pb,Zn,As	-Cp-Sp-quartz vein -sericite alteration (ENE Extension of Kasihan)	Au-Ag quartz vein (porphyry type deposits)
C2. South of Slahung	Au,Ag,Zn,As,Hg	-quartz vein, pyrite dissemination -sericite alteration mix layered mineral	Au-Ag quartz vein
C3. Lorog River	Au,Cu,Zn,As,Mo	-quartz vein -pyrite dissemination -sericite alteration	Au-Ag quartz vein (porphyry type deposits)
C4. East of Punung	Au,Ag,Pb,Zn,As,Mo	-quartz float -propylitic alteration (West of Existing mine )	Au-Ag quartz vein (porphyry type deposits?)
C5. North of Pule-East of Ponorogo	Ag,Cu,Zn,Mo,As,Hg	quartz vein, silicified rocks (within existing concessions)	Au-Ag quartz vein (porphyry type deposits?)
C6. East of Wonocoyo	Au,Ag,Mo	-quartz float	Au-Ag quartz vein
C7. West of Ponorogo	Mo,Hg	(unknown)	—
C8. North east of Pacitan	Hg	(within existing concessions)	—
C9. East of Pacitan	Au	-pyrite dissemination -quartz float	Au-Ag quartz vein
C10. Kedungwedi River	Zn	-quartz float (near a prospect)	Au-Ag quartz vein
C11. West of Wonogiri	Hg	(near existing mine)	Au-Ag quartz vein

(C-1) Tegalombo - Slahung district

Of the 8 sites, Au anomalies were detected at 2 sites, Ag anomalies at 2 sites, Cu anomaly at 1 site, and Pb anomalies at 3 sites in this district. Quartz veins are most developed here in the survey area. Sericite is observed. The maximum Au anomaly is only 1.1g/t Au (rock chips), and the gold content of a 35cm-wide quartz vein containing chalcopyrite with 2.2% Cu has low gold grade. Also the quartz veins with width of 1.6m and 1.9m contain maximum of only 0.1g/t Au. But the average homogenization temperatures of the samples are low at 186° C and 210° C (salinity of 1 sample is 3.2%).

(C-2) South of Slahung:

There are; Ag anomalies at 5 sites, Zn anomalies at 2 sites, and an Au anomaly at 1 site in this district. These anomalies coincide fairly well with the alteration zone consisting of sericite and mixed-layer clay minerals and probably extending in the N-S direction. On the surface, however, pyrite-disseminated quartz veins were confirmed at 3 localities and the gold content of 2 samples analyzed was low at 42ppb and 56ppb (E10A, E13A).

(C-3) Along Lorog River:

There are; Au anomalies at 2 sites, Mo anomalies at 2 sites, and Cu and Zn anomaly at site in this district. The 2 alteration zones at the lower and upper stream trending N-S~E-W and N-S respectively coincide with the Au geochemical anomalies. Sericite and mixed-layer clay minerals constitute the alteration minerals, and kaolin mineral is also observed and this is believed to be related to mineralization. Pyrite and clay vein with 10cm width is accompanied by chalcopyrite and the Cu grade is 6.9% (F33A). Intrusion of white argillized and pyrite-disseminated quartz porphyry is observed in this district.

(C-4) East of Punung:

There are 1 Au anomaly and 1 Ag anomaly in this district. Also there are Zn anomalies at 3 sites, Mo anomalies at 2, and Pb anomaly at 1 site. Gold showings occur at Kebonsari Prospect to the east of this district. Mixed-layer clay minerals are the alteration minerals found in this zone.

(C-5) North of Candi-Pule Prospect:

Ag anomalies occur at 2 sites, Mo, Cu, and Zn anomalies occur at 1 site each. Also As and Hg anomalies occur at 2 sites each at Candi-Pule Prospect and N-S trending quartz veins and silicified

veins are clearly observed in this prospect. Check sampling showed 4.4g/t Au in Candi silicified vein (A40A) and 1.2g/t Au from Pule vein outcrop (A45A). As and Cu geochemical anomalies were detected from a locality in the NNE direction from Cad-Pule Prospect. Also alteration zone consisting of kaolin and other acidic alteration products occur in this prospect.

(C-6) Wonocoyo geochemical anomaly zone:

There are Au anomalies at 2 sites, Ag at 3 sites, and Mo anomalies at 2 sites in this zone. Au, Ag anomalies are particularly notable along the K. Konong basin. A quartz vein float (F19A) contained low amount of Au (58ppb).

(C-7) ~ (C-11) are all isolated geochemical anomaly zones. Known prospect is said to occur at Kedungwedi River, it was not possible to confirm it during the present survey, and there is a small gold workings further eastward and this was confirmed. Au anomaly was confirmed on 1 sample.



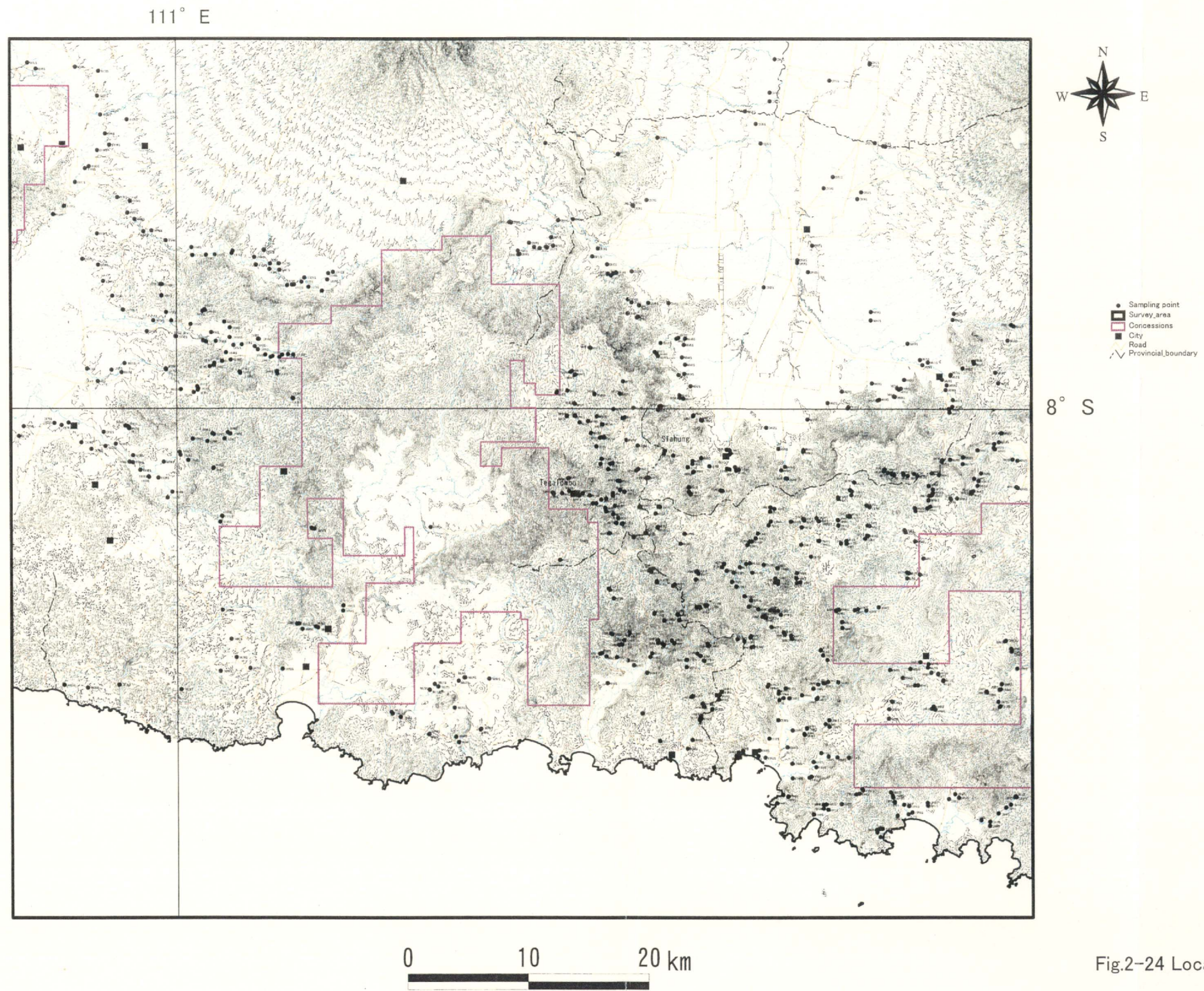


Fig.2-24 Location Map of Geochemical Sediment Samples



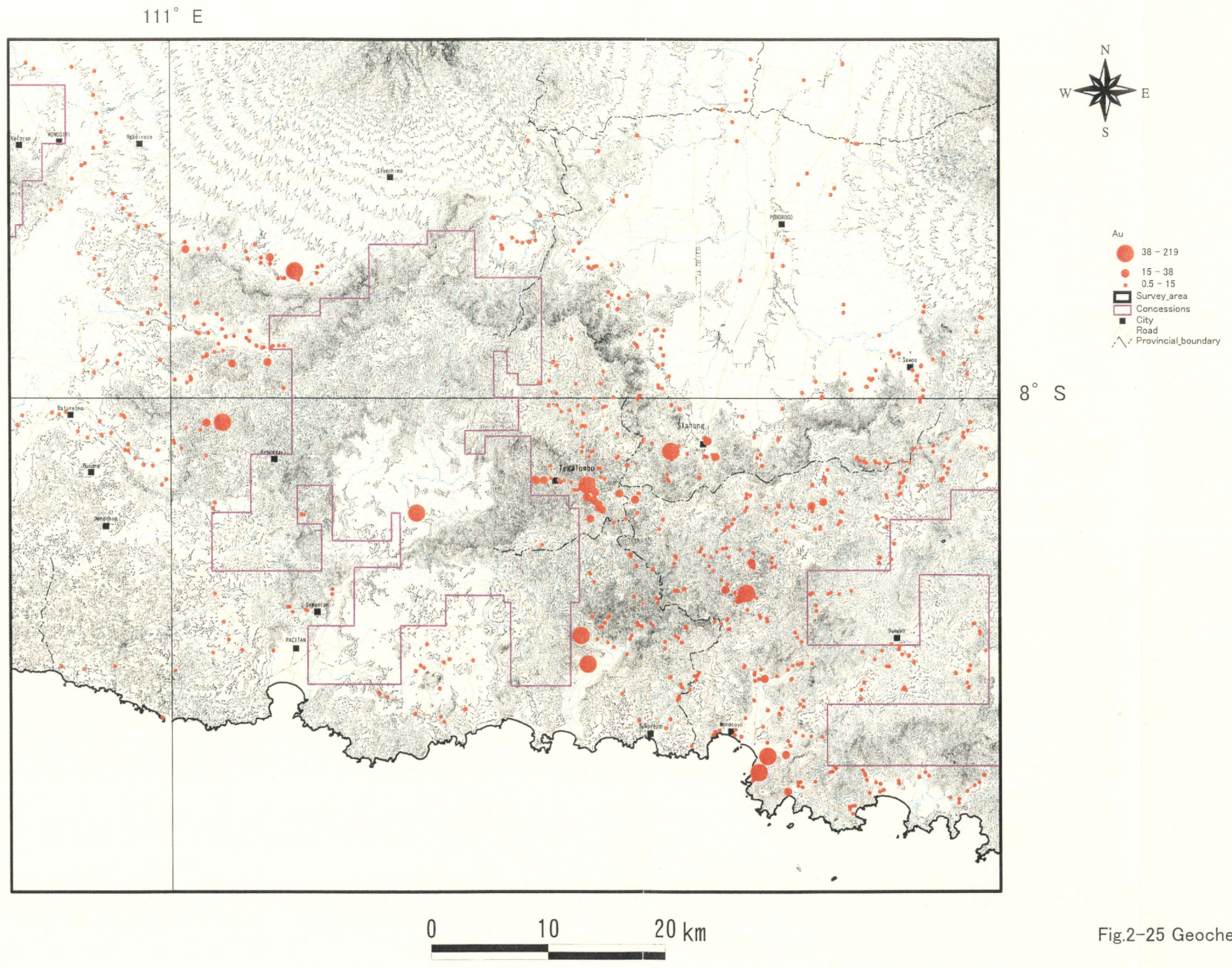


Fig.2-25 Geochemical Anomaly Distribution of Element Au



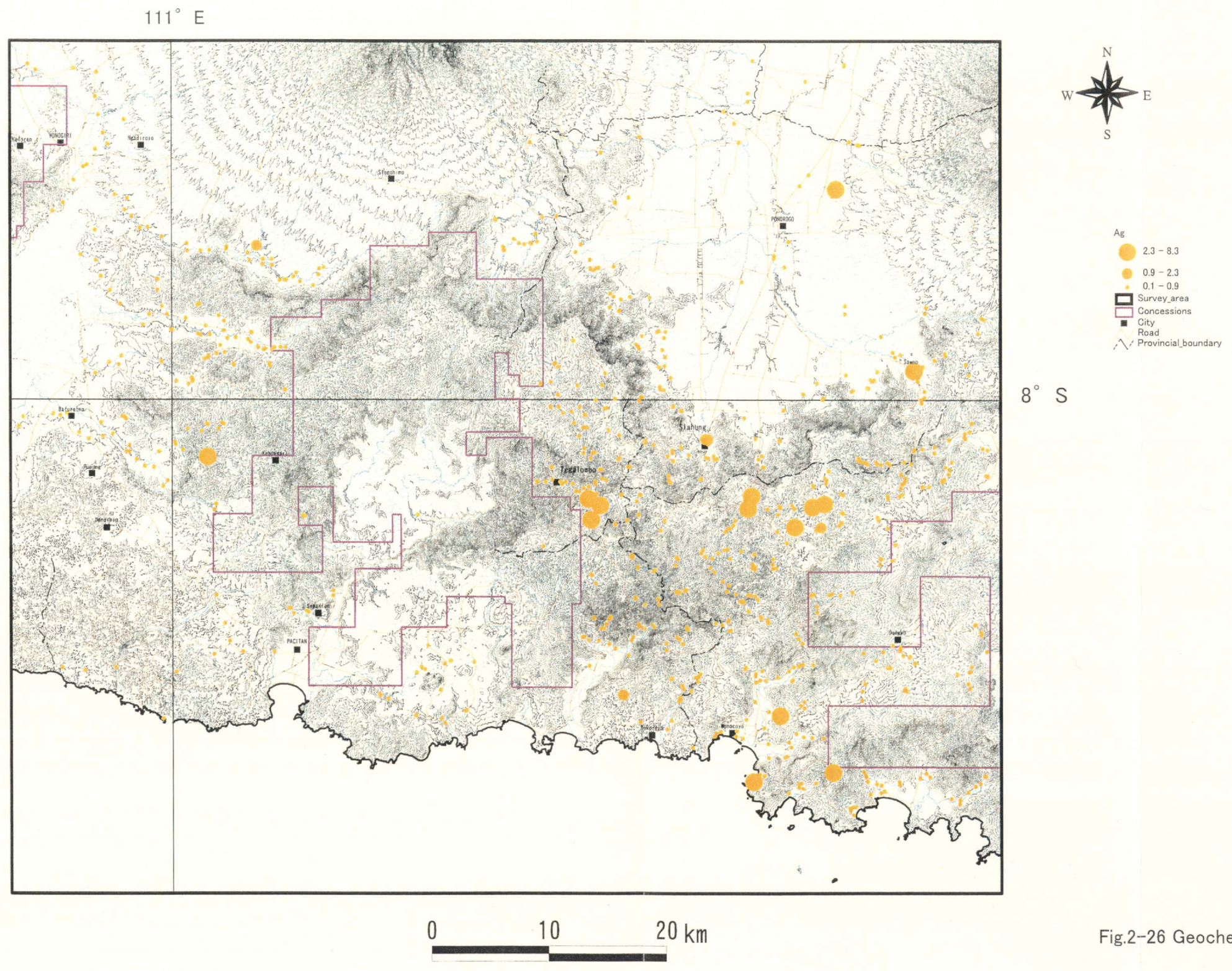


Fig.2-26 Geochemical Anomaly Distribution of Element Ag



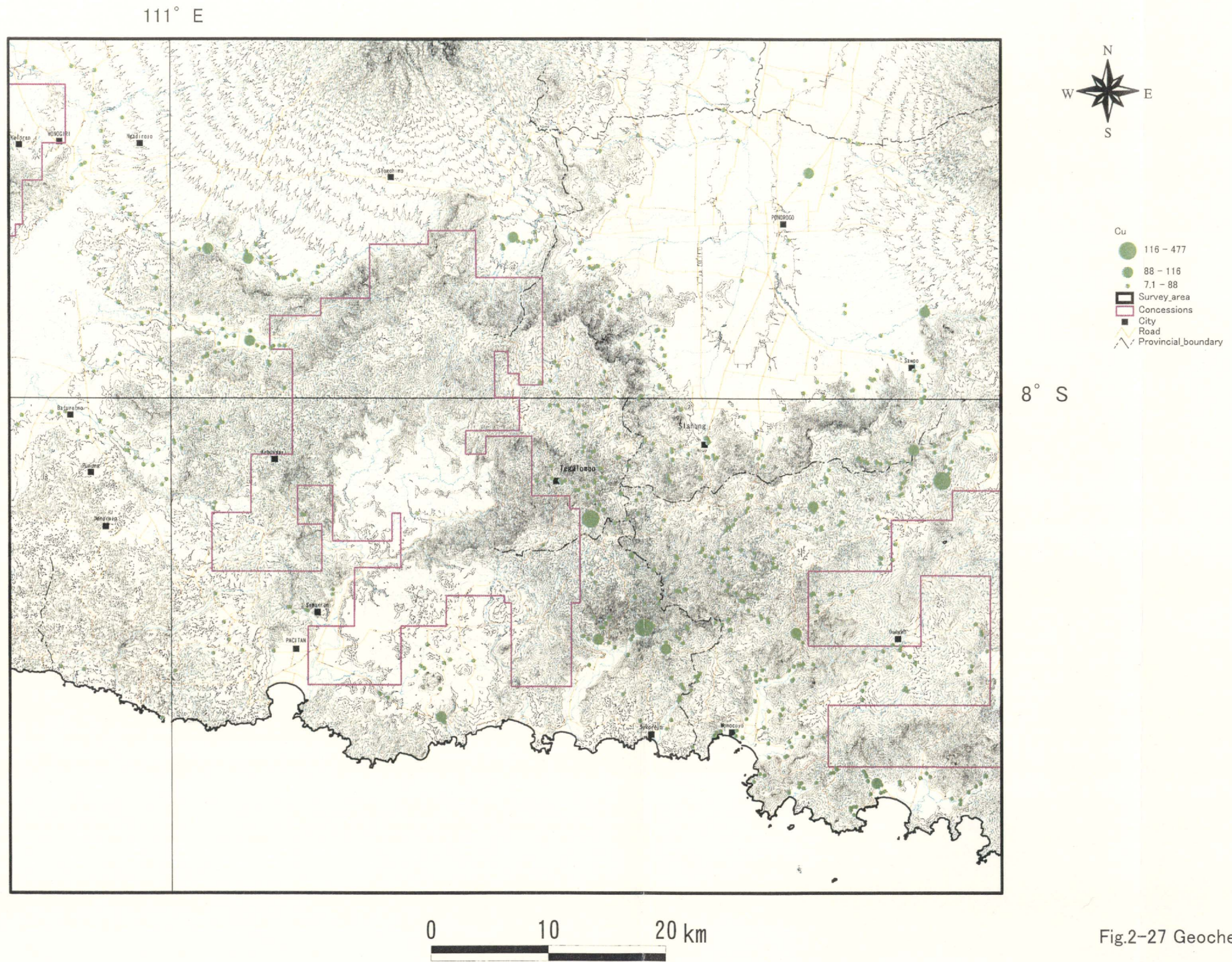


Fig.2-27 Geochemical Anomaly Distribution of Element Cu



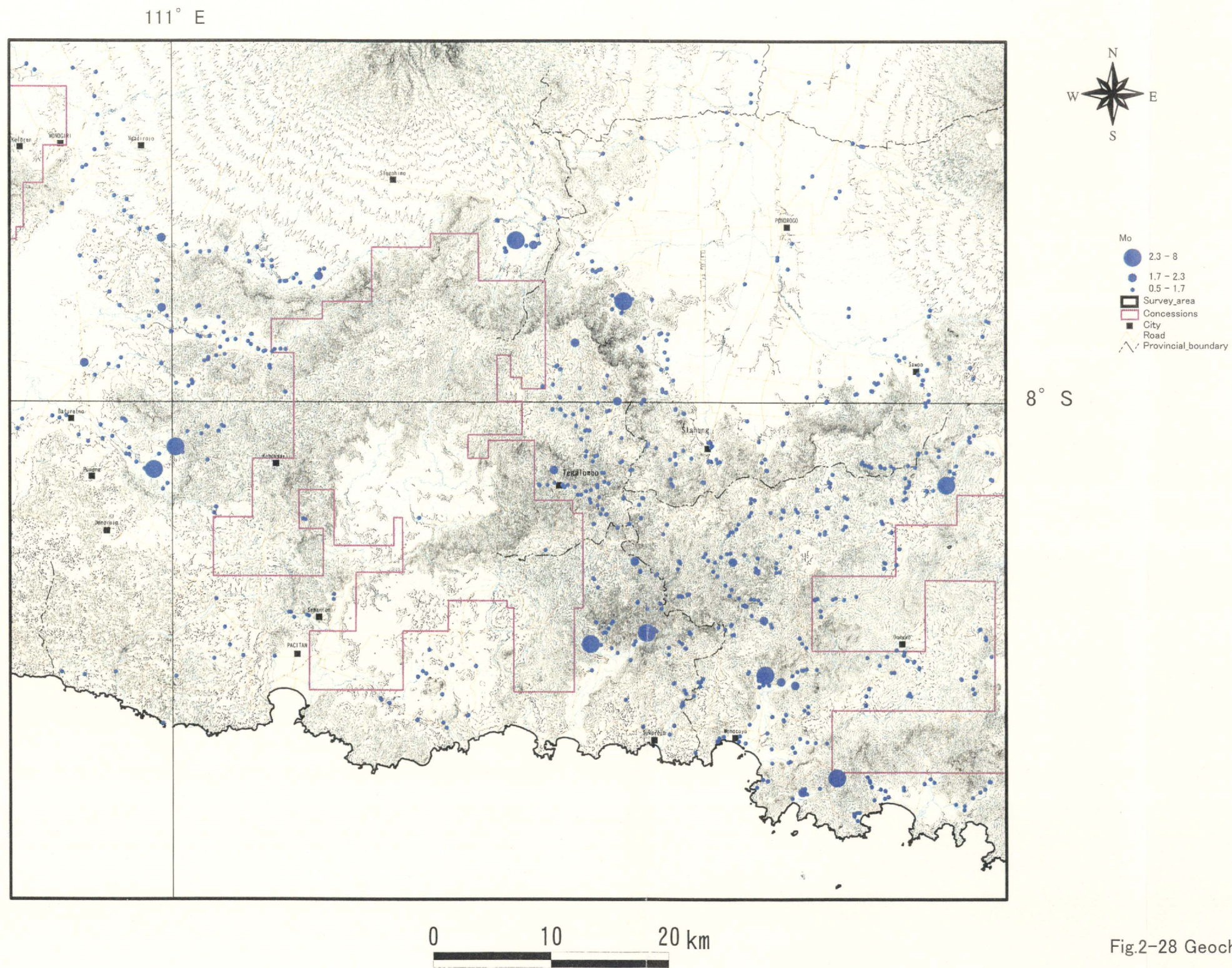


Fig.2-28 Geochemical Anomaly Distribution of Element Mo



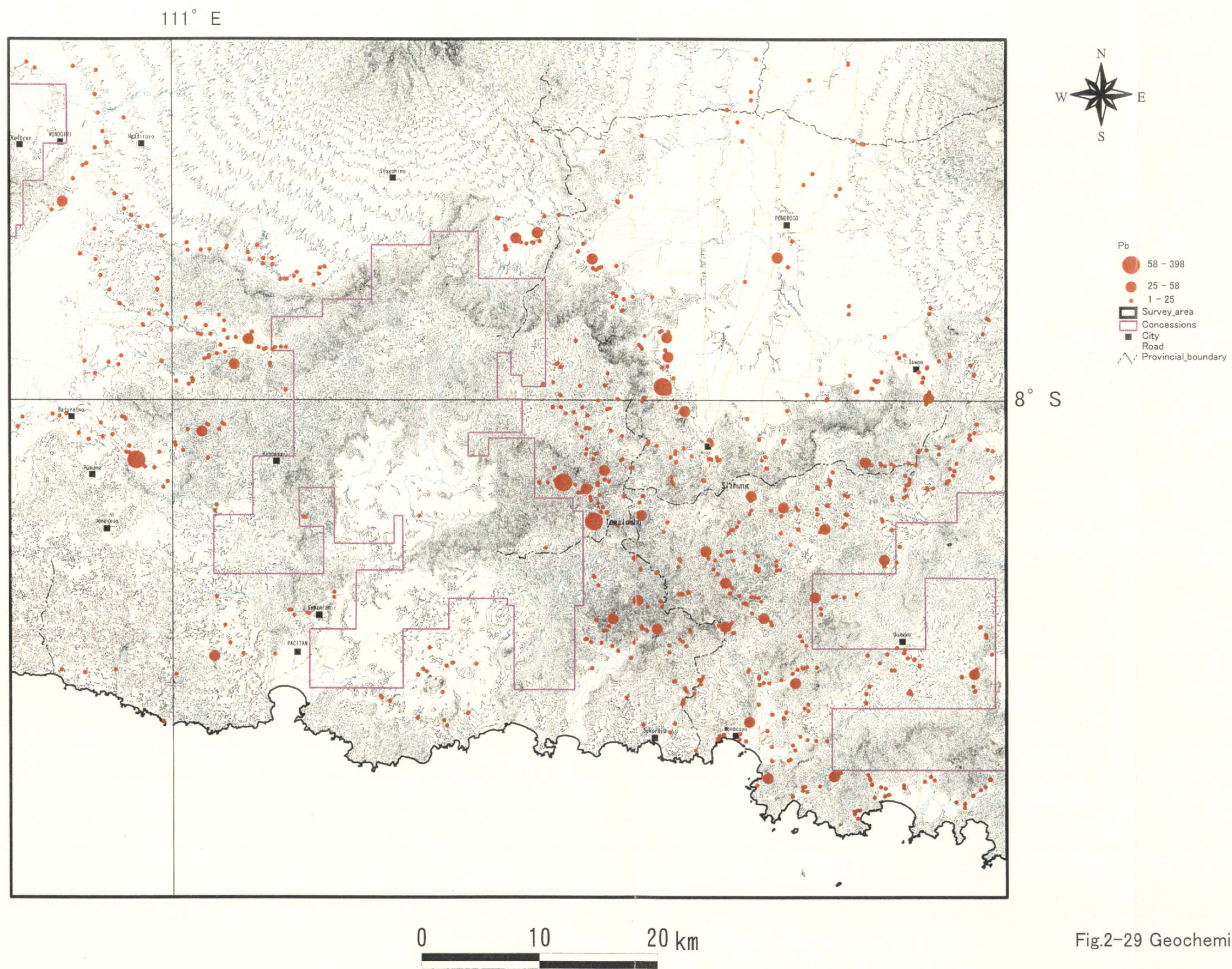


Fig.2-29 Geochemical Anomaly Distribution of Element Pb



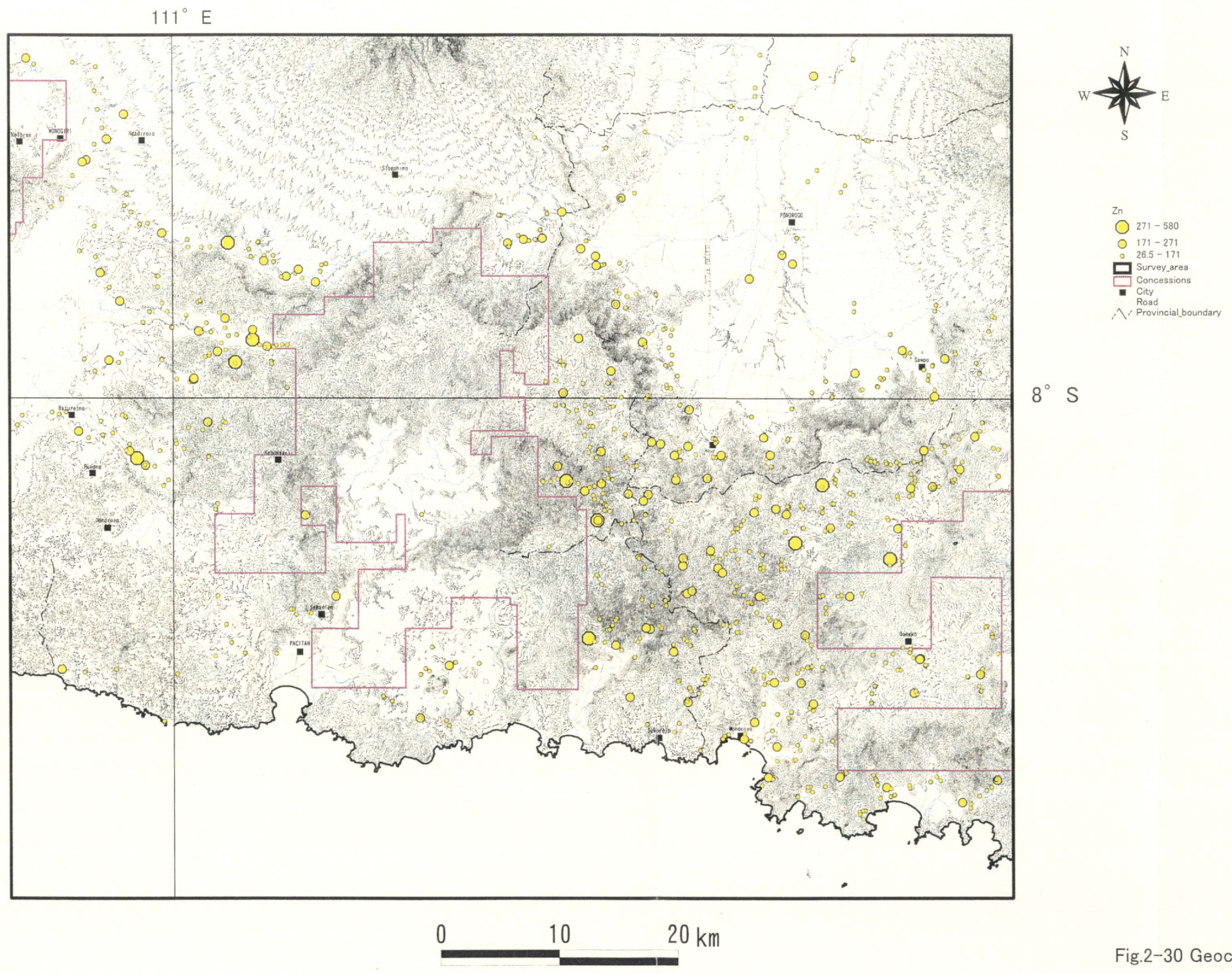


Fig.2-30 Geochemical Anomaly Distribution of Element Zn



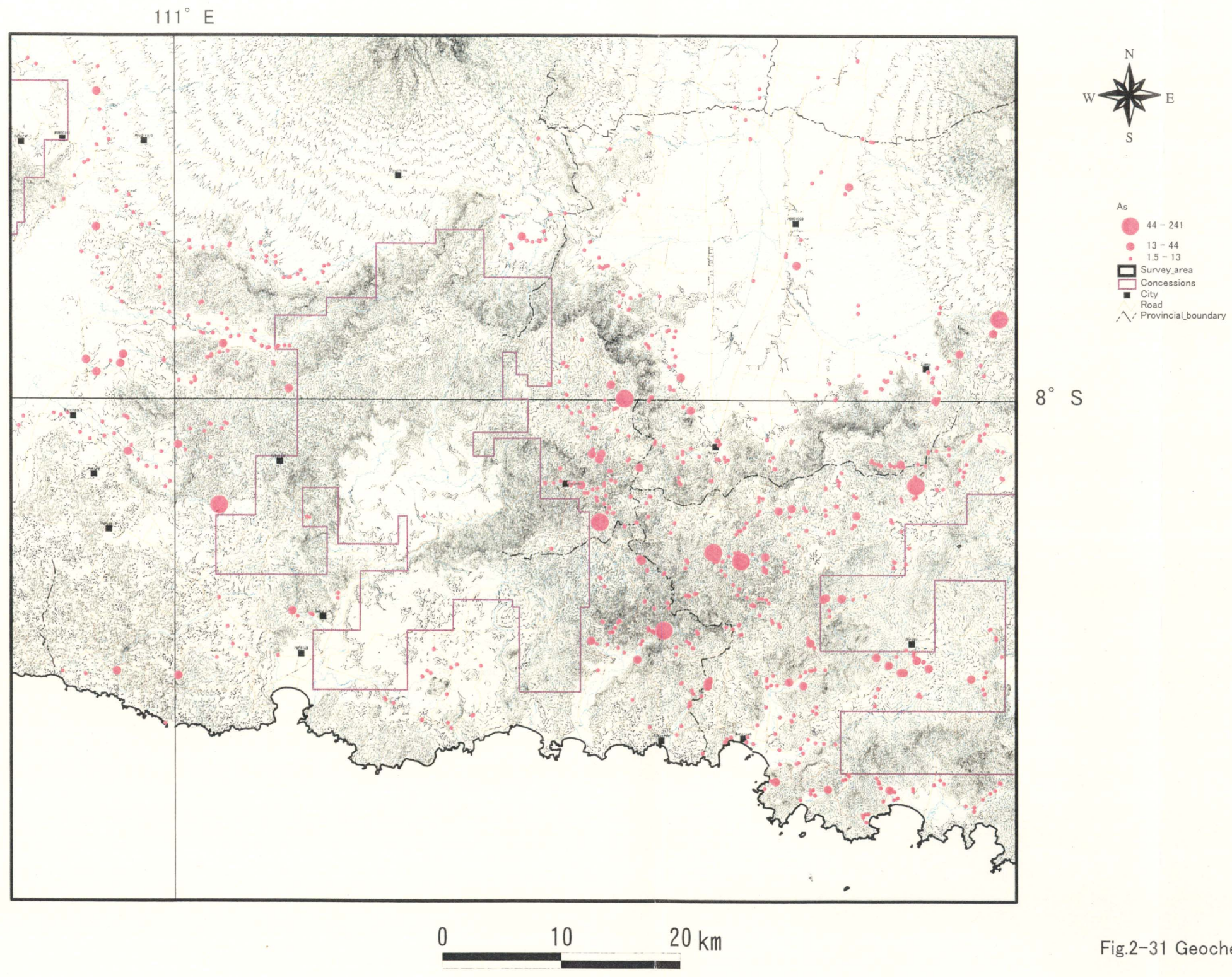


Fig.2-31 Geochemical Anomaly Distribution of Element As



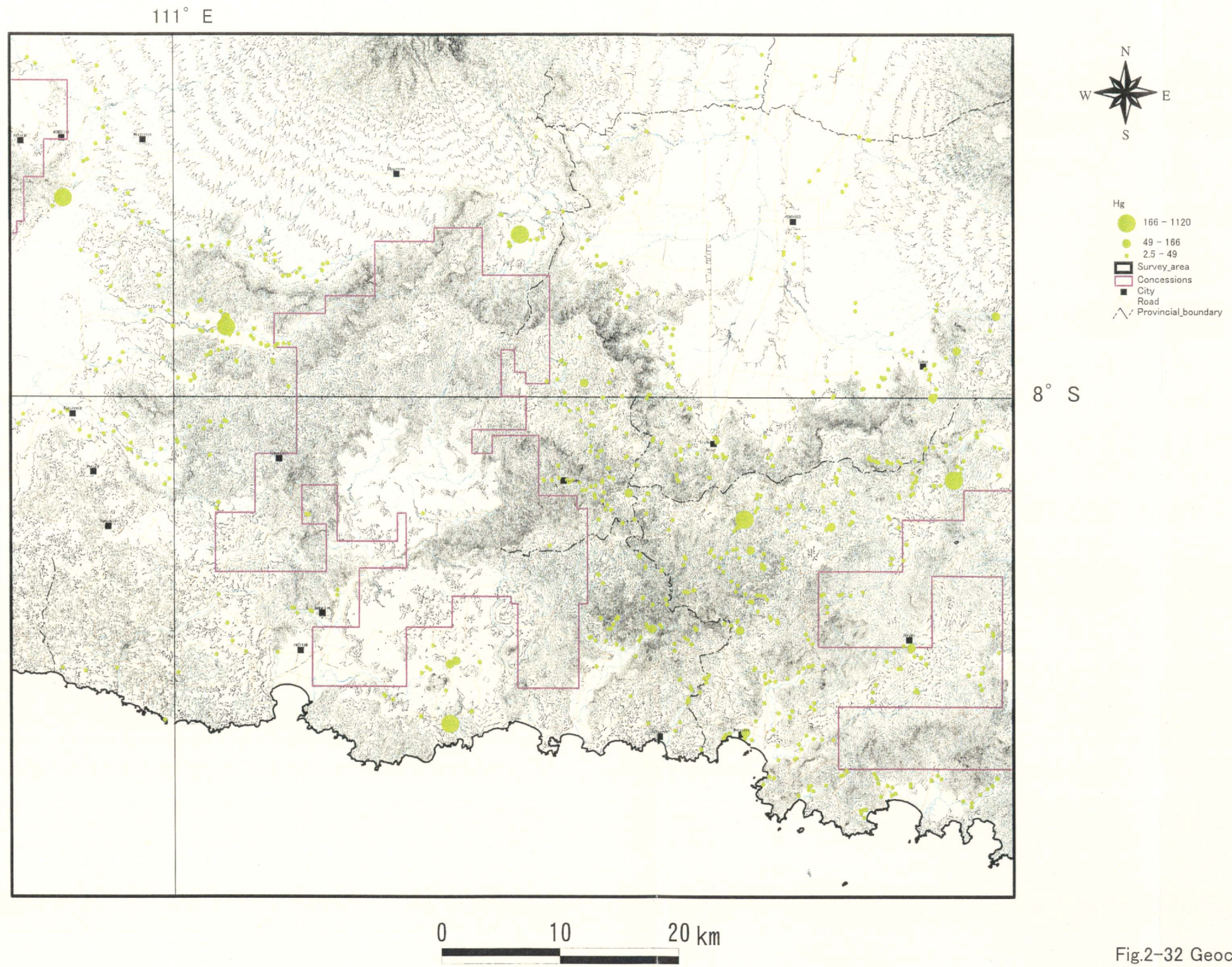


Fig.2-32 Geochemical Anomaly Distribution of Element Hg

## **PART III**

# **CONCLUSIONS AND RECOMMENDATIONS**

## **PART III CONCLUSIONS AND RECOMMENDATIONS**

### **Chapter 1 Conclusions**

During the first year of the mineral exploration project in East Java, existing documents and information on geology and mineral resources of the project area were analyzed, satellite images were analyzed and interpreted, and geological and geochemical surveys were carried out. And the following results were obtained.

#### **(1) Geological and geochemical survey results**

Many gold, copper, lead, zinc prospects and geochemical anomaly zones were confirmed in Tertiary volcanic and pyroclastic rocks of the survey area. For these mineral prospects, distribution of the quartz veins, filling temperatures of the fluid inclusions, pyrite dissemination, nature and distribution of alteration minerals, relation with geologic structure, and the results of geochemical survey were examined. It was concluded from these results that; (a) gold and copper potential is the highest at the prospect in the vicinity of Tegalombo-Slahung, followed by (b) the gold, silver, and copper geochemical anomaly zones to the south of Slahung, (c) geochemical anomalous zones near the Lorog River in the eastern part of the study area, and (d) the geochemical anomaly zones to the east of Punung.

Chalcopyrite and sphalerite are often observed in the quartz veins of this area, but the geochemical anomalies of heavy metals are low. And in this general trend, copper anomalies have been detected in the Tegalombo Prospect, and the mineral potential for gold and copper is high. The prospect to the east of Punung has molybdenum anomalies and it arouses interest despite its weak content.

#### **(2) Mineral potential of the study area**

Tertiary volcanic and pyroclastic rocks are distributed to the east and west of the survey area, but their distribution is not as wide as in the survey area. Also the mineral prospects reported in existing information are mainly manganese and gold, silver, copper, lead, zinc, mineral showings are not abundant. Thus it is considered that the ore potential is higher in the survey area within the potential area. However, the eastern extension of the ore prospect discovered by the present survey at north of Pule, and the western extension of the known prospect at Selogiri should be confirmed.



## **Chapter 2 Recommendations**

Based on the above-reported results of the first year survey, it is recommended that the following be carried out as the second year survey of the East Java mineral exploration project. Assess the ore potential and extract targets for further drilling by; detailed geological and geochemical surveys of the survey area and reconnaissance and detailed survey of the adjacent areas as listed below. Also it is recommended that panning be used effectively for efficient extraction of geochemical anomaly zones.

- (1) Geological and geochemical reconnaissance of area to the east and west of the survey area.
  - a. Western side: northern half of the area adjacent to the survey area (40km×25km)
  - b. Eastern side: area adjacent to the survey area (50km×20km)
  
- (2) Detailed geological and geochemical survey of the promising mineral showings
  - a. Mineral showings and geochemical anomaly zones of Tegalombo-Slahung (5km×12km)
  - b. Mineral showings and geochemical anomaly zones near Lorog River (6km×10km)
  - c. Geochemical anomaly zones east of Punung (5km×14km)
  - d. Geochemical anomaly zones south of Slahung (5km×12km)
  
- (3) Geophysical Survey may be applied when it becomes necessary with extraction of high-ore potential zones by the above a to d of the detailed survey. IP electric exploration is concluded to be most appropriate since pyrite dissemination is expected in the epithermal and porphyry copper ore deposits in this area.