vesicular olivine basalt with olivine in its voids - the maximum diameter of which attains about 5mm - .

Scoriae assume black ~ light grey, have a characteristic of pumiceous ~ foamy ~ fibrous ~ acicular aggregation and not only occur isolatedly on sediments but also are collectable from transition part between vitric basalt and overlying sediments. There is no specific tendency of being prominent in sallow areas.

Many pieces of slaggy lava with an intermediary character between basalt and scoriae are collectable from the submarine surface, especially from the submarine surface at water depths of about 500 m. It assumes dark brown, has pumiceous texture of well-developed holes and thin walls, and has a characteristic of coarse surfaces.

3) Sediments

The sampling for the ore deposit survey was carried out at six points among the seafloor surfaces from which ore signs or indications and an oxidation zone had been recognized by the FDC survey. Okean grab and power grab were employed for the sampling. These sampling locations are shown in Annexed Figure 6.

Among the samples collected by this sampling operation, sediments ran up to 6,720.86 kg (see Appendix Table 3).

Except reddish brown iron hydroxide considered to be goethite, the collected sediments are composed of sand ~ muddy sediments assuming brown ~ olive ~ grey and clay assuming dark green.

The sandy ~ muddy sediments are mainly composed of volcanic glass, calcareous shells of foraminifera and clay minerals, and are accompanied by a small amount of clastic mineral grains (quartz, plagioclase, pyroxene and amphibole) and radiolarian shells, sponge spicules and fish teeth.

These are fundamentally the same with those collected at the geochemical survey, so we will not describe them here (for the details see the paragraph (1) Muddy Substances of the subchapter 4-2 Characteristics of Samples Collected).

The clay assuming dark green was not collected by the geochemical survey and it is considered as showing a characteristic distribution in the neighborhood of ore indications. Under the microscopic observation, the dark green clay is an aggregation of small plate type crystals of about 20 μm and is considered to be chlorite.

5-4 Hydrothermal Activities

1) Mineralized Zones

Five places of ore signs or indications and two oxidation zones were identified in the area of this year's survey. A list of ore indications observed is shown in Table 5-4-1-1 and the photographs showing the occurrence of ore indications are shown in Figure 5-4-1-1 (1) ~ (3).

Ore indications were identified by the FDC observation at the track lines 92SFDC02, 92SFDC06, 92SFDC07 and 92SFDC08 out of 8 (eight) track lines. A stretch of about 550 m in the direction of the track line 92SFDC08 was identified at the Ore Indication No.5, which is considered to be the largest one, and a stretch of about 30 m in the direction of the track line 92SFDC06 was identified at the Ore Indication No.3, which is considered to be the smallest one. In either case, yellow ~ reddish brown precipitates on the muddy sediments sometimes with underlying slaggy ~ pillow lava are recognized. Furthermore, no living things preferring the hydrothermal environment were recognized, and thus, it is considered that the hydrothermal activities in this area were over.

2) The Composition of the Mineralized Zones

Total 22 rounds of sampling (i.e. 16 rounds of FPG and 6 rounds of OG) were performed against the ore indications and oxidation zones observed by the FDC survey.

The results of the sampling are listed in Appendix Table 3 and a location map of the sampling is shown in Annexed Figure 6 (1) ~ (6). Total weight of hydrothermal precipitates is 3,242 kg.

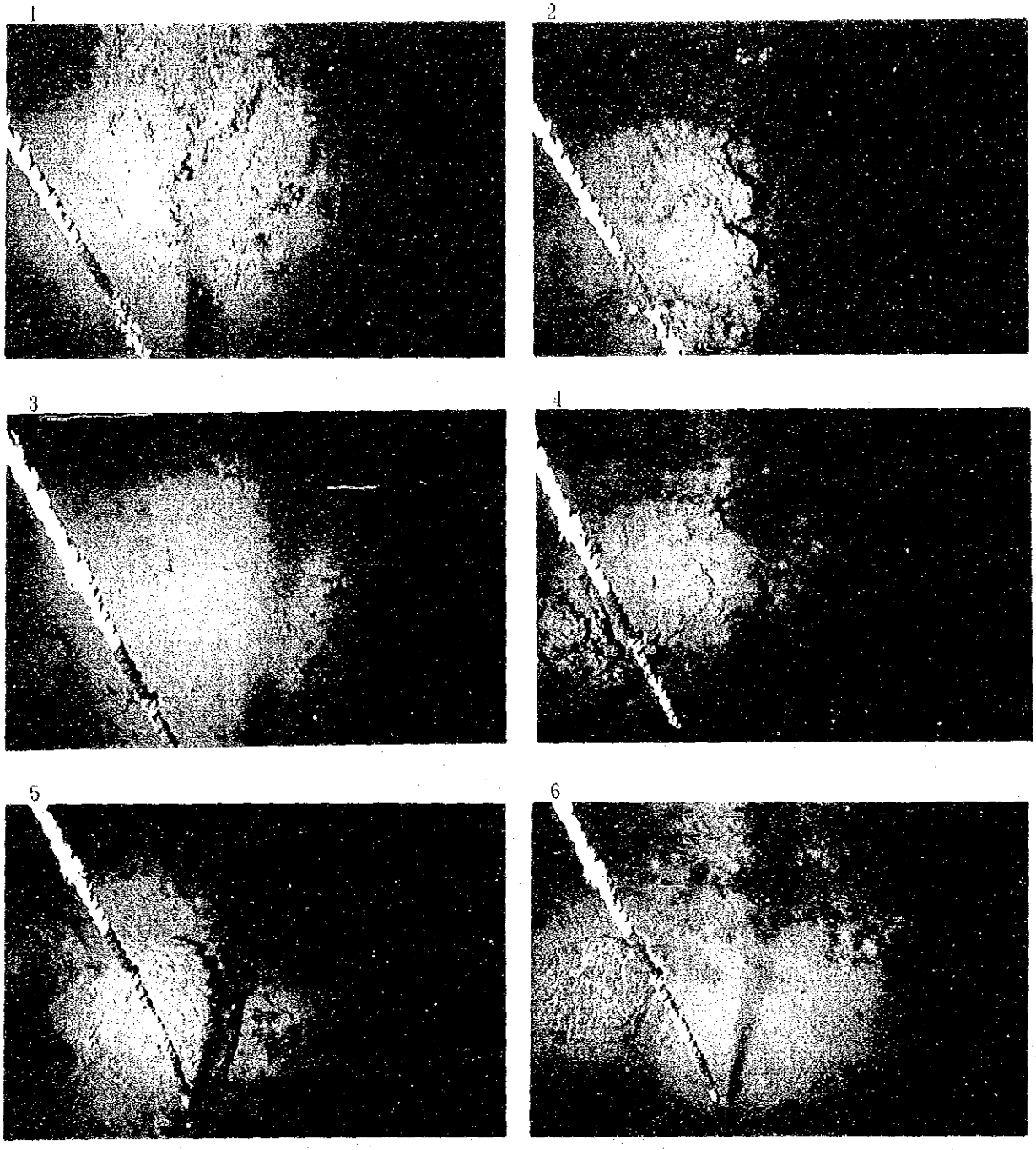
As a result of this sampling, brown precipitates and dark green clay were collected as characteristic samples. The photographs of them are shown in Figure 5-4-2-1 and the description of them will follow.

Incidentally, no sulfide was collected by this sampling.

Table 5-4-1-1 List of Ore Indications Observed by FDC

※Ore Indi-cation No.	Track Line No.	Location		Water Depth (m)	Results of Observation
		Latitude	Longitude		
1	92SFDC02	03°24.65′S 03°24.70′S	147°03.84′E 147°03.80′E	1,780	Yellow deposits and altered lava are scattered on muddy sediments. Its scale is about 150m in the direction of the track line. Biotic community considered to be of hydrothermal is not recognized.
2	92SFDC06	02°56.69′S	147°27.32′E	1,050	Yellow deposits and altered lava are scattered on pillow lava and neighboring muddy sediments. Its scale is about 30m in the direction of the track line. Biotic community considered to be of hydrothermal is not recognized.
3	92SFDC06	02°57.29′S 02°57.32′S	147°26.59′E 147°26.32′E	1,110	Yellwo deposits and altered lava are scattered on muddy sediments covering slaggy lava and on its neighboring muddy sediments. Its scale is about 100m in the direction of the track line. Biotic community considered tobe of hydrothermal is
4	92SFDC07	03°05.97′S 03°06.19′S	147°45.23′E 147°45.01′E	500	The part neighboring to the oxidation zone(7)(described later) and predominant in yellow oxidized substances. Its topography is flat and yellow deposits are covered with pebbles. Its scale is about 350m in the direction of the track line . Biotic community considered to be of hydrothermal is not recognized.
5	92SFDC08	03°05.97′S 03°06.19′S	147°45.23′E 147°45.01′E	940	Yellow deposits and altered lava are scattered on slaggy lava, pillow lava and muddy sediments that cover the circumference. Its scale is about 550m, which is rather big, in the direction of the track line. Biotic community considered to be of hydrothermal is not recognized.
(6)	92SFDC07	03°00.41′S 03°00.58′S	147°54.02′E 147°53.80′E	390	An oxidation zone predominant in reddish brown oxidized substances. Yellow, yellowish brown and reddish brown oxidized substances and small pebbles of lava are accumulated like talus shape on flat floor. Its scale is about 500m in the direction of the track line. Biotic community considered to be of hydrothermal is not recognized.
(7)	92SFDC07	03°01.72′S 03°01.97′S	147°52.27′E 147°51.94′E	500	An oxidation zone predominant in reddish brown oxidized substances. It lies between the oxidation zone(6) and the ore indication No.4, but the boundary with the ore indication No.4 is not clear. White,yellow, yellowish brown and reddish brown oxidized substances are accumulated in talus shape on flat topography. Its scale is about 700m in the direction of the track line. Biotic community considered to be of hydrothermal is not recognized.

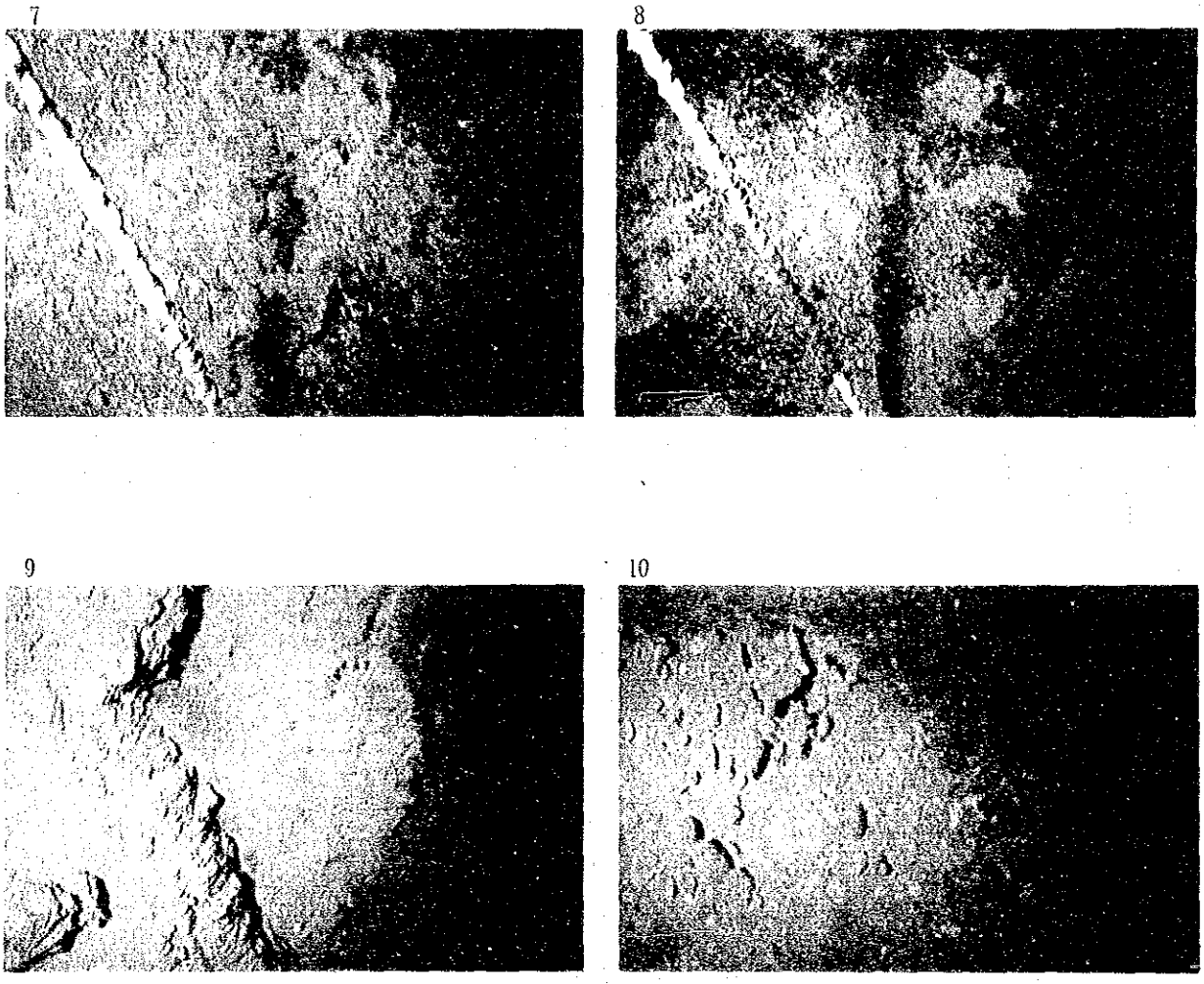
※No.1～No.5;Ore Indication(or Sign)
(6)&(7);Oxidation Zone



Yellow deposits or alteration lava

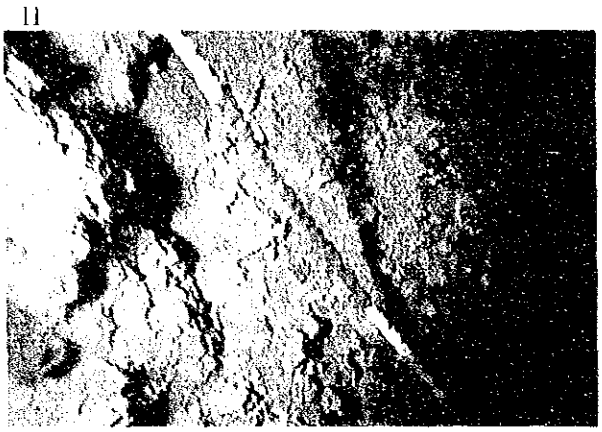
1. Ore indication No. 1 Line 92SFDC02(03°24.7'S, 147°03.8'E, water depth 1,784m)
2. Ore indication No. 1 Line 92SFDC02(03°24.7'S, 147°03.8'E, water depth 1,784m)
3. Ore indication No. 2 Line 92SFDC06(02°57.3'S, 147°26.6'E, water depth 1,103m)
4. Ore indication No. 2 Line 92SFDC06(02°57.3'S, 147°26.6'E, water depth 1,111m)
5. Ore indication No. 3 Line 92SFDC06(02°56.7'S, 147°27.3'E, water depth 1,047m)
6. Ore indication No. 3 Line 92SFDC06(02°56.7'S, 147°27.3'E, water depth 1,050m)

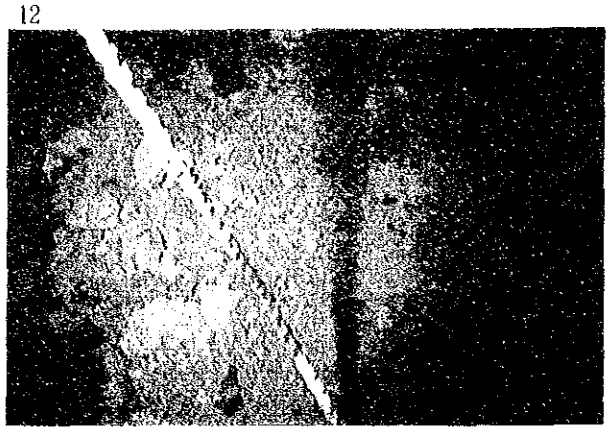
Figure 5-4-1-1 Occurrences of Ore Indications (1)

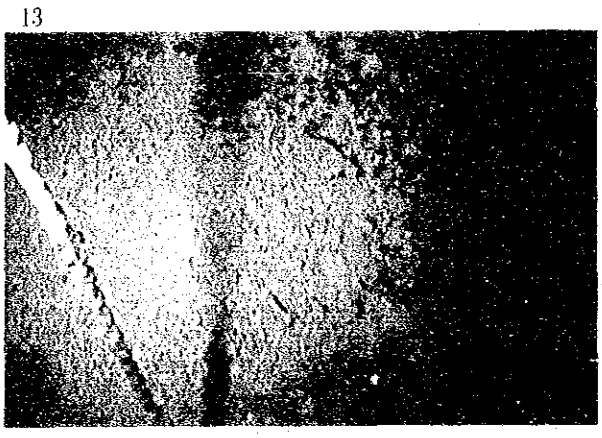


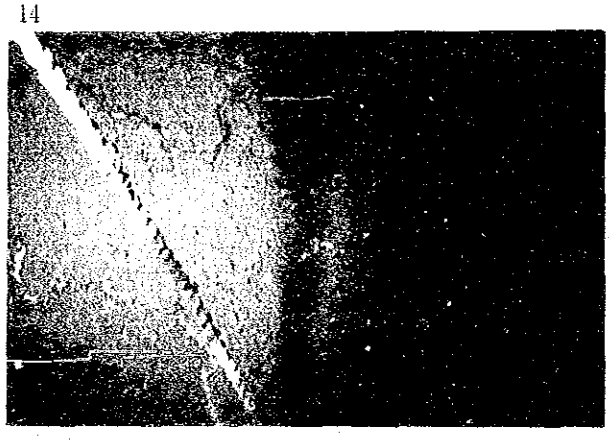
7. Reddish brown hydroxides
   Ore indication No. 4 Line 92SFDC07(03°02.2'S, 147°51.7'E, water depth 501m)
8. Yellow hydroxides. Pebbles are accumulated on the surface.
   Ore indication No. 4 Line 92SFDC07(03°02.2'S, 147°51.6'E, water depth 499m)
9. Yellowish brown hydroxides
   Ore indication No. 5 Line 92SFDC07(03°02.2'S, 147°51.6'E, water depth 973m)
10. Spongy hydroxides
   Ore indication No. 5 Line 92SFDC08(03°06.1'S, 147°45.1'E, water depth 975m)

Figure 5-4-1-1 Occurrences of Ore Indications (2)







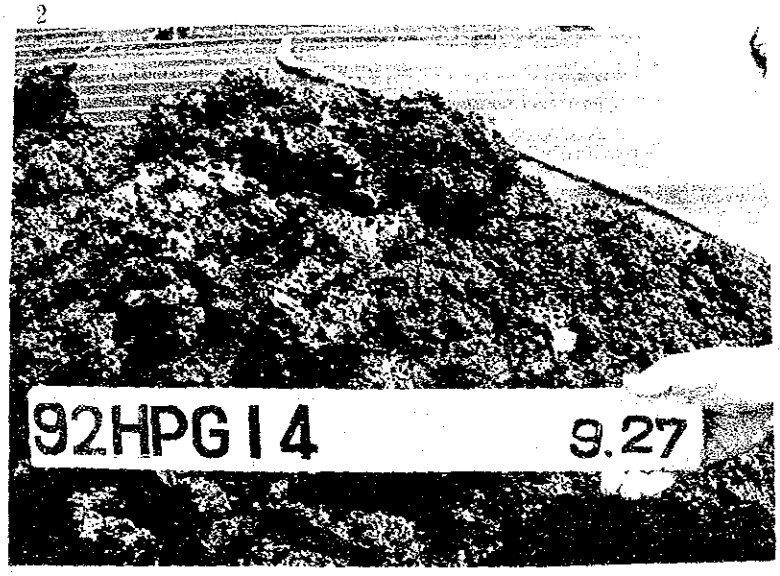


11. Brown hydroxides coated by green clay
    Ore indication No. 6 Line 92SFDC07(03°00.4'S, 147°54.0'E, water depth 433m)
12. Reddish brown hydroxides. Pebbles are accumulated on the surface.
    Ore indication No. 6 Line 92SFDC07(03°00.6'S, 147°53.8'E, water depth 373m)
13. Conglomeratic hydroxides
    Ore indication No. 7 Line 92SFDC07(03°01.8'S, 147°52.2'E, water depth 487m)
14. White~Yellow hydroxides outcropped in cracked shape
    Ore indication No. 7 Line 92SFDC07(03°01.8'S, 147°52.2'E, water depth 469m)

Figure 5-4-1-1 Occurrences of Ore Indications (3)

1

2



1. Brown deposits (92HPG07)
2. Green clay (92HPG14)

Figure 5-4-2-1 Photos of Samples Collected during Ore Deposit Investigation

(1) Result of observation by naked eye

Brown precipitates (deposits)

They assume brown ~ reddish brown and show semi-hard or clayish appearances. Some of them were collected in the form of sticking on the surface of lava and the others were collected independently. But, from the viewpoint of occurrence, some of them are considered to be resulted from the alteration of lava and the others were precipitated from hot water. The major mineral composition is considered to be iron hydroxide. Most of deposits described on Appendix Table 3 means brown precipitates mentioned here.

Dark green clay

Dark green clay was collected from the samples numbered 92HPG15, 92HPG16, 92HPG18, 92HPG21 and 92HPG27. Some oolitic clay occurred in lava's voids and some occurred independently as clayish substances. Under the microscopic observation, this kind of clay assumes a small plate shape and is considered to be chlorite.

(2) Result of Chemical Analysis

14 samples of brown precipitates were selected from the collected substances and the analysis of ore grade for 9 components (Cu, Pb, Zn, Fe, Mn, Ba, Ca, SiO2 and S) was made on these 14 samples of which list is shown in Table 5-4-2-1.

We describe here the method of analysis for every element.

- Sample conditioning

  After crushing, those samples were dried by heating at 60°C and then, pulverized by a ring mill using stainless steel rings.

- Cu, Zn and Pb

  Hot aqua regia was added to the pulverized sample (0.5 ~ 2.0g) and after the sample was dried up and cooled, the sample was put into a 250 ml flask and was made to the constant volume by employing 25% hydrochloric acid. The solution was measured by the atomic absorption method (AA).

Table 5-4-2-1 List of Samples from Ore Indication Zones for Chemical Analysis

No.	Sample No.	Description of Appearance
1	92HPG04	Dark Red (2.5YR3/6) Clay Mineral (Limonite?)
2	92HPG06	Dark Red (2.5YR3/6) Clay Mineral (Limonite?)
3	92HPG07-02	Dark Red (2.5YR3/6) Clay Mineral (Limonite?)
4	92HPG08	Dark Red (2.5YR3/6) Clay Mineral (Limonite?)
5	92HPG09	Dark Red (2.5YR3/6) Clay Mineral (Limonite?)
6	92HPG10-02	Dark Red (2.5YR3/6) Clay Mineral (Limonite?)
7	92HPG13	Dark Red (2.5YR3/6) Clay Mineral (Limonite?)
8	92HPG14-01	Dark Red (2.5YR3/6) Clay Mineral (Limonite?)
9	92HPG15-03	Dark Red (2.5YR3/6) Clay Mineral (Limonite?)
10	92HOG16	Dark Red (2.5YR3/6) Clay Mineral (Limonite?)
11	92HPG18-02	Dark Brown (7.5YR4/6) Clay Mineral (Limonite?)
12	92HPG21	Dark Brown (7.5YR4/6) Clay Mineral (Limonite?)
13	92HPG25	Dark Brown (7.5YR4/6) Clay Mineral (Limonite?)
14	92HPG27	Dark Brown (7.5YR4/6) Clay Mineral (Limonite?)

Note: (2.5YR3/6) etc. represent MUNSELL SOIL COLOR CHARTS.

- SiO_2

  The sample (0.1 g) was melted together with sodium peroxide, and then the melt was added with acetic acid and measured by the atomic absorption method.

- Ba

  The sample (0.2 ~ 1.0 g) was added with a mixed liquid of perchloric acid, fluorine and nitric acid, and after the solution was dried up, it was dissolved in a mixed liquid of hydrochloric acid and sulfuric acid. The solution was filtered and the residue was dissolved in flux of carbonate. Then, the generated barium carbonate was dissolved in hydrochloric acid and measured by the atomic absorption method.

  In case the concentration of barium was higher, the pH of the barium carbonate dissolved in hydrochloric acid was adjusted, and then sulfuric acid was added to it to make it precipitate as barium sulfate.

- S

  The sample (0.2 ~ 0.5 g) was added with nitric acid and bromine to oxidize sulfur as sulfuric acid, and then it was dehydrated, dissolved in hydrochloric acid and the insoluble substances were removed by filtering the solution. Iron was removed at this step as precipitate of hydroxide. The filtered solution was acidified by adding barium chloride solution and was precipitated as barium sulfide. This barium sulfide was extracted by passing it through a filter and then its weight was measured.

- Fe

  The sample (0.5 g) was dissolved by adding sodium peroxide and sodium hydroxide.

  The melt was infiltrated by hydrochloric acid. The obtained hydroxide was precipitated by ammonium hydroxide and then dissolved by hydrochloric acid. Iron was reduced by employing stannic chloride and its solution was dropped against potassium bichromate. When doing this, a sulfide of diphenylalanine chloride was employed as its indicator.

- Mn

  The sample (0.1 g) was added with a mix of perchloric acid, nitric acid and hydrofluoric acid to dry it up.

Later, two rounds of drying up were performed by adding hydrochloric acid and then it was put into a flask and was added with dilute hydrochloric acid, and then, cesium chloride was added to it as an ionization inhibitor.

Mn was measured by the atomic absorption method.

- Ca

The sample (0.1 g) was added with a mix of perchloric acid, nitric acid and hydrofluoric acid to dry it up.

Later, two rounds of drying up were performed by adding hydrochloric acid and then it was put into a flask and was added with dilute hydrochloric acid, and then, cesium chloride was added to it as an ionization inhibitor.

Mn was measured by the atomic absorption method.

Based on the results of the ore grade analysis, elements with relatively high content were considered as major components of major minerals in the respective sample. And each of them was assumed as in the state of oxide, hydroxide or carbonate minerals, and was calculated as the mineral composition in the sample. However, as the contribution of Na, K, Mg, (OH_2) and H_2O in the clay minerals and the existence of other minerals are ignored, the total values shown in the table are slightly lower than the actual values. A list representing the results of ore grade analysis is shown in Table 5-4-2-2, and the mineral composition of the assumed minerals obtained from the ore grade analysis is shown in Table 5-4-2-3. The results of ore grade analysis show that the values of Cu, Pb, Zn and Ba are, in the aggregate, considerably low, the values of Ca, Mn and S are low, and the values of SiO_2 and Fe are high.

Correlation of content among elements was calculated for the five elements (SiO_2, Fe, Mn, Ca and S) by excluding Cu, Pb, Zn and Ba - these are the elements the content of which was low among the analyzed elements - and then a correlation chart was established. A correlation coefficient table is shown in Table 5-4-2-4, scatter diagrams of SiO2-Ca (strong in positive correlation), and of SiO_2-Fe and Fe-Ca (strong in negative correlation) are shown in Figure 5-4-2-2.

Table 5-4-2-2 Results of Chemical Analysis of Samples from Ore Indication Zones

No.	SAMPLE	Cu %	Pb %	Zn %	Fe %	Mn %	Ba %	Ca %	SiO_2 %	S %
1	92HPG04	<0.01	<0.01	<0.01	31.75	0.04	0.01	0.96	20.60	0.192
2	92HPG06	<0.01	<0.01	<0.01	20.32	0.11	0.02	1.72	47.90	0.078
3	92HPG07-02	<0.01	<0.01	<0.01	21.72	0.04	0.01	0.79	38.10	0.219
4	92HPG08	<0.01	<0.01	<0.01	11.21	0.16	0.02	2.43	59.20	0.059
5	92HPG09	<0.01	<0.01	<0.01	35.72	0.02	<0.01	0.45	19.00	0.124
6	92HPG10-02	<0.01	<0.01	<0.01	28.95	0.08	0.01	2.00	28.60	0.089
7	92HPG13	<0.01	<0.01	<0.01	14.36	0.45	0.02	2.32	52.10	0.110
8	92HPG14-01	<0.01	<0.01	<0.01	29.01	0.70	<0.01	1.18	24.90	0.117
9	92HPG15-03	0.01	<0.01	<0.01	9.68	1.60	0.03	3.97	49.30	0.076
10	92HOG16	<0.01	<0.01	<0.01	22.91	2.58	0.02	1.75	27.30	0.120
11	92HPG18-02	<0.01	<0.01	<0.01	30.05	2.73	<0.01	1.19	20.80	0.069
12	92HPG21	<0.01	<0.01	<0.01	27.82	2.00	<0.01	1.54	27.10	0.077
13	92HPG25	<0.01	<0.01	<0.01	20.70	7.63	0.02	2.32	25.90	0.089
14	92HPG27	<0.01	<0.01	<0.01	22.09	3.83	0.02	1.68	31.50	0.072

Table 5-4-2-3 Mineral Composition Presumed by Chemical Analysis of Samples from Ore Indication Zones

No.	SAMPLE	Goethite $FeO(OH)_2$ (%)	Manganese Oxide MnO_2 (%)	Carbonate Mineral $CaCO_3$ (%)	Silicate Mineral SiO_2 (%)	Total (%)
1	92HPG04	60.18	0.06	2.41	20.60	83.25
2	92HPG06	38.52	0.17	4.28	47.90	90.87
3	92HPG07-02	41.17	0.06	1.96	38.10	81.30
4	92HPG08	21.25	0.26	6.07	59.20	86.77
5	92HPG09	67.71	0.04	1.12	19.00	87.87
6	92HPG10-02	54.88	0.12	5.00	28.60	88.60
7	92HPG13	27.22	0.71	5.78	52.10	85.81
8	92HPG14-01	54.99	1.12	2.94	24.90	83.95
9	92HPG15-03	18.35	2.54	9.91	49.30	80.09
10	92HOG16	43.43	4.08	4.37	27.30	79.18
11	92HPG18-02	56.96	4.31	2.98	20.80	85.06
12	92HPG21	52.73	3.16	3.84	27.10	86.83
13	92HPG25	39.24	2.07	5.80	25.90	83.01
14	92HPG27	41.87	6.05	4.19	31.50	83.62

Table 5-4-2-4 Correlation Coefficient Table

	SiO_2	Fe	Mn	Ca	S
SiO_2	*****	-0.898	-0.277	0.632	-0.262
Fe	14	*****	-0.098	-0.818	0.308
Mn	14	14	*****	0.242	-0.333
Ca	14	14	14	*****	-0.534
S	14	14	14	14	*****

Note) Correlation Coefficient : Upper-right side
Number of Samples : Lower-left side

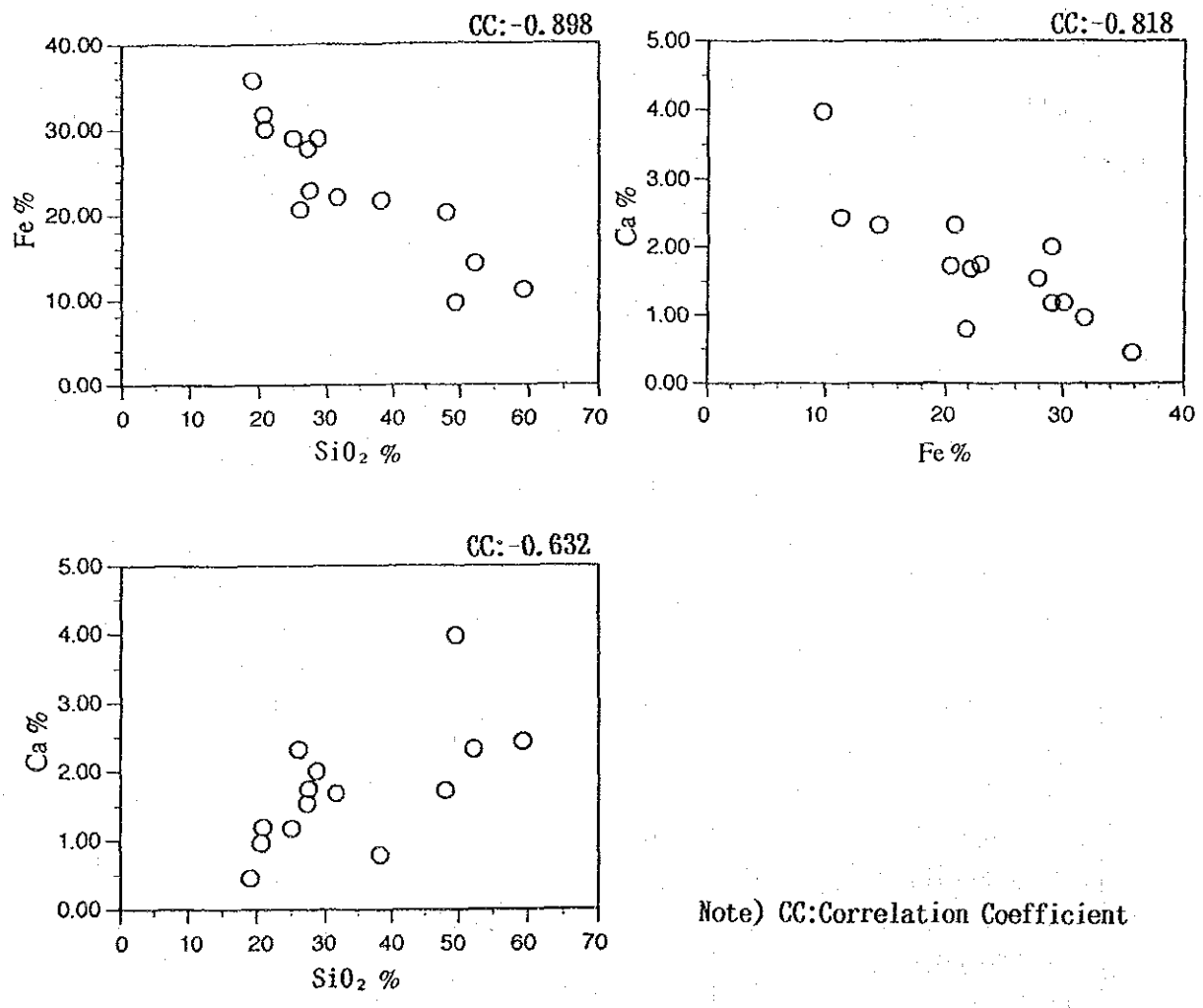


Figure 5-4-2-2 Dispersion Diagram between Major Elements (Ore Deposit Survey)

(3) Result of X-ray diffraction

Clay minerals collected from ore indication zones were investigated by X-ray diffraction and its result was resumed in Table 4-3-2-2 as above described.

Brown precipitates from 92H series points seem to be iron hydroxide minerals by X-ray diffraction, but the decision was not clear because of their amorphism.

3) Inhabiting Living Things

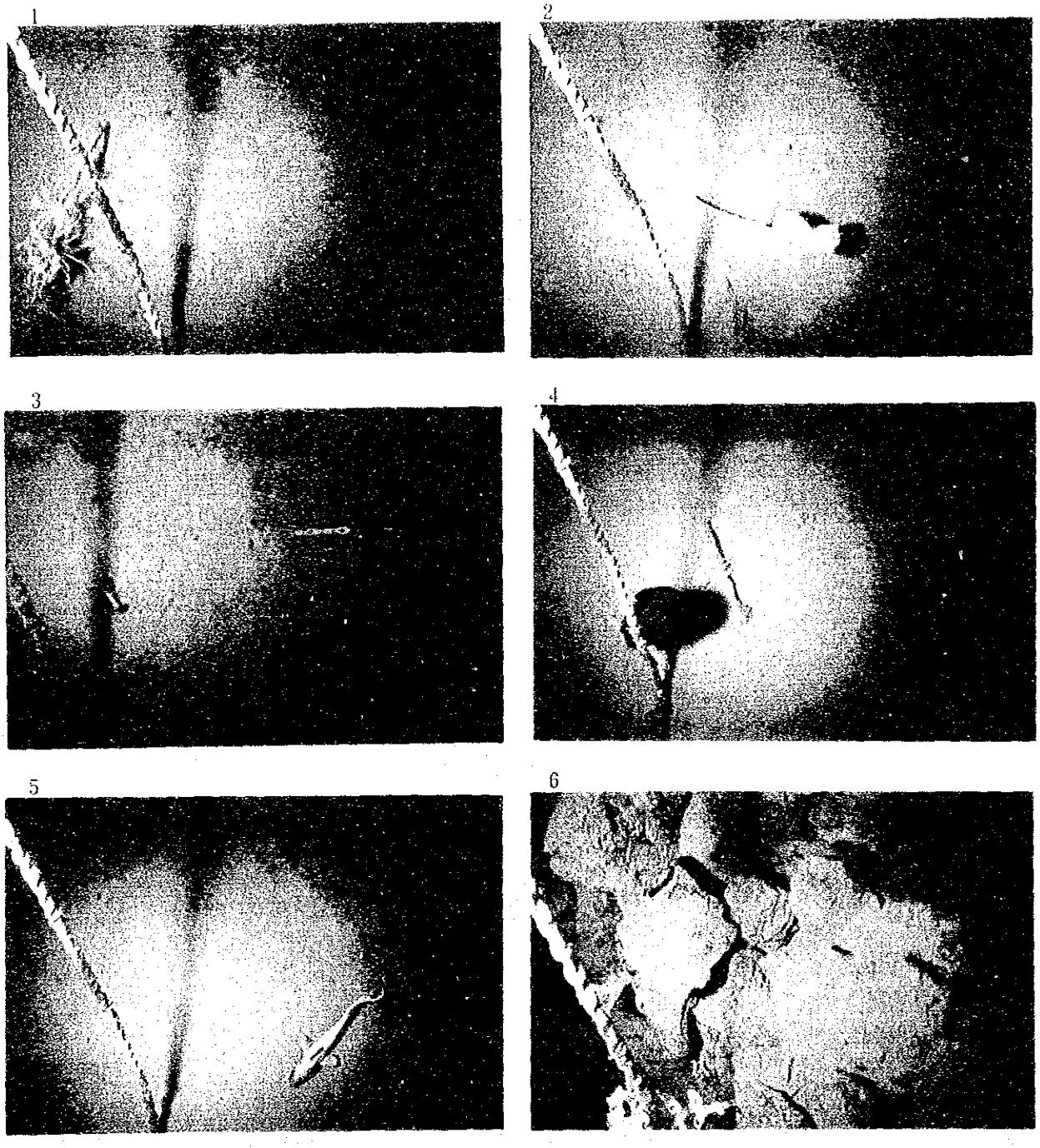
We describe here about the living things observed by the FDC survey. The photographs of the major living things are shown in Figure 5-4-3-1 (1), (2).

The major living things observed are as follows:

- Coelenterata (actiniariae)
- Echinodermata (starfishes, sea cucumbers, sea urchins and crinoids)
- Vertebrata (fishes)
- Shrimps (red)
- Crabs (red)

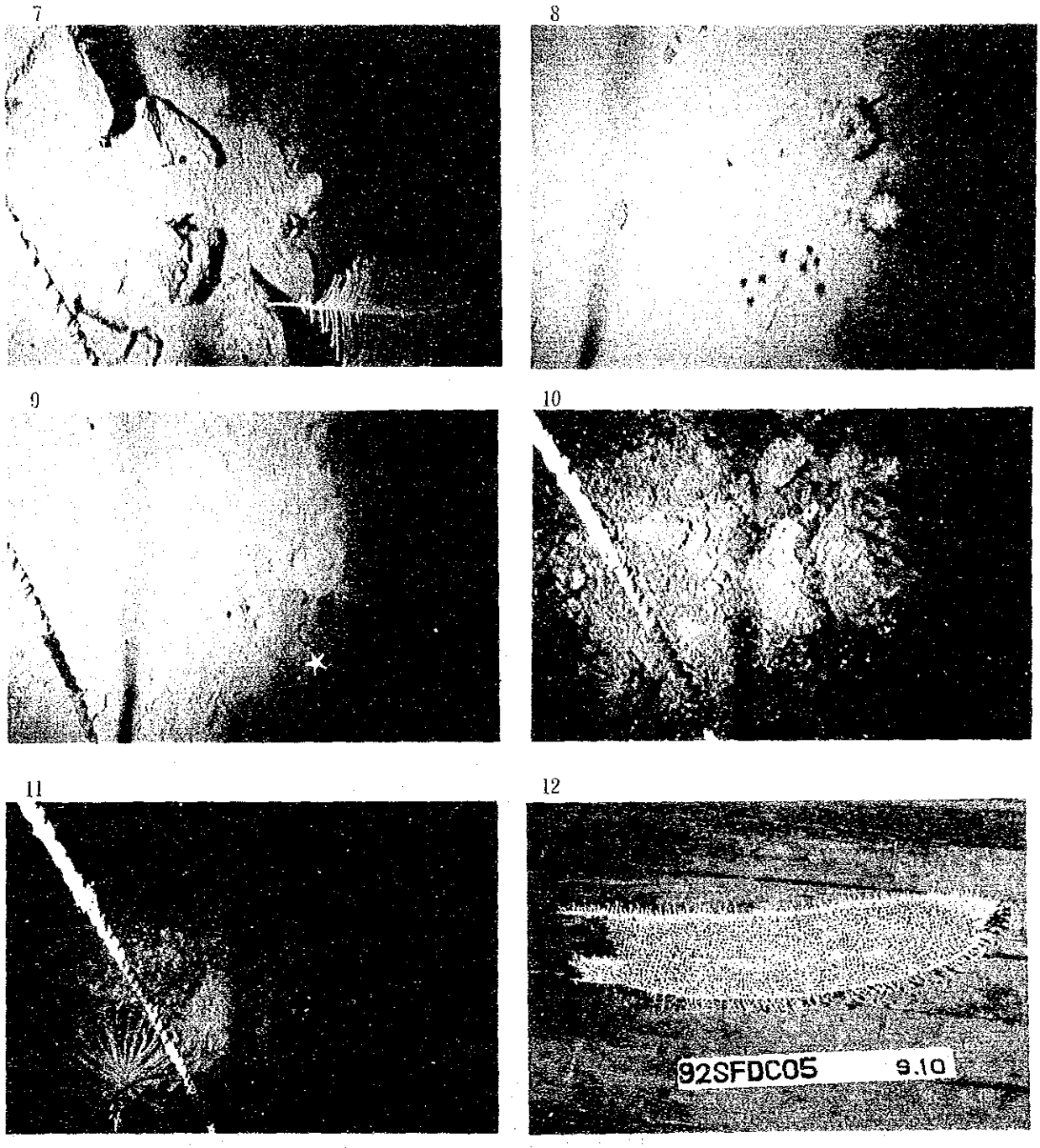
The submarine surface of this area is mainly composed of pillow lava and overlying muddy sediments. A number of sea cucumbers, crinoids and so forth were recognized on the surface of muddy substances and a lot of holes with diameters of several centimeters - presumed to be trace fossils - were also observed. Furthermore, actiniariae, sea cucumbers and crinoids were observed on pillow lava, and the existence of red shrimps and crabs was identified in openings and crevices of lava.

If we classify the inhabiting living things by the water depth, the existence of living things is relatively few at the depths of more than 1,000 m but it shows a tendency that the existence of living things increases in number at depths of shallower than 1,000 m. Actiniariae and crinoids are universally recognized and red shrimps also exist rarely at the water depths of 2,000 ~ 1,500 m. While at the water depth of 1,500 ~ 1,000 m, in addition to actiniariae and crinoids, the inhabitation of starfishes and sea urchins is not rare. A number of species of living things, e.g. actiniariae, sea cucumbers, shrimps and crabs, are identified at the depths shallower than 1,000 m.



1. Crinoidea
   (Line 92SFDC01, 03°16.2'S, 147°09.5'E, water depth 1,520m)
2. Porifera
   (Line 92SFDC01, 03°17.8'S, 147°08.3'E, water depth 1,637m)
3. Macrura
   (Line 92SFDC01, 03°18.1'S, 147°08.1'E, water depth 1,589m)
4. Holothurioidea
   (Line 92SFDC01, 03°18.6'S, 147°07.7'E, water depth 1,653m)
5. Osteichthyes
   (Line 92SFDC01, 03°20.7'S, 147°06.1'E, water depth 1,758m)
6. Porifera
   (Line 92SFDC02, 03°23.5'S, 147°04.6'E, water depth 1,810m)

Figure 5-4-3-1 Living Things (1)



7. Hydrozoa
   (Line 92SFDC02, 03°24.3'S, 147°04.1'E, water depth 1,793m)
8. Echinoidea
   (Line 92SFDC03, 03°09.5'S, 147°38.2'E, water depth 1,059m)
9. Asteroidea
   (Line 92SFDC03, 03°10.0'S, 147°38.4'E, water depth 1,094m)
10. Anomwa
    (Line 92SFDC07, 03°00.6'S, 147°53.8'E, water depth 352m)
11. Anthozoa
    (Line 92SFDC07, 03°01.1'S, 147°53.1'E, water depth 521m)
12. Hydrozoa colony?
    (Line 92SFDC05, Attached to the FDC frame and collected)

Figure 5-4-3-1 Living Things (2)

Such living things as lugworms, white crabs and abyssal shrimps, which prefer the hydrothermal environment, are not recognized even around the reddish brown precipitate during the present survey, and from the fact that only the living things disliking temperature change or change of seawater composition are identified, the possibilities of active hydrothermal activities existing in this area are small.

4) Temperature Anomalies

Measurement of water temperature by CTD was performed simultaneously with the FDC survey and related data were collected at intervals of five seconds. In-situ temperature was adopted as the water temperature. FDC's towing speed was 1 ~ 1.5 knots, therefore the travel was 2.57 ~ 3.85 m per five seconds.

A CTD vertical profile of the survey area is shown in Figure 5-4-4-1. Temperature·depth profiles are shown in Figures 5-4-4-2 (1) and (2) (as for the measuring location, see the FDC Trackline Map).

According to the CTD Vertical Profile, the relation between the water temperature and the water depth is not constant at the depth shallower than 2,000 m. Furthermore, the CTD sensor cannot be maintained at a fixed height due to the measuring method with the FDC survey. For this reason, the temperature changes about 7.2 ~ 9.5°C roughly in proportion to the depth on Figure 5-4-4-2 and Temperature·Depth Profile of FDC07.

This tendency applies to every Temperature·Depth Profile shown in Figure 5-4-4-2.

We, therefore, could not judge the temperature anomalies in the depth of this area being too shallow.

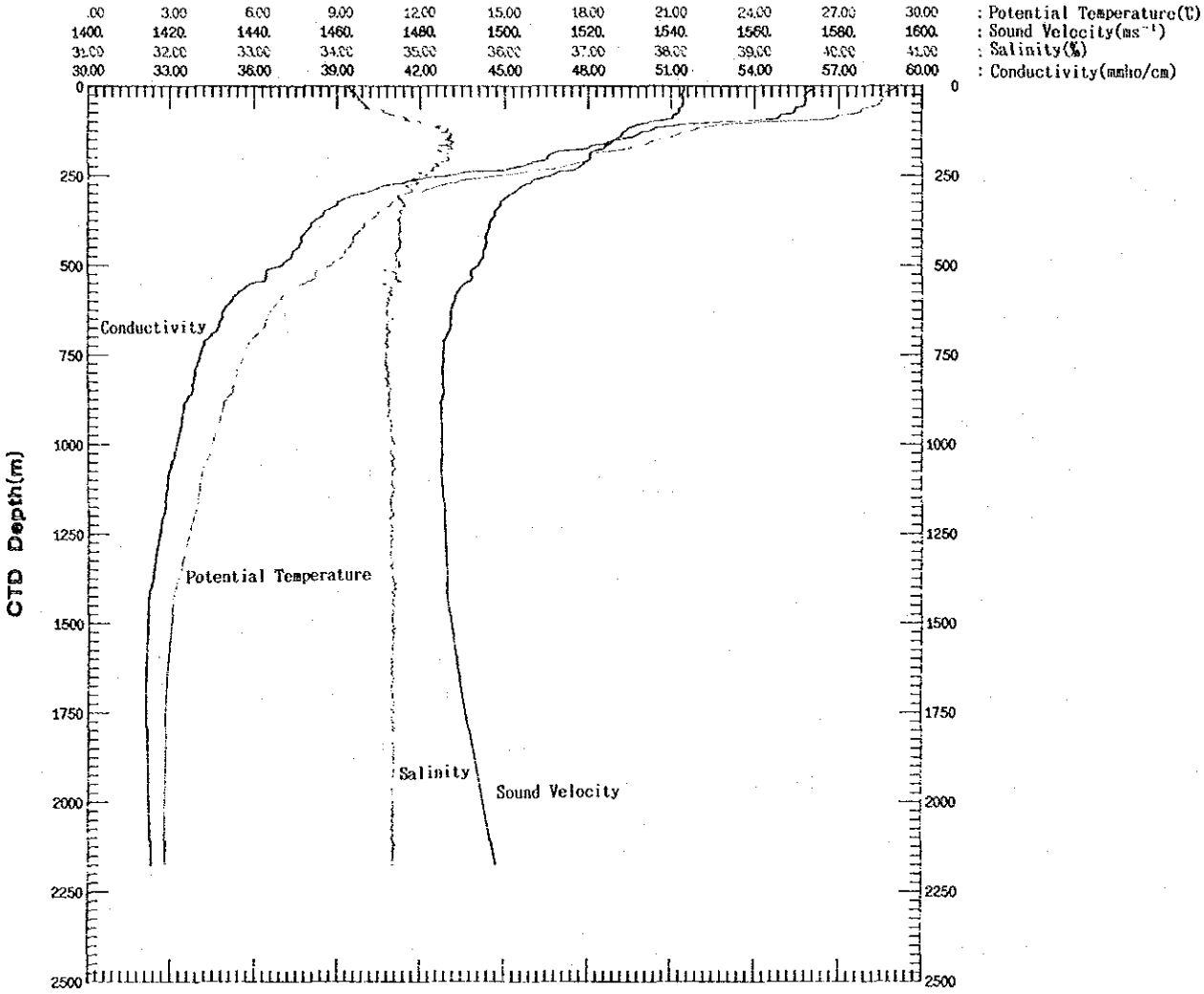
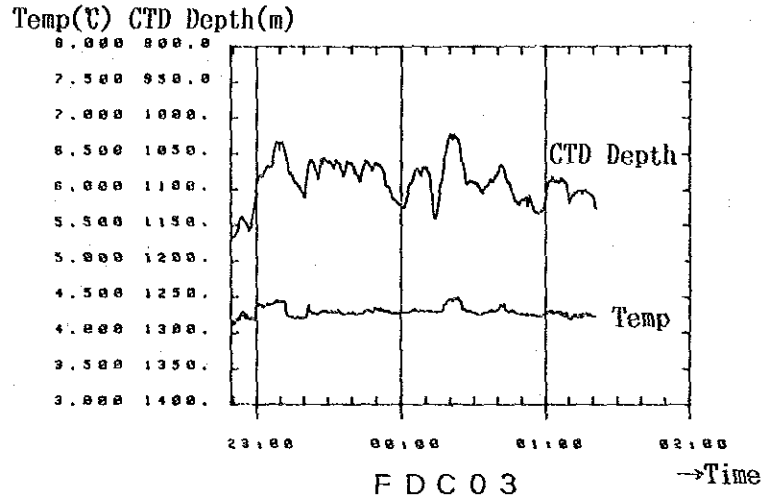
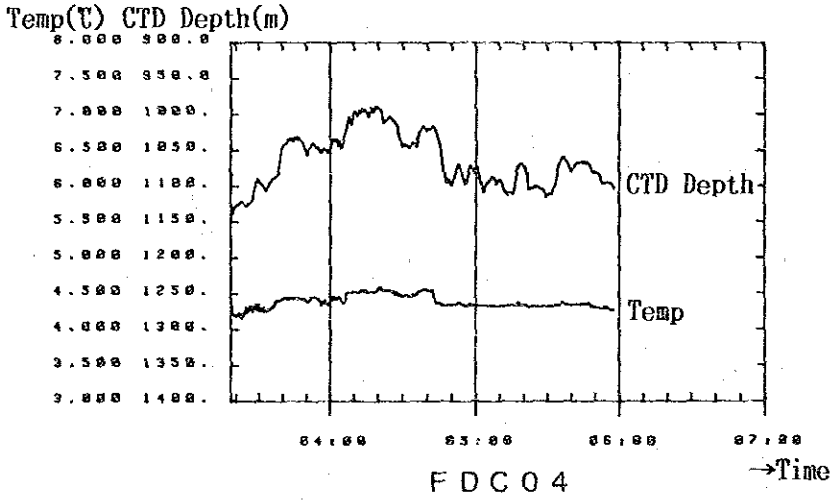


Figure 5-4-4-1 Vertical CTD Profile (Conductivity, Salinity, Potential Temperature and Sound Velocity Versus Depth) Measured at 2°30.120'S, 148°00.057'E.





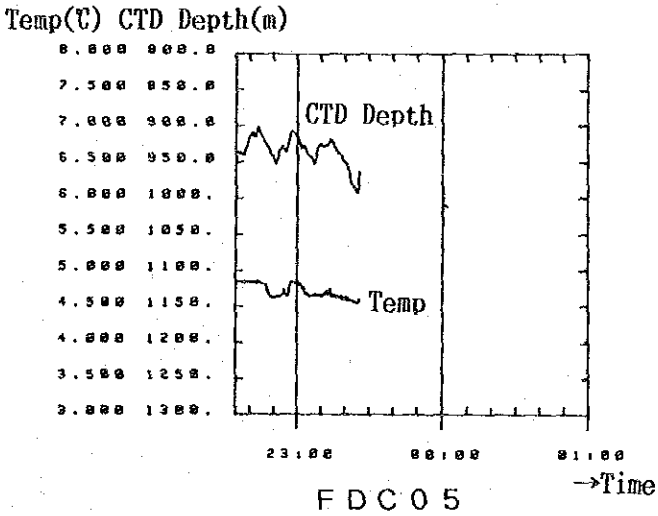
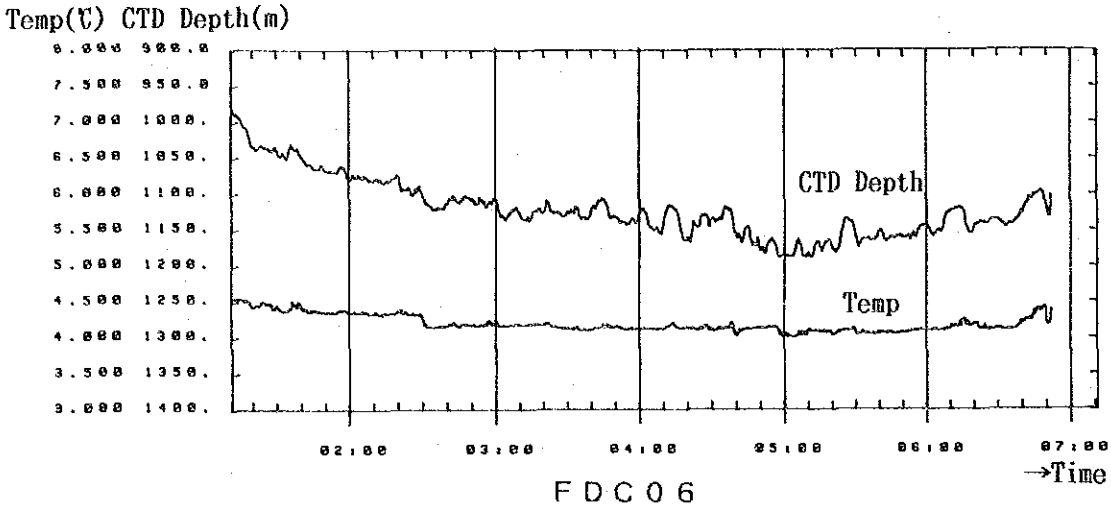
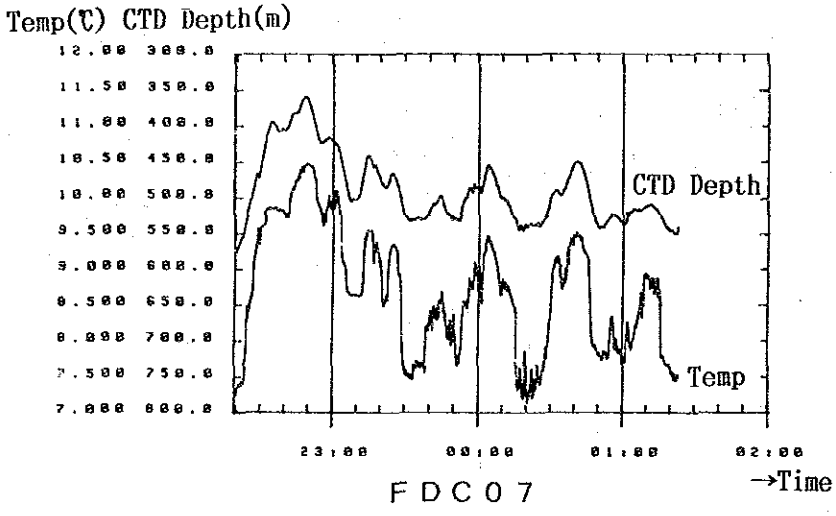


Figure 5-4-4-2 Temperature · CTD Depth Profiles. (1)





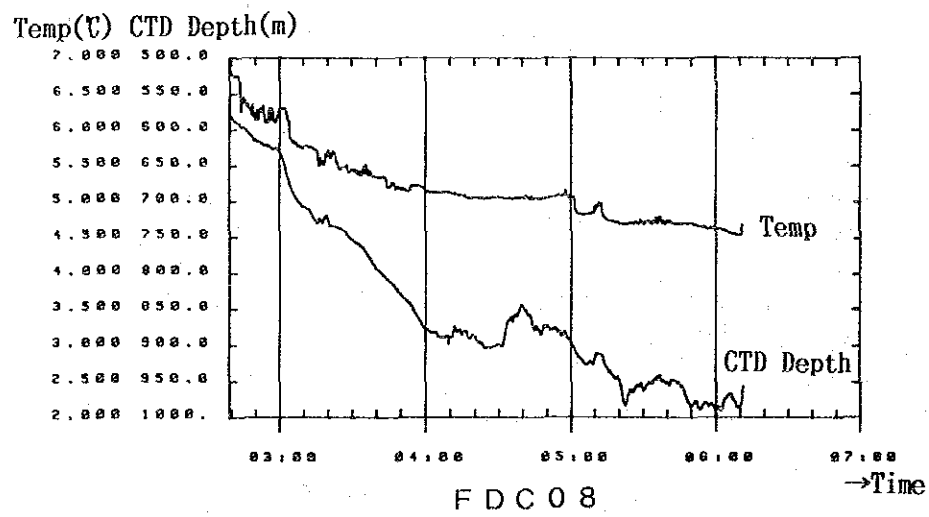


Figure 5-4-4-2 Temperature・CTD Depth Profiles. (2)

Chapter 6. Discussions

< With regard to the Geological Structure >

We determined that the seafloor spreading system in this area array from the eastern part to the western part as described below (see Figure 3-3-1).

A transform fault zone (trending N72°W) - a spreading center (trending S45°W) - a transform fault zone (trending N80°W) - a spreading center (trending S35°W) - a transform fault zone (trending N60°W) - a transform fault zone (from east to west).

The transform fault zone in the Willaumez rise trends roughly the same direction with that of the rise crest and is accompanied by conspicuous magnetic anomalies. But the transform fault zone in the New Guinea Basin is not accompanied by conspicuous magnetic anomalies. The reason of such difference in magnetic anomalies may be explained by the fact that the former belongs to younger magmatic activities (volcanic activities) than those of the latter.

The transform fault zone changes its direction from N60°W to E-W in the New Guinea Basin. We determined the zone trending E-W as a transform fault zone, from the reasons that it is composed of small seamounts and a chain of seamounts and that it roughly coincides with a strike-slip type shallow earthquake zone. We determined the zone trending N60°W as a transform fault zone from the reasons that its topography is composed of cliffs and furrows and that the southern part of it is a very flat submarine surface.

The spreading center trending S45°W belongs to a low magnetization zone considered to be of hydrothermal alteration. The identification of the magnetic stripes is not possible.

The spreading center trending S35°W belongs to, in the aggregate, a low magnetization zone. The identification of the magnetic stripes is not possible.

As for the reasons of the low magnetization zone, we can enumerate that (1) the spreading movement is at a standstill for a long time and there is no young volcanic activities and that (2) the spreading is a non-magmatic spreading at a low spreading rate.

The following factors can be presumed for the reasons of not being able to identify the magnetic stripes.

(1) According to the magnetization distribution map of this area (Figure 3-2-6), the directionality of the magnetic lineation trends N-S and arrays in the order of the Manus Basin (low magnetization) - the Willaumez rise (high magnetization) - the area between 146°50'E ~ 147°20'E (low magnetization) - the New Guinea Basin (medium ~ high magnetization), and the spreading center trending S45°W is located in the direction to cross them orthogonally. Because volcanic activities outside the spreading center are also active in the Willaumez rise, we can infer that the magnetic stripes are counteracted by those volcanic activities. Furthermore, the magnetic stripes in the neighborhood of the St. Andrew Islands at the northern part of the survey area is not prominent signature. This may be caused by the magma activities in the plate trending E-W.

(2) The spreading center trending S35°W is in the low magnetization zone of 146°50'E ~ 147°20'E, and is considered to be a spreading activity without accompanying a magma activity or a spreading activity caused by non-magnetic magma.

< With regard to the Relation between Ore Indication and Topography >

We postulated the seafloor spreading system by bathymetric and magnetic surveys and accoustic sounding, and performed a survey of submarine hydrothermal deposits on the spreading centers (topographically, they are seamounts and ridges). As a result, we found five ore indications at these spreading centers and graben zones surrounding them.

From the fact that ore indications are recognized from the photographs taken at the sampling point 92BGC26, which is located about 5 miles south to the Ore Indication No.1, we think it is necessary to make a follow-up survey to find out whether the width of this spreading center (ridge) is wider than the estimated one or there are other ore indications outside the spreading center.

< With regard to Magnetic Anomalies >

When we converted the magnetic anomalies into reduction to the pole anomaly, we assumed the inclination of this area as 23°30'S and the declination as 5°00'E. Also, we did not consider the negative magnetic anomalies on reduction to the pole anomaly maps (Figure 3-2-5) as reverse magnetization but mainly interpret them as non-magnetic zones. When we determined the magnetization distribution, we took a plane 20 km under the sea level as the bottom of the magnetic substance (reference plane) because the

water depth varied considerably from 170 m to 2,400 m. As the magnetization of rocks in the back-arc basin and the submarine geological structure are unknown under the present data, we merely added a constant to the magnetic anomalies as an "annihilator."

A supplementary explanation is given in the following.

Magnetic substances and hydrothermal alteration zones are widely distributed within the Willaumez rise, which is an active region of the magmatic activities. Among them, two high magnetization zones are conspicuous. One is seen along the boundary part between the Willaumez rise and the Manus Basin, and the other is seen along the transform fault zone. No conspicuous magnetic anomalies are recognized in the northern margin of the Manus Basin where is a cliff with a head of about 1,000 m.

Furthermore, as normally magnetized anomalies are recognized at the deepest place (2,400 m) in the northern part of the 146°40'E line within the New Guinea Basin, a future survey there is anticipated.

< With regard to the Temperature Anomaly >

As the seawater temperature varies rather widely according to the water depth in an area shallower than depth of 2,000 m, the temperature anomaly related to the hydrothermal activities could not be detected in such a shallow and rugged seafloor like this survey area.

< With regard to SSS >

We did the SSS survey with the object of finding out the center of the spreading centers. Some of the spreading centers have obvious central grabens but some not. According to SSS data, a central graben shows a linear pattern of strongly reflecting lines (Figure 5-2-3).

< With regard to the Distribution of Rocks >

Judging from the camera work and sampling, volcanic rocks are widely distributed in and around the plate spreading centers within the Willaumez rise. This fact coincides with the topography. However, most of the areas outside the periphery of the spreading center are covered with thick sediments regardless of topography or water depth. Most of the volcanic rocks are tholeiite but alkai basalt and dacitic volcanic rock are also recognized, which indicates the complexity of the volcanic activities.

Considerable amount of fragments of black amorphous tholeiitic basalt were collected from under the thin sediments at 92RPG03. Also a certain amount of fragments of the same basalt were recognized at the sampling points surrounding there. This is considered to be the effects of a recent eruption of Tuluman volcano (Johnson et al., 1979) situated about 15 miles west to 92RPG03.

< With regard to Ore Indications >

The portion of the assumptive plate spreading center to which FDC was carried out was merely an exceedingly small portion and from the viewpoint of an ore deposit survey, we think it still needs much more camera work. As we describe later, hydrothermal activities exist here widely so the camera work should be carried out closely.

The fact that five ore indication sites and two oxidation zones are found by this insufficient FDC survey suggests that there would exist many traces of hydrothermal activities within this area. The track lines 92SFDC07 and 92SFDC08 were set along the crests and valleys in a wide topographical rise presumed to be a spreading center. The distance between these two track lines is about two miles. Nevertheless, ore indications and oxidation zones were found on these two track lines. Also, yellow part indicating ore signs was photographed on still pictures taken at 92BGC26 during the baseline geochemical survey sampling on the SW side. The point of 92BGC26 is about five miles away, in the direction of SE, from the center part (ore indication site) of the baseline on the SW side. Accordingly, although we could not identify the existence of sulfide (ores), we can say that the hydrothermal activity existed widely.

< With regard to the Existence of Ore Deposits >

Although we found five places suggesting ore signs by this year's FDC survey, we could not pick up any ore from the sampling. We cannot determine whether it is because there are no ores (sulfide) at all but only oxide, or because of an insufficient survey although there exits sulfide. In all events, it is true that the survey is still insufficient. For reference, the existence of chimneys, hydrothermal living things and sulfide in the hydrothermal activity area around the spreading center adjoining the eastern side of the survey area was reported by Both et al. (1986).

Samples from geochemical sampling were investigated by X-ray diffraction and a small amount of pyrite was confirmed, but its genetical relation with hydrothermal activities was not clear.

< With regard to the Method of Survey >

The survey of this year was performed, on the whole, in the order of the topographical survey (simultaneously with the magnetic survey), the geochemical survey and the geological ore deposit survey. Normally, a geochemical survey may choose one of the following three targets, i.e. (1) bottom sediments, (2) seawater or (3) both. We chose the first target (i.e. bottom sediments) for this year's survey for the reasons of its effectiveness and our equipment. As in the case of this survey, it may be difficult to estimate an area of hydrothermal activity from the results of seawater analysis at an area where the hydrothermal activity is terminated. The analysis of bottom sediments is anticipated.

The survey of geological ore deposits is composed of a SSS survey, submarine observation and sampling but it was difficult to do sufficient survey in a limited time. However, if we consider that, before the operation, we feared we might not even find ore indications or oxidation zones, the fruits of this survey may fairly be called a success. Although it was only one area, it was not an easy task to complete a survey of hydrothermal ore deposits just by one curising. The survey for more details seems to be necessary.

Chapter 7. Summary

In 1992, the third fiscal year of the second phase of the five-year SOPAC program, a survey on submarine hydrothermal ore deposits and their related survey was carried out in the Bismarck Sea within the exclusive economic zone of Papua New Guinea. The survey is composed of topographical cruising for drawing topographical maps based on accoustic sounding, regional geochemical sampling carried out in the entire waters, baseline geochemical sampling focused on discovered ore indications and a survey of geological ore deposits (SSS, FDC and sampling) carried out in and around the sea-floor spreading centers. Furthermore, in order to serve as an aid in estimating geological structure, a magnetic survey was carried out in parallel with the topographical cruising and a CTD survey for water temperature anomalies caused by hydrothermal activities was carried out by loading CTD on FDC.

(The Results of Acoustic Sounding)

A bathymetric map of the entire region, drawn on a scale of 1 to 850,000 and contoured at 200 m intervals, is shown in Figure 3-1-2. However, these scale and contour interval can be selected freely. Topographical cruising distance was 5,564.0 miles.

The interpretation of the geological structure including the spreading center presumed from the topographical map is shown in Figure 3-3-1, but the width of the spreading center is estimated to be about 5 miles, which is a considerable one.

(The Results of Magnetic Survey)

The results of the total magnetic force measuring reveal that the eastern part of the waters (the Manus Basin) is an area of magnetic smoothness and the middle part of the waters (the Willaumez rise) is an area of magnetic anomalies with large amplitude. Furthermore, an area of positive and negative magnetic anomaly pair caused by transform faults and an area of positive magnetic smoothness corresponding to the New Guinea Basin are recognized in the western part of the waters.

PGM towing distance was 3,544.2 miles.

(The Results of Regional Geochemical Sampling)

Muddy sediments were collected at 39 points as scheduled.

However, there were some cases in which no samples were collected, so the number of sampler used amounted to 42 times.

The microfossil appraisal was performed on a part of the samples.

(The Results of Baseline Geochemical Sampling)

Two track lines of about 40 miles each and 30 sampling points on these track lines were established around the sites with ore indications discovered by the submarine observation. The number of samplers used, including re-trial, amounted to 36 times. Nevertheless, there were three points at which no samples were collected due to hard rock, so the collectable points were 27 points.

Samples were collected from 66 points by the regional geochemical sampling and the base-line geochemical sampling, and 250 samples were selected from them to perform chemical analysis as well as 200 samples were selected from them to perform X-ray diffraction. The respective results are listed in the present report.

(The Results of the Survey on Geological Ore Deposits)

SSS: 3 track lines totaling 19.1 miles are conducted for identifying the spreading center.

FDC: As a result of ore deposit survey conducted through 8 FDC track lines (Total length of the track lines: 35.8 miles.

Number of photos taken: 1,073 sheets), five places with ore indications and two oxidation zones were discovered.

However, no hydrothermal living things nor active chimneys were recognized in either case, which indicates that the hydrothermal activity in this region has almost terminated.

Sampling: Sampling was conducted at five places with ore indications as mentioned above and an oxidation zone in the neighborhood of the Ore Indication No.4 by employing FPG (19 rounds) and OG (8 rounds), which totaled 27 rounds (including the cases in which no samples were collected). The results of sampling show that iron oxide (or iron hydroxide) considered to be of hydrothermal was collected at every place with ore indications but no sulfide was collected.

Rocks collected through the geochemical sampling and the geological ore deposit sampling were analyzed and examined by microscopy. The results

reveal that most of the volcanic rocks are tholeiite but there are a certain amount of alkali basalt and dacitic volcanic rock. This area is an area of showing complicated volcanic activities.

(The Survey of Water Temperature Anomalies)

Owing to the shallow depths, the water temperature varies at different depths, so we could not collect enough data to discuss the water temperature anomalies.

(Discussions)

Notwithstanding that the FDC survey carried out on the widely developed spreading center was insufficient, a number of ore indications and oxidation zones were found in the region.

This suggests that a lot of hydrothermal activities were in existence in this region.

But we could not collect any sulfide sample through the sampling for ore deposits. It is not clear whether we could not catch sulfide because duration of our survey was not enough or sulfide did not exist. This matter would be a future subject of survey and study.

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【 Appendix 】

1. List of the Results of the Regional Geochemical Sampling
2. List of the Results of the Base-Line Geochemical Sampling
3. List of the Results of the Geological Surveys on Ore Deposits
4. List of Samples for Chemical Analysis
5. List of Samples for X-ray Diffraction Analysis
6. List of the Results of Chemical Analysis for Major Elements
7. List of the Results of Chemical Analysis for Minor Elements
8. Weather and Sea-state Data
9. Sound Velocity of Sea-water used for MBES

Appendix 1. List of the Results of the Regional Geochemical Sampling

Sample No.	Date	Time	Latitude	Longitude	Depth	Equipment used	Quantity collected	Remarks
92RLC01	08/18	08:44:40	2° 30.120' S	148° 00.057' E	2148.00m	LC	297cm	
92ROG02	08/19	05:08:25	2° 59.998' S	147° 59.910' E	762.70m	OG	2.6kg	
92RPG03	08/19	23:33:10	2° 30.009' S	147° 30.076' E	1079.00m	FPG	19cm	
92RLC04	08/20	03:56:00	2° 45.009' S	147° 44.954' E	2200.00m	LC	232cm	
92RPG05	08/20	21:31:00	3° 14.956' S	147° 45.027' E	967.00m	FPG	48cm	
92RPG06	08/21	00:55:55	3° 30.028' S	148° 00.026' E	1022.00m	FPG	42cm	
92RGC07	08/22	23:11:20	2° 45.113' S	147° 14.797' E	1027.50m	GC	177cm	
92RGC08	08/23	03:00:55	2° 30.030' S	146° 59.938' E	529.00m	GC	143cm	
92RGC09	08/24	02:10:25	4° 00.066' S	147° 29.950' E	1597.00m	GC	127cm	
92RGC10	08/24	22:39:30	3° 29.980' S	147° 00.101' E	1775.00m	GC	172cm	
92RGC11	08/25	03:38:25	4° 00.077' S	146° 59.882' E	1968.00m	GC	200cm	
92RGC12	08/25	21:19:20	3° 00.091' S	146° 59.917' E	1643.00m	GC	152cm	
92RGC13	08/26	04:40:50	3° 44.810' S	147° 15.034' E	1731.00m	GC	35cm	
92RGC14	08/27	00:46:30	3° 30.136' S	147° 30.050' E	1484.00m	GC	148cm	
92ROG15	08/27	05:30:35	3° 15.051' S	147° 15.005' E	1265.00m	OG	20cm	
92RGC16	08/28	00:53:00	3° 45.026' S	147° 45.020' E	1353.00m	GC	190cm	
92RGC17	08/28	04:27:15	3° 59.970' S	147° 59.898' E	1544.00m	GC	40cm	
92ROG18	08/29	00:01:35	2° 59.990' S	147° 29.958' E	1277.00m	OG	27cm	
92RGC19	09/02	23:04:05	2° 59.984' S	146° 00.035' E	1847.00m	GC	190cm	
92RGC20	09/03	02:24:00	2° 44.828' S	146° 15.099' E	785.50m	GC	205cm	

Sample No.	Date	Time	Latitude	Longitude	Depth	Equipment used	Quantity collected	Remarks
92RGC21	09/03	05:33:30	2° 30.096' S	145° 59.935' E	1090.50m	GC	210cm	
92RGC22	09/03	23:03:10	3° 00.002' S	145° 29.879' E	1943.00m	GC	191cm	
92RGC23	09/04	02:45:00	2° 44.950' S	145° 45.052' E	1814.00m	GC	185cm	
92RGC24	09/04	06:09:40	2° 30.041' S	145° 29.946' E	1136.00m	GC	190cm	
92RGC25	09/04	21:27:10	2° 29.947' S	146° 30.004' E	902.00m	GC	183cm	
92RGC26	09/05	00:40:30	2° 45.008' S	146° 44.887' E	1116.00m	GC	208cm	
92RGC27	09/05	03:45:20	2° 59.972' S	146° 29.833' E	676.00m	GC	43cm	
92RGC28	09/19	22:57:10	3° 45.000' S	146° 45.088' E	2187.00m	GC	192cm	
92RGC29	09/20	05:58:35	3° 15.031' S	146° 45.066' E	1808.00m	GC	205cm	
92RGC30	10/02	20:51:55	3° 59.930' S	146° 29.959' E	1632.50m	GC	204cm	
92RGC31	10/03	00:24:25	3° 44.923' S	146° 14.930' E	2027.00m	GC	188cm	
92RGC32	10/03	04:01:50	3° 30.070' S	146° 30.019' E	2170.50m	GC	130cm	
92RGC33	10/03	07:37:05	3° 14.950' S	146° 15.017' E	1845.00m	GC	136cm	
92RGC34	10/03	22:44:45	3° 59.909' S	145° 59.641' E	2089.00m	GC	95cm	
92RGC35	10/04	02:44:35	4° 00.024' S	145° 29.570' E	2080.50m	GC	183cm	
92RGC36	10/04	22:33:05	3° 29.854' S	145° 29.917' E	2110.50m	GC	74cm	
92RGC37	10/05	02:05:00	3° 44.908' S	145° 44.995' E	2144.00m	GC	113cm	
92RGC38	10/05	05:30:00	3° 29.834' S	146° 00.235' E	2172.00m	GC	128cm	
92RGC39	10/05	09:00:10	3° 15.054' S	145° 44.879' E	1960.00m	GC	181cm	

Note: Date and Time represent the GMT of collecting samples or landing on the bottom.
Latitude and Longitude are the GPS vessel position and Depth is based on NBS.

Appendix 2. List of the Results of the Base-Line Geochemical Sampling

1) Track Line A

Sample No.	Date	Time	Latitude	Longitude	Depth	Equipment used	Quantity collected	Remarks
92BGC17	09/29	22:32:10	3° 12.919' S	146° 47.755' E	1197.00m	GC	200m	
92BGC18	09/30	00:27:30	3° 15.898' S	146° 51.753' E	1472.00m	GC	212cm	
92BGC19	09/30	02:32:55	3° 18.836' S	146° 55.800' E	1937.00m	GC	39cm	
92BGC20	09/30	04:32:40	3° 20.326' S	146° 57.718' E	1864.00m	GC	133cm	
92BGC21	09/30	06:23:35	3° 21.805' S	146° 59.779' E	1859.00m	GC	104cm	
92BGC22	09/30	22:46:30	3° 23.174' S	147° 01.824' E	1844.00m	GC	88cm	
23								
92BGC24	10/01	03:56:40	3° 25.264' S	147° 04.589' E	1803.00m	GC	40cm	
92BGC25	10/01	05:43:05	3° 26.246' S	147° 05.779' E	1780.00m	GC	150cm	
92BGC26	10/01	07:36:30	3° 27.619' S	147° 07.850' E	1861.00m	GC	4cm	
92BGC27	10/01	22:50:25	3° 29.102' S	147° 09.840' E	1936.00m	GC	66cm	
92BGC28	10/02	00:51:10	3° 30.576' S	147° 11.910' E	1974.00m	GC	105cm	
92BGC29	10/02	03:01:10	3° 33.464' S	147° 15.866' E	1789.00m	GC	115cm	
92BGC30	10/02	05:10:55	3° 36.560' S	147° 19.951' E	1609.00m	GC	33cm	

2) Track Line B

Sample No.	Date	Time	Latitude	Longitude	Depth	Equipment used	Quantity collected	Remarks
92BGC01	09/20	22:27:55	2° 49.487' S	147° 20.254' E	978.00m	GC	199cm	
92BGC02	09/20	23:52:00	2° 51.486' S	147° 21.900' E	986.00m	GC	105cm	
92BGC03	09/21	01:24:10	2° 53.414' S	147° 23.375' E	1277.00m	GC	195cm	
92BGC04	09/21	03:02:40	2° 55.353' S	147° 24.967' E	1259.00m	GC	45cm	
92BGC05	09/21	04:33:05	2° 56.492' S	147° 25.873' E	1127.00m	GC	105cm	
06								
92BGC07	09/22	03:36:55	2° 58.053' S	147° 27.219' E	1184.00m	GC	21cm	
92BGC08	09/22	05:18:20	2° 59.268' S	147° 28.038' E	1313.00m	GC	2cm	
92BGC09	09/22	07:43:15	3° 06.697' S	147° 34.598' E	1366.00m	GC	10cm	
10								
92BOG11	09/23	02:44:45	3° 09.823' S	147° 36.999' E	1038.00m	OG	10kg	
92BPG12	09/23	04:13:25	3° 10.632' S	147° 37.583' E	1053.00m	FPG	30cm	
92BOG13	09/23	06:54:05	3° 11.218' S	147° 38.167' E	1087.00m	OG	20cm	
92BGC14	09/23	22:28:35	3° 12.463' S	147° 39.184' E	1169.00m	GC	13cm	
92BGC15	09/24	00:13:45	3° 14.508' S	147° 40.770' E	1132.00m	GC	155cm	
92BGC16	09/24	02:16:20	3° 18.329' S	147° 43.812' E	1235.00m	GC	95cm	

Note: Date and Time represent the GMT of collecting samples or landing on the bottom.
Latitude and Longitude are the GPS vessel position and Depth is based on NBS.

Appendix 3. List of the Results of the Geological Surveys on Ore Deposits

Sample No.	DATE	Time	Latitude	Longitude	Depth	Equipment used	Deposits	Rocks	Sediments	Remarks
92HPG04	09/12	08:35:10	3° 02.222' S	147° 51.621' E	508.00m	F P G	1250kg			
92HPG06	09/24	22:54:05	3° 05.933' S	147° 45.236' E	936.00m	F P G	100kg	900kg		
92HPG07	09/25	01:04:55	3° 05.897' S	147° 45.196' E	928.00m	F P G	200kg			
92HPG08	09/25	03:28:00	3° 05.860' S	147° 45.260' E	941.50m	F P G	100kg	900kg		
92HPG09	09/25	22:40:20	3° 02.194' S	147° 51.626' E	491.50m	F P G	900kg	100kg		
92HPG10	09/25	23:52:05	3° 01.768' S	147° 52.268' E	482.00m	F P G	10kg		700 kg	
92HOG11	09/26	00:51:25	3° 02.214' S	147° 51.609' E	499.00m	O G			60 kg	
92HOG12	09/26	01:47:15	3° 01.780' S	147° 52.166' E	460.00m	O G			100 kg	
92HPG13	09/26	03:13:00	3° 01.753' S	147° 52.247' E	483.00m	F P G	10kg		400 kg	
92HPG14	09/26	23:24:55	2° 57.333' S	147° 26.611' E	1099.00m	F P G	10kg	200kg	800 kg	
92HPG15	09/27	01:41:40	2° 57.314' S	147° 26.627' E	1091.00m	F P G	90kg	50kg	360 kg	
92HPG16	09/27	03:03:05	2° 57.311' S	147° 26.563' E	1109.00m	F P G	50kg		100 kg	
92HPG18	09/27	05:47:55	2° 57.291' S	147° 26.601' E	1103.00m	F P G	200kg		1000 kg	
92HPG19	09/28	00:03:00	2° 56.705' S	147° 27.409' E	1037.00m	F P G		50kg		
92HOG20	09/28	01:13:55	2° 56.700' S	147° 27.326' E	1033.00m	O G			0.1 kg	
92HPG21	09/28	04:09:15	2° 56.709' S	147° 27.348' E	1045.00m	F P G	22kg			
92HOG22	09/28	05:24:50	2° 56.640' S	147° 27.337' E	1012.00m	O G			0.75kg	
92HPG23	09/28	23:59:15	3° 24.667' S	147° 03.789' E	1791.00m	F P G			1800 kg	
92HOG24	09/29	01:41:25	3° 24.680' S	147° 03.805' E	1790.00m	O G			100 kg	
92HPG25	09/29	03:41:10	3° 24.689' S	147° 03.769' E	1797.00m	F P G	100kg		1100 kg	
92HOG26	09/29	05:20:25	3° 24.614' S	147° 03.788' E	1796.50m	O G			0.01kg	
92HPG27	09/29	07:31:50	3° 24.662' S	147° 03.881' E	1779.00m	F P G	200kg		200 kg	

Note: Date and Time represent the GMT of collecting samples or landing on the bottom.
Latitude and Longitude are the GPS vessel position and Depth is based on NBS.
Deposits, Rocks and Sediments show the quantity of samples collected.

Appendix 4. List of Samples for Chemical Analysis

No.	Sample No.	Depth (cm)	Description
1	92RLC01-01	0~ 5	brown(M.No.:10YR4/3) clay
2	92RLC01-02	11~ 16	dark grey(M.No.:7.5YR4/0) fine sand
3	92RLC01-03	26~ 31	pale yellow(M.No.:5Y7/3) clay with dark brown 5mm thick clay band
4	92RLC01-04	75~ 80	light grey(M.No.:5Y6/1) tfs.clay bearing dark green glass in lapilli size common
5	92RLC01-05	165~170	olive grey(M.No.:5Y4/2) tfs.clay
6	92RLC01-06	292~297	light olive grey(M.No.:5Y6/2) > olive grey(M.No.:5Y5/2) tfs.clay
7	92ROG02		yellowish brown(M.No.:10YR5/4) clay with much black volcanic glass
8	92RPG03-01	0~ 5	brownish yellow(M.No.:10YR6/6) clay
9	92RPG03-02	10~ 15	brown(M.No.:10YR5/3)~greyish brown(M.No.:10YR5/2) with much black volcanic glass
10	92RLC04-01	0~ 5	dark brown(M.No.:10YR3/3) clay
11	92RLC04-02	15~ 20	grey(M.No.:10YR5/1) clay
12	92RLC04-03	45~ 50	pale brown(M.No.:10YR6/3)~ grey(M.No.:5Y6/1) clay
13	92RLC04-04	147~152	olive grey(M.No.:5Y5/2) clay
14	92RLC04-05	222~227	grey(M.No.:5Y5/1) clay
15	92RPG05-01	0~ 5	very dark greyish brown(M.No.:10YR3/2) clay
16	92RPG05-02	43~ 48	olive grey(M.No.:5Y5/2)~dark brown(M.No.:10YR4/3) clay
17	92RPG06-01	0~ 5	very dark greyish brown(M.No.:10YR3/2) clay
18	92RPG06-02	13~ 18	dark greyish brown(M.No.:10YR4/2) clay
19	92RPG06-03	37~ 42	grey(M.No.:5Y5/1) clay
20	92RGC07-01	0~ 5	very dark greyish brown(M.No.:10YR3/2) clay
21	92RGC07-02	15~ 20	light olive grey(M.No.:5Y6/2) tfs. fine sand with shell fragments
22	92RGC07-03	92~ 97	olive grey(M.No.:5Y5/2) tfs. clay with shell fragments
23	92RGC07-04	151~154	black(M.No.:5Y6/2) tfs. clay patch
24	92RGC07-05	172~177	very dark grey(M.No.:5Y3/1) tfs. fine sand
25	92RGC08-01	0~ 5	dark greyish brown(M.No.:10YR4/2) fine sand with basalt,coral and shell fragments
26	92RGC08-02	15~ 20	very pale brown(M.No.:10YR7/3) clay with coral and shell fragments
27	92RGC08-03	45~ 50	yellowish brown(M.No.:10YR5/6) clay with coral and shell fragments
28	92RGC08-04	60~ 65	dark yellowish brown(M.No.:10YR4/4) fine sand with shell fragments
29	92RGC08-05	80~ 85	very pale brown(M.No.:10YR7/4) clay with basalt and shell fragments
30	92RGC08-06	130~135	dark reddish brown(M.No.:2.5YR2.5/4) oxidated clay
31	92RGC09-01	0~ 5	dark brown(M.No.:10YR3/3) clay
32	92RGC09-02	13~ 18	olive grey(M.No.:5Y5/2) clay
33	92RGC09-03	65~ 70	olive grey(M.No.:5Y4/2) clay
34	92RGC09-04	120~125	olive grey(M.No.:5Y4/2) clay
35	92RGC10-01	0~ 5	very dark brown(M.No.:10YR2/2) clay
36	92RGC10-02	16~ 20	brown(M.No.:10YR4/3) clay
37	92RGC10-03	25~ 30	olive(M.No.:5Y5/3) clay
38	92RGC10-04	70~ 75	olive grey(M.No.:5Y5/2)>dark grey(M.No.:5Y4/1) clay
39	92RGC10-05	165~170	olive(M.No.:5Y5/3)>dark olive grey(M.No.:5Y3/2) clay
40	92RGC11-01	0~ 5	black(M.No.:5Y5/1) corse sand

Note: M.No. means color number of MUNSELL SOIL COLOR CHARTS.

No.	Sample No.	Depth (cm)	Description
41	92RGC11-02	10~ 15	very dark greyish brown(M.No.:10YR3/2) clay
42	92RGC11-03	30~ 35	very dark grey(M.No.:5YR3/1) clay
43	92RGC11-04	55~ 60	black(M.No.:5YR2.5/1) fine sand
44	92RGC11-05	64~ 68	brown(M.No.:10YR4/3) clay
45	92RGC11-06	115~120	dark grey(M.No.:5Y4/1) clay
46	92RGC11-07	152~157	light olive grey(M.No.:5Y6/2) clay
47	92RGC11-08	195~200	very dark grey(M.No.:5Y3/1) clay
48	92RGC12-01	0~ 5	very dark brown(M.No.:10YR2/2) clay
49	92RGC12-02	15~ 20	yellowish brown(M.No.:10YR5/4) clay
50	92RGC12-03	35~ 40	olive(M.No.:5Y5/3) clay
51	92RGC12-04	85~ 90	very dark grey(M.No.:5Y3/1)>olive grey(M.No.:5Y5/2) clay
52	92RGC12-05	140~145	olive grey(M.No.:5Y5/2) clay
53	92RGC13-01	0~ 5	very dark greyish brown(M.No.:10YR3/2) clay
54	92RGC13-02	10~ 15	very dark brown(M.No.:10YR2/2) clay
55	92RGC13-03	20~ 25	brown(M.No.:10YR5/3) clay
56	92RGC13-04	27~ 41	olive grey(M.No.:5Y4/2) clay
57	92RGC14-01	0~ 5	olive grey(M.No.:5Y5/2) clay
58	92RGC14-02	20~ 25	very dark greyish brown(M.No.:10YR3/2) clay
59	92RGC14-03	36~ 39	light yellowish brown(M.No.:10YR6/4) clay
60	92RGC14-04	43~ 46	pale yellow(M.No.:5Y7/4) clay
61	92RGC14-05	46~ 51	dark grey(M.No.:5Y4/1) clay
62	92RGC14-06	70~ 75	olive grey(M.No.:5Y5/2) clay
63	92RGC14-07	140~145	olive grey(M.No.:5Y5/2) clay
64	92ROG15-01	0~ 8	dark brown(M.No.:10YR3/3) clay
65	92ROG15-02	8~ 20	brown(M.No.:10YR4/3) clay
66	92RGC16-01	0~ 5	dark brown(M.No.:10YR3/3) clay
67	92RGC16-02	10~ 15	light yellowish brown(M.No.:10YR6/4) clay
68	92RGC16-03	17~ 21	pale olive(M.No.:5Y6/4) clay
69	92RGC16-04	31~ 34	white(M.No.:5Y8/1) clay
70	92RGC16-05	34~ 38	dark grey(M.No.:5Y4/1) clay
71	92RGC16-06	50~ 55	olive grey(M.No.:5Y5/2)~grey(M.No.:5Y5/1) clay
72	92RGC16-07	185~190	olive grey(M.No.:5Y5/2)~grey(M.No.:5Y5/1) clay
73	92RGC17-01	0~ 5	grey(M.No.:5Y5/1) clay
74	92RGC17-02	8~ 13	very dark greyish brown(M.No.:10YR3/2) and dark yellowish brown(M.No.:10YR4/4) clay
75	92RGC17-03	20~ 25	pale olive(M.No.:5Y6/4) clay
76	92RGC17-04	35~ 40	light grey(M.No.:5Y7/1) clay
77	92ROG18-01	0~ 5	dark brown(M.No.:10YR3/3) clay
78	92ROG18-02	22~ 27	light yellowish brown(M.No.:10YR6/4) clay
79	92RGC19-01	0~ 5	dark grey(M.No.:intermediate of 5Y5/1 to 4/1) clay
80	92RGC19-02	20~ 25	very dark greyish brown(M.No.:10YR3/2) clay

Note: M.No. means color number of MUNSELL SOIL COLOR CHARTS.

No.	Sample No.	Depth (cm)	Description
81	92RGC19-03	50~ 55	olive grey(M.No.:5Y5/2) clay
82	92RGC19-04	185~190	olive grey(M.No.:5Y5/2) clay
83	92RGC20-01	0~ 5	light olive grey(M.No.:5Y6/2) tfs. sandy clay
84	92RGC20-02	20~ 25	olive grey(M.No.:5Y5/2) tfs. sandy clay
85	92RGC20-03	195~200	olive grey(M.No.:5Y5/2) tfs. sandy clay
86	92RGC21-01	0~ 5	grey(M.No.:intermediate of 5Y6/1 to 5/1) clay
87	92RGC21-02	11~ 16	brown(M.No.:10YR4/3) clay
88	92RGC21-03	40~ 45	light olive grey(M.No.:5Y6/2) tfs. sandy clay
89	92RGC21-04	205~210	olive grey(M.No.:5Y5/2) tfs. sandy clay
90	92RGC22-01	0~ 5	grey(M.No.:intermediate of 5Y5/1 to 4/1) clay
91	92RGC22-02	15~ 20	brown(M.No.:10YR4/3) clay
92	92RGC22-03	35~ 40	olive grey(M.No.:5Y5/2) clay
93	92RGC22-04	171~176	black(M.No.:5Y2.5/1) clay
94	92RGC23-01	0~ 5	grey(M.No.:intermediate of 5Y6/1 to 5/1) clay
95	92RGC23-02	20~ 25	dark brown(M.No.:10YR3/3) clay
96	92RGC23-03	40~ 45	pale olive(M.No.:5Y6/4) clay
97	92RGC23-04	180~185	olive grey(M.No.:5Y5/2) clay
98	92RGC24-01	0~ 5	alternative of olive grey(M.No.:5Y5/2) and dark greyish brown(M.No.:10YR4/2) clay
99	92RGC24-02	15~ 20	olive grey(M.No.:5Y5/2) clay
100	92RGC24-03	23~ 29	very dark greyish brown(M.No.:10YR3/2) clay
101	92RGC24-04	29~ 35	light yellowish brown(M.No.:10YR6/4) clay
102	92RGC24-05	45~ 50	olive grey(M.No.:5Y5/2) clay
103	92RGC24-06	185~190	olive grey(M.No.:5Y5/2) clay
104	92RGC25-01	0~ 5	grey(M.No.:5Y6/1)>>brown(M.No.:10YR4/3) clay
105	92RGC25-02	30~ 35	dark greyish brown(M.No.:10YR3/2) clay
106	92RGC25-03	35~ 40	light yellowish brown(M.No.:10YR6/4)>grey(M.No.:10YR5/1)+pale olive(M.No.:5Y6/3)clay
107	92RGC25-04	40~ 45	alternative of light olive grey(M.No.:5Y6/2) and olive grey(M.No.:5Y5/2) clay
108	92RGC25-05	135~140	olive grey(M.No.:5Y5/2) clay
109	92RGC26-01	0~ 5	grey(M.No.:intermediate of 5Y6/1 to 5/1) clay
110	92RGC26-02	7~ 12	dark brown(M.No.:10YR3/3) clay
111	92RGC26-03	15~ 19	light yellowish brown(M.No.:10YR6/4) clay
112	92RGC26-04	19~ 24	pale olive(M.No.:5Y6/4) clay
113	92RGC26-05	25~ 30	light olive grey(M.No.:5Y6/2) clay
114	92RGC26-06	85~ 90	olive grey(M.No.:5Y5/2)>grey(M.No.5Y5/1) clay
115	92RGC26-07	138~141	black(M.No.:5Y2.5/1)>light grey(M.No.:5Y7/1) clay
116	92RGC27-01	0~ 5	pale brown(M.No.:10YR6/3) m.sand
117	92RGC27-02	10~ 15	light olive grey(M.No.:5Y6/2) m.sand
118	92HPG04		dark red(2.5YR3/6) clay(limonite?)
119	92RGC28-01	0~ 5	very dark grey(M.No.2.5Y3/0) clay
120	92RGC28-02	33~ 39	dark yellowish brown(M.No.10YR4/4) clay

Note: M.No. means color number of MUNSELL SOIL COLOR CHARTS.

No.	Sample No.	Depth(cm)	Description
123	92RGC29-01	0~ 5	olive(M.No.5Y5/3) clay
124	92RGC29-02	5~ 10	light olive grey(M.No.5Y6/2) clay
127	92BGC01-01	0~ 5	grey(M.No.5Y5/1) m. sand
128	92BGC01-02	7~ 15	banded alternation of black(M.No.10YR3/1) and dark yellowish brown(M.No.10YR4/4)clay
129	92BGC01-03	15~ 20	brown(M.No.10YR5/3) clay
130	92BGC01-04	25~ 30	light olive grey(M.No.5Y6/2) clay
131	92BGC01-05	49~ 54	very dark grey(M.No.5Y3/1) clay with pumices
133	92BGC02-01	0~ 5	yellowish brown(M.No.10YR5/4) clay
134	92BGC02-02	25~ 30	pale brown(M.No.10YR6/3) clay with grey(M.No.5Y6/1) clay spotted
135	92BGC02-03	55~ 60	olive grey(M.No.5Y5/2) clay
136	92BGC02-04	74~ 79	brownish yellow(M.No.10YR6/6) clay
138	92BGC03-01	0~ 5	brown(M.No.10YR4/3) clay
139	92BGC03-02	10~ 15	very dark grey(M.No.10YR3/1) clay
141	92BGC03-04	44~ 50	very pale brown(M.No.10YR7/3) clay
143	92BGC03-06	95~100	dark grey(M.No.5Y4/1) very f. clay
145	92BGC04-01	0~ 5	dark brown(M.No.10YR4/3) clay
146	92BGC04-02	22~ 29	yellowish brown(M.No.10YR5/4) clay
147	92BGC04-03	29~ 38	brown(M.No.10YR5/3) clay with light olive grey(M.No.5Y6/2) clay spotted
148	92BGC05-01	0~ 5	very dark brown(M.No.10YR2/2) clay
149	92BGC05-02	15~ 20	yellowish brown(M.No.10YR5/4) clay
150	92BGC05-03	45~ 50	olive grey(M.No.5Y4/2) clay
151	92BGC05-04	70~ 75	brownish yellow(M.No.10YR6/8) clay
152	92BGC05-05	80~ 85	dark greyish brown(M.No.10YR4/2) clay
153	92BGC05-06	95~100	pale yellow(M.No.5Y8/4) clay
154	92BGC07-01	0~ 5	very dark greyish brown(M.No.10YR3/2) clay
155	92BGC07-02	10~ 15	brown(M.No.10YR5/3) clay
156	92BGC08	0~ 2	dark brown(M.No.10YR4/3) clay
157	92BGC09-01	0~ 4	olive(M.No.5Y4/4) clay
158	92BGC09-02	5~ 10	olive(M.No.5Y4/3) clay
159	92BOG11		yellowish brown(M.No.10YR5/6) clay
160	92BOG12-01	0~ 5	dark brown(M.No.10YR4/3) clay
161	92BOG12-02	15~ 20	yellowish brown(M.No.10YR5/6) clay
162	92BOG13-01	0~ 5	dark brown(M.No.10YR3/3) clay
163	92BOG13-02	15~ 20	yellowish brown(M.No.10YR5/4) clay
164	92BGC14-01	0~ 5	very dark greyish brown(M.No.10YR3/2) clay
165	92BGC14-02	8~ 13	brown(M.No.10YR5/3) clay
166	92BGC15-01	0~ 5	very dark greyish brown(M.No.10YR3/2) clay
167	92BGC15-02	7~ 13	brown(M.No.10YR5/3) clay
168	92BGC15-03	15~ 20	light olive grey(M.No.5Y6/2) clay
169	92BGC15-04	25~ 28	light grey(M.No.5Y7/1) clay

Note: M.No means color number of MUNSELL SOIL COLOR CHARTS.

No.	Sample No.	Depth(cm)	Description
170	92BGC15-05	28~ 31	grey(M.No.5Y5/1) clay
172	92BGC16-01	0~ 5	brown(M.No.10YR4/3) clay
174	92BGC16-03	70~ 75	olive grey(M.No.5Y5/2) clay
175	92BGC16-04	90~ 95	pale yellow(M.No.5Y7/3) clay
177	92HPG07-01		dark red(2.5YR3/6) clay(limonite?)
180	92HPG10-01		pale brown c.sand(foraminiferas and scoria)
181	92HOG11		dark greyish brown(M.No.10YR4/2) clay
182	92HOG12		brown(M.No.10YR4/3) clay
183	92HPG13		dark red(2.5YR3/6) clay(limonite?)
186	92HPG15-01		dark green(M.No.5Y2.5/1) clay
187	92HPG15-02		light olive grey(M.No.5Y6/2) clay
188	92HPG15-03		dark red(2.5YR3/6) clay(limonite?)
189	92HOG16		yellowish brown(M.No.10YR5/4) clay
192	92HOG20		brown(M.No.10YR4/3) clay
193	92HOG22		dark brown(M.No.10YR3/3) clay
195	92HOG24		brown~yellowish brown(M.No.10YR5/3~5/4) clay
196	92HPG25		brown~dark greyish brown(M.No.10YR4/3~4/2) clay
197	92BGC17-01	0~ 4	black m.sand with much foraminifera
198	92BGC17-02	4~ 8	very dark greyish brown(M.No.10YR3/2) clay > black m.sand
199	92BGC17-03	12~ 18	pale olive(M.No.5Y6/4) clay > black m.sand
202	92BGC18-01	0~ 5	grey(M.No.5Y5/1) clay
203	92BGC18-02	10~ 15	dark brown(M.No.10YR4/3) clay
204	92BGC18-03	20~ 25	light yellowish brown(M.No.10YR6/4) clay
205	92BGC18-04	40~ 45	olive grey(M.No.5Y5/2) clay
206	92BGC19-01	0~ 5	olive grey(M.No.5Y5/2) clay
207	92BGC19-02	10~ 15	very dark grey(M.No.10YR3/1) clay
208	92BGC19-03	30~ 35	olive grey(M.No.5Y5/2) > brown(M.No.10YR4/3) clay
209	92BGC20-01	0~ 5	very dark grey(M.No.10YR3/1) clay
210	92BGC20-02	5~ 10	dark greyish brown(M.No.10YR4/2) clay
211	92BGC20-03	25~ 30	pale olive(M.No.5Y6/4) clay
212	92BGC20-04	35~ 40	olive grey(M.No.5Y5/2) clay
213	92BGC21-01	0~ 5	very dark greyish brown(M.No.10YR3/2) clay
214	92BGC21-02	24~ 28	light yellowish brown(M.No.10YR6/4) clay
215	92BGC21-03	30~ 35	olive grey(M.No.5Y4/2) clay
217	92BGC22-01	0~ 5	very dark greyish brown(M.No.10YR3/2) clay
218	92BGC22-02	21~ 29	black f.sand
219	92BGC22-03	30~ 35	light yellowish brown(M.No.10YR6/4) ~ pale olive(M.No.5Y6/4) clay
220	92BGC22-04	44~ 49	dark grey(M.No.5Y4/1) clay
221	92BGC24	0~ 5	dark yellowish brown(M.No.10YR4/4) clay
222	92BGC25-01	2~ 8	olive grey(M.No.5Y5/2) clay

Note: M.No. means color number of MUNSELL SOIL COLOR CHARTS.

No.	Sample No.	Depth(cm)	Description
223	92BGC25-02	10~ 13	very dark grey(M.No.10YR3/1) clay
224	92BGC25-03	32~ 39	light yellowish brown(M.No.10YR6/4) clay
226	92BGC26	0~ 4	very dark greyish brown(M.No.10YR3/2) clay
227	92BGC27-01	0~ 5	brown(M.No.10YR4/3) clay in very dark grey(M.No.10YR3/1) mud
228	92BGC27-02	20~ 25	yellowish brown(M.No.10YR5/4) clay
229	92BGC27-03	35~ 40	dark grey(M.No.5Y4/1) clay
230	92BGC27-04	61~ 66	dark yellowish brown(M.No.10YR4/4) clay
231	92BGC28-01	0~ 5	very dark grey(M.No.10YR3/1) clay
232	92BGC28-02	15~ 20	dark grey(M.No.5Y4/1) clay
233	92BGC28-03	35~ 40	dark greyish brown(M.No.10YR4/2) clay
235	92BGC29-01	0~ 5	brown(M.No.10YR4/3) clay
236	92BGC29-02	16~ 20	light yellowish brown(M.No.10YR6/4) clay
237	92BGC29-03	25~ 29	dark grey(M.No.5Y4/1) clay
238	92BGC29-04	50~ 55	olive(M.No.5Y5/3) clay
239	92BGC30-01	0~ 5	very dark greyish brown(M.No.10YR3/2) clay with black clay patch
240	92BGC30-02	15~ 20	very yellowish brown(M.No.10YR4/4) clay
241	92BGC30-03	22~ 27	dark grey(M.No.10YR4/1) > dark yellowish brown(M.No.10YR4/4) clay
242	92RGC30-01	0~ 5	olive grey(M.No.5Y5/2) clay
243	92RGC30-02	10~ 15	very dark grey(10YR3/1) clay
244	92RGC30-03	17~ 22	pale brown(10YR6/3) and brown(10YR5/3) clay
245	92RGC30-04	25~ 30	pale olive(M.No.5Y6/4) clay
246	92RGC31-01	0~ 5	dark grey(M.No.5Y4/1) clay
247	92RGC31-02	23~ 27	very dark greyish brown(M.No.10YR3/2) clay
248	92RGC31-03	33~ 37	black(M.No.5Y2.5/1) clay
249	92RGC31-04	48~ 54	brown(M.No.10YR5/3) clay
250	92RGC31-05	75~ 80	dark grey(M.No.5Y4/1) clay
251	92RGC32-01	0~ 5	dark grey(M.No.5Y4/1) > dark greyish brown(M.No.10Y4/2) clay
252	92RGC32-02	10~ 15	dark grey(M.No.5Y4/1) clay
253	92RGC32-03	44~ 49	black silt
254	92RGC33-01	0~ 5	grey(M.No.5Y5/1) clay
255	92RGC33-02	8~ 13	dark greyish brown(M.No.10YR4/2) clay
256	92RGC33-03	18~ 23	olive(M.No.5Y5/3) clay
258	92RGC34-01	0~ 5	dark grey(M.No.5Y4/1) clay
259	92RGC34-02	16~ 23	dark greyish brown(M.No.10YR4/2) clay
260	92RGC34-03	82~ 89	white(M.No.5Y8/1) clay
261	92RGC34-04	89~ 95	black clay
262	92RGC35-01	0~ 5	dark grey(M.No.5Y4/1) clay
263	92RGC35-02	14~ 20	dark greyish brown(M.No.10YR4/2) clay
264	92RGC35-03	25~ 30	very dark grey(M.No.5Y3/1) clay
265	92RGC35-04	75~ 80	dark grey(M.No.5Y4/1) clay

Note: M.No. means color number of MUNSELL SOIL COLOR CHARTS.

No.	Sample No.	Depth(cm)	Description
266	92RGC36-01	0~ 5	dark grey(M.No.5Y4/1) clay
268	92RGC36-03	55~ 60	black f.sand
269	92RGC37-01	0~ 5	grey(M.No.5Y5/1) clay
270	92RGC37-02	15~ 20	very dark grey(M.No.5Y3/1) silt
273	92RGC38-01	0~ 5	dark grey(M.No.5Y4/1) > dark greyish brown(M.No.10YR4/2) clay
274	92RGC38-02	16~ 21	very dark grey(M.No.5Y3/1) silt
277	92RGC39-01	0~ 5	grey(M.No.5Y5/1) >> dark greyish brown(M.No.10YR4/2) clay
278	92RGC39-02	20~ 25	dark greyish brown(M.No.10YR4/2) clay
279	92RGC39-03	30~ 35	pale olive(M.No.5Y6/4) clay
280	92RGC39-04	105~110	black f.sand

Note: M.No. means color number of MUNSELL SOIL COLOR CHARTS.

Appendix 5. List of Samples for X-ray Diffraction Analysis

No.	Sample No.	Depth (cm)	Description
1	92RLC01-01	0~ 5	brown(M.No.:10YR4/3) clay
2	92RLC01-02	11~ 16	dark grey(M.No.:7.5YR4/0) fine sand
3	92RLC01-03	26~ 31	pale yellow(M.No.:5Y7/3) clay with dark brown 5mm thick clay band
4	92RLC01-04	75~ 80	light grey(M.No.:5Y6/1) tfs.clay bearing dark green glass in lapilli size common
5	92RLC01-05	165~170	olive grey(M.No.:5Y4/2) tfs.clay
6	92RLC01-06	292~297	light olive grey(M.No.:5Y6/2) > olive grey(M.No.:5Y5/2) tfs.clay
7	92ROG02		yellowish brown(M.No.:10YR5/4) clay with much black volcanic glass
8	92RPG03-01	0~ 5	brownish yellow(M.No.:10YR6/6) clay
9	92RPG03-02	10~ 15	brown(M.No.:10YR5/3)~greyish brown(M.No.:10YR5/2) with much black volcanic glass
10	92RLC04-01	0~ 5	dark brown(M.No.:10YR3/3) clay
11	92RLC04-02	15~ 20	grey(M.No.:10YR5/1) clay
12	92RLC04-03	45~ 50	pale brown(M.No.:10YR6/3)~ grey(M.No.:5Y6/1) clay
13	92RLC04-04	147~152	olive grey(M.No.:5Y5/2) clay
14	92RLC04-05	222~227	grey(M.No.:5Y5/1) clay
15	92RPG05-01	0~ 5	very dark greyish brown(M.No.:10YR3/2) clay
16	92RPG05-02	43~ 48	olive grey(M.No.:5Y5/2)~dark brown(M.No.:10YR4/3) clay
17	92RPG06-01	0~ 5	very dark greyish brown(M.No.:10YR3/2) clay
18	92RPG06-02	13~ 18	dark greyish brown(M.No.:10YR4/2) clay
19	92RPG06-03	37~ 42	grey(M.No.:5Y5/1) clay
20	92RGC07-01	0~ 5	very dark greyish brown(M.No.:10YR3/2) clay
21	92RGC07-02	15~ 20	light olive grey(M.No.:5Y6/2) tfs. fine sand with shell fragments
22	92RGC07-03	92~ 97	olive grey(M.No.:5Y5/2) tfs. clay with shell fragments
23	92RGC07-04	151~154	black(M.No.:5Y6/2) tfs. clay patch
24	92RGC07-05	172~177	very dark grey(M.No.:5Y3/1) tfs. fine sand
25	92RGC08-01	0~ 5	dark greyish brown(M.No.:10YR4/2) fine sand with basalt,coral and shell fragments
26	92RGC08-02	15~ 20	very pale brown(M.No.:10YR7/3) clay with coral and shell fragments
27	92RGC08-03	45~ 50	yellowish brown(M.No.:10YR5/6) clay with coral and shell fragments
28	92RGC08-04	60~ 65	dark yellowish brown(M.No.:10YR4/4) fine sand with shell fragments
29	92RGC08-05	80~ 85	very pale brown(M.No.:10YR7/4) clay with basalt and shell fragments
30	92RGC08-06	130~135	dark reddish brown(M.No.:2.5YR2.5/4) oxidated clay
31	92RGC09-01	0~ 5	dark brown(M.No.:10YR3/3) clay
32	92RGC09-02	13~ 18	olive grey(M.No.:5Y5/2) clay
33	92RGC09-03	65~ 70	olive grey(M.No.:5Y4/2) clay
34	92RGC09-04	120~125	olive grey(M.No.:5Y4/2) clay
35	92RGC10-01	0~ 5	very dark brown(M.No.:10YR2/2) clay
36	92RGC10-02	16~ 20	brown(M.No.:10YR4/3) clay
37	92RGC10-03	25~ 30	olive(M.No.:5Y5/3) clay
38	92RGC10-04	70~ 75	olive grey(M.No.:5Y5/2)>dark grey(M.No.:5Y4/1) clay
39	92RGC10-05	165~170	olive(M.No.:5Y5/3)>dark olive grey(M.No.:5Y3/2) clay
40	92RGC11-01	0~ 5	black(M.No.:5Y5/1) corse sand

Note: M.No. means color number of MUNSELL SOIL COLOR CHARTS.

No.	Sample No.	Depth (cm)	Description
41	92RGC11-02	10~ 15	very dark greyish brown(M.No.:10YR3/2) clay
42	92RGC11-03	30~ 35	very dark grey(M.No.:5YR3/1) clay
43	92RGC11-04	55~ 60	black(M.No.:5YR2.5/1) fine sand
44	92RGC11-05	64~ 68	brown(M.No.:10YR4/3) clay
45	92RGC11-06	115~120	dark grey(M.No.:5Y4/1) clay
46	92RGC11-07	152~157	light olive grey(M.No.:5Y6/2) clay
47	92RGC11-08	195~200	very dark grey(M.No.:5Y3/1) clay
48	92RGC12-01	0~ 5	very dark brown(M.No.:10YR2/2) clay
49	92RGC12-02	15~ 20	yellowish brown(M.No.:10YR5/4) clay
50	92RGC12-03	35~ 40	olive(M.No.:5Y5/3) clay
51	92RGC12-04	85~ 90	very dark grey(M.No.:5Y3/1)>olive grey(M.No.:5Y5/2) clay
52	92RGC12-05	140~145	olive grey(M.No.:5Y5/2) clay
53	92RGC13-01	0~ 5	very dark greyish brown(M.No.:10YR3/2) clay
54	92RGC13-02	10~ 15	very dark brown(M.No.:10YR2/2) clay
55	92RGC13-03	20~ 25	brown(M.No.:10YR5/3) clay
56	92RGC13-04	27~ 41	olive grey(M.No.:5Y4/2) clay
57	92RGC14-01	0~ 5	olive grey(M.No.:5Y5/2) clay
58	92RGC14-02	20~ 25	very dark greyish brown(M.No.:10YR3/2) clay
59	92RGC14-03	36~ 39	light yellowish brown(M.No.:10YR6/4) clay
60	92RGC14-04	43~ 46	pale yellow(M.No.:5Y7/4) clay
61	92RGC14-05	46~ 51	dark grey(M.No.:5Y4/1) clay
62	92RGC14-06	70~ 75	olive grey(M.No.:5Y5/2) clay
63	92RGC14-07	140~145	olive grey(M.No.:5Y5/2) clay
64	92ROG15-01	0~ 8	dark brown(M.No.:10YR3/3) clay
65	92ROG15-02	8~ 20	brown(M.No.:10YR4/3) clay
66	92RGC16-01	0~ 5	dark brown(M.No.:10YR3/3) clay
67	92RGC16-02	10~ 15	light yellowish brown(M.No.:10YR6/4) clay
68	92RGC16-03	17~ 21	pale olive(M.No.:5Y6/4) clay
69	92RGC16-04	31~ 34	white(M.No.:5Y8/1) clay
70	92RGC16-05	34~ 38	dark grey(M.No.:5Y4/1) clay
71	92RGC16-06	50~ 55	olive grey(M.No.:5Y5/2)~grey(M.No.:5Y5/1) clay
72	92RGC16-07	185~190	olive grey(M.No.:5Y5/2)~grey(M.No.:5Y5/1) clay
73	92RGC17-01	0~ 5	grey(M.No.:5Y5/1) clay
74	92RGC17-02	8~ 13	very dark greyish brown(M.No.:10YR3/2) and dark yellowish brown(M.No.:10YR4/4) clay
75	92RGC17-03	20~ 25	pale olive(M.No.:5Y6/4) clay
76	92RGC17-04	35~ 40	light grey(M.No.:5Y7/1) clay
77	92ROG18-01	0~ 5	dark brown(M.No.:10YR3/3) clay
78	92ROG18-02	22~ 27	light yellowish brown(M.No.:10YR6/4) clay
79	92RGC19-01	0~ 5	dark grey(M.No.:intermediate of 5Y5/1 to 4/1) clay
80	92RGC19-02	20~ 25	very dark greyish brown(M.No.:10YR3/2) clay

Note: M.No. means color number of MUNSELL SOIL COLOR CHARTS.

No.	Sample No.	Depth (cm)	Description
81	92RGC18-03	50~ 55	olive grey(M.No.:5Y5/2) clay
82	92RGC19-04	185~190	olive grey(M.No.:5Y5/2) clay
83	92RGC20-01	0~ 5	light olive grey(M.No.:5Y6/2) tfs. sandy clay
84	92RGC20-02	20~ 25	olive grey(M.No.:5Y5/2) tfs. sandy clay
85	92RGC20-03	195~200	olive grey(M.No.:5Y5/2) tfs. sandy clay
86	92RGC21-01	0~ 5	grey(M.No.:intermediate of 5Y6/1 to 5/1) clay
87	92RGC21-02	11~ 16	brown(M.No.:10YR4/3) clay
88	92RGC21-03	40~ 45	light olive grey(M.No.:5Y6/2) tfs. sandy clay
89	92RGC21-04	205~210	olive grey(M.No.:5Y5/2) tfs. sandy clay
90	92RGC22-01	0~ 5	grey(M.No.:intermediate of 5Y5/1 to 4/1) clay
91	92RGC22-02	15~ 20	brown(M.No.:10YR4/3) clay
92	92RGC22-03	35~ 40	olive grey(M.No.:5Y5/2) clay
93	92RGC22-04	171~176	black(M.No.:5Y2.5/1) clay
94	92RGC23-01	0~ 5	grey(M.No.:intermediate of 5Y6/1 to 5/1) clay
95	92RGC23-02	20~ 25	dark brown(M.No.:10YR3/3) clay
96	92RGC23-03	40~ 45	pale olive(M.No.:5Y6/4) clay
97	92RGC23-04	180~185	olive grey(M.No.:5Y5/2) clay
98	92RGC24-01	0~ 5	alternative of olive grey(M.No.:5Y5/2) and dark greyish brown(M.No.:10YR4/2) clay
99	92RGC24-02	15~ 20	olive grey(M.No.:5Y5/2) clay
100	92RGC24-03	23~ 29	very dark greyish brown(M.No.:10YR3/2) clay
101	92RGC24-04	29~ 35	light yellowish brown(M.No.:10YR6/4) clay
102	92RGC24-05	45~ 50	olive grey(M.No.:5Y5/2) clay
103	92RGC24-06	185~190	olive grey(M.No.:5Y5/2) clay
104	92RGC25-01	0~ 5	grey(M.No.:5Y6/1)>>brown(M.No.:10YR4/3) clay
105	92RGC25-02	30~ 35	dark greyish brown(M.No.:10YR3/2) clay
106	92RGC25-03	35~ 40	light yellowish brown(M.No.:10YR6/4)>grey(M.No.:10YR5/1)+pale olive(M.No.:5Y6/3)clay
107	92RGC25-04	40~ 45	alternative of light olive grey(M.No.:5Y6/2) and olive grey(M.No.:5Y5/2) clay
108	92RGC25-05	135~140	olive grey(M.No.:5Y5/2) clay
109	92RGC26-01	0~ 5	grey(M.No.:intermediate of 5Y6/1 to 5/1) clay
110	92RGC26-02	7~ 12	dark brown(M.No.:10YR3/3) clay
111	92RGC26-03	15~ 19	light yellowish brown(M.No.:10YR6/4) clay
112	92RGC26-04	19~ 24	pale olive(M.No.:5Y6/4) clay
113	92RGC26-05	25~ 30	light olive grey(M.No.:5Y6/2) clay
114	92RGC26-06	85~ 90	olive grey(M.No.:5Y5/2)>grey(M.No.5Y5/1) clay
115	92RGC26-07	138~141	black(M.No.:5Y2.5/1)>light grey(M.No.:5Y7/1) clay
116	92RGC27-01	0~ 5	pale brown(M.No.:10YR6/3) m.sand
117	92RGC27-02	10~ 15	light olive grey(M.No.:5Y6/2) m.sand
118	92HPG04		dark red(2.5YR3/6) clay(limonite?)
119	92RGC28-01	0~ 5	very dark grey(M.No.2.5Y3/0) clay
120	92RGC28-02	33~ 39	dark yellowish brown(M.No.10YR4/4) clay

Note: M.No. means color number of MUNSELL SOIL COLOR CHARTS.

No.	Sample No.	Depth (cm)	Description
123	92RGC28-01	0~ 5	olive(M.No.5Y5/3) clay
124	92RGC28-02	5~ 10	light olive grey(M.No.5Y6/2) clay
127	92BGC01-01	0~ 5	grey(M.No.5Y5/1) m. sand
128	92BGC01-02	7~ 15	banded alternation of black(M.No.10YR3/1) and dark yellowish brown(M.No.10YR4/4)clay
133	92BGC02-01	0~ 5	yellowish brown(M.No.10YR5/4) clay
134	92BGC02-02	25~ 30	pale brown(M.No.10YR6/3) clay with grey(M.No.5Y6/1) clay spotted
138	92BGC03-01	0~ 5	brown(M.No.10YR4/3) clay
139	92BGC03-02	10~ 15	very dark grey(M.No.10YR3/1) clay
145	92BGC04-01	0~ 5	dark brown(M.No.10YR4/3) clay
146	92BGC04-02	22~ 29	yellowish brown(M.No.10YR5/4) clay
148	92BGC05-01	0~ 5	very dark brown(M.No.10YR2/2) clay
149	92BGC05-02	15~ 20	yellowish brown(M.No.10YR5/4) clay
154	92BGC07-01	0~ 5	very dark greyish brown(M.No.10YR3/2) clay
155	92BGC07-02	10~ 15	brown(M.No.10YR5/3) clay
156	92BGC08	0~ 2	dark brown(M.No.10YR4/3) clay
157	92BGC09-01	0~ 4	olive(M.No.5Y4/4) clay
158	92BGC09-02	5~ 10	olive(M.No.5Y4/3) clay
159	92BOG11		yellowish brown(M.No.10YR5/6) clay
160	92BOG12-01	0~ 5	dark brown(M.No.10YR4/3) clay
161	92BOG12-02	15~ 20	yellowish brown(M.No.10YR5/6) clay
162	92BOG13-01	0~ 5	dark brown(M.No.10YR3/3) clay
163	92BOG13-02	15~ 20	yellowish brown(M.No.10YR5/4) clay
164	92BGC14-01	0~ 5	very dark greyish brown(M.No.10YR3/2) clay
165	92BGC14-02	8~ 13	brown(M.No.10YR5/3) clay
166	92BGC15-01	0~ 5	very dark greyish brown(M.No.10YR3/2) clay
167	92BGC15-02	7~ 13	brown(M.No.10YR5/3) clay
172	92BGC16-01	0~ 5	brown(M.No.10YR4/3) clay
174	92BGC16-03	70~ 75	olive grey(M.No.5Y5/2) clay
177	92HPG07-01		dark red(2.5YR3/6) clay(limonite?)
180	92HPG10		pale brown c.sand(foraminiferas and scoria)
186	92HPG15-01		dark green(M.No.5Y2.5/1) clay
188	92HPG15-03		dark red(2.5YR3/6) clay(limonite?)
189	92HOG16		yellowish brown(M.No.10YR5/4) clay
193	92HOG22		dark brown(M.No.10YR3/3) clay
195	92HOG24		brown~yellowish brown(M.No.10YR5/3~5/4) clay
197	92BGC17-01	0~ 4	black m.sand with much foraminifera
198	92BGC17-02	4~ 8	very dark greyish brown(M.No.10YR3/2) clay > black m.sand
202	92BGC18-01	0~ 5	grey(M.No.5Y5/1) clay
203	92BGC18-02	10~ 15	dark brown(M.No.10YR4/3) clay
206	92BGC19-01	0~ 5	olive grey(M.No.5Y5/2) clay

Note: M.No. means color number of MUNSELL SOIL COLOR CHARTS.

No.	Sample No.	Depth (cm)	Description
207	92BGC19-02	10~ 15	very dark grey(M.No.10YR3/1) clay
209	92BGC20-01	0~ 5	very dark grey(M.No.10YR3/1) clay
210	92BGC20-02	5~ 10	dark greyish brown(M.No.10YR4/2) clay
213	92BGC21-01	0~ 5	very dark greyish brown(M.No.10YR3/2) clay
214	92BGC21-02	24~ 28	light yellowish brown(M.No.10YR6/4) clay
217	92BGC22-01	0~ 5	very dark greyish brown(M.No.10YR3/2) clay
218	92BGC22-02	21~ 29	black f.sand
221	92BGC24	0~ 5	dark yellowish brown(M.No.10YR4/4) clay
222	92BGC25-01	2~ 8	olive grey(M.No.5Y5/2) clay
226	92BGC26	0~ 4	very dark greyish brown(M.No.10YR3/2) clay
227	92BGC27-01	0~ 5	brown(M.No.10YR4/3) clay in very dark grey(M.No.10YR3/1) mud
228	92BGC27-02	20~ 25	yellowish brown(M.No.10YR5/4) clay
231	92BGC28-01	0~ 5	very dark grey(M.No.10YR3/1) clay
232	92BGC28-02	15~ 20	dark grey(M.No.5Y4/1) clay
235	92BGC29-01	0~ 5	brown(M.No.10YR4/3) clay
236	92BGC29-02	16~ 20	light yellowish brown(M.No.10YR6/4) clay
239	92BGC30-01	0~ 5	very dark greyish brown(M.No.10YR3/2) clay with black clay patch
240	92BGC30-02	15~ 20	very yellowish brown(M.No.10YR4/4) clay
242	92RGC30-01	0~ 5	olive grey(M.No.5Y5/2) clay
243	92RGC30-02	10~ 15	very dark grey(10YR3/1) clay
246	92RGC31-01	0~ 5	dark grey(M.No.5Y4/1) clay
247	92RGC31-02	23~ 27	very dark greyish brown(M.No.10YR3/2) clay
251	92RGC32-01	0~ 5	dark grey(M.No.5Y4/1) > dark greyish brown(M.No.10Y4/2) clay
252	92RGC32-02	10~ 15	dark grey(M.No.5Y4/1) clay
254	92RGC33-01	0~ 5	grey(M.No.5Y5/1) clay
255	92RGC33-02	8~ 13	dark greyish brown(M.No.10YR4/2) clay
258	92RGC34-01	0~ 5	dark grey(M.No.5Y4/1) clay
259	92RGC34-02	16~ 23	dark greyish brown(M.No.10YR4/2) clay
262	92RGC35-01	0~ 5	dark grey(M.No.5Y4/1) clay
263	92RGC35-02	14~ 20	dark greyish brown(M.No.10YR4/2) clay
266	92RGC36-01	0~ 5	dark grey(M.No.5Y4/1) clay
268	92RGC36-03	55~ 60	black f.sand
269	92RGC37-01	0~ 5	grey(M.No.5Y5/1) clay
270	92RGC37-02	15~ 20	very dark grey(M.No.5Y3/1) silt
273	92RGC38-01	0~ 5	dark grey(M.No.5Y4/1) > dark greyish brown(M.No.10YR4/2) clay
274	92RGC38-02	16~ 21	very dark grey(M.No.5Y3/1) silt
277	92RGC39-01	0~ 5	grey(M.No.5Y5/1) >> dark greyish brown(M.No.10YR4/2) clay
278	92RGC39-02	20~ 25	dark greyish brown(M.No.10YR4/2) clay
279	92HPG07-02		dark red(2.5YR3/6) clay(limonite?) with a little amount of greyish green clay
280	92HPG19		oolitic dark green clay minerals(chlorites?)

Note: M.No. means color number of MUNSELL SOIL COLOR CHARTS.

Appendix 6. List of the Results of Chemical Analysis for Major Elements

No.	Sample No.	SiO2 %	TiO2 %	Al2O3 %	Fe2O3 %	FeO %	MnO %	MgO %	CaO %	BaO %	Na2O %	K2O %	P2O5 %	LOI %	Total
1	92RLC01-01	41.20	0.67	11.28	4.71	1.25	0.56	3.53	14.08	0.05	4.47	1.13	0.20	16.85	100.08
2	92RLC01-02	45.10	0.69	12.34	2.77	2.58	0.17	3.35	14.09	0.03	4.42	1.18	0.17	13.21	100.20
3	92RLC01-03	44.92	0.35	9.82	3.45	0.26	1.70	1.41	14.93	0.06	4.21	1.35	0.16	18.17	100.79
4	92RLC01-04	22.81	0.35	6.97	3.07	1.03	0.26	1.83	28.47	0.05	3.68	0.81	0.05	31.45	100.83
5	92RLC01-05	48.19	0.91	12.16	2.54	3.47	0.20	2.43	13.40	0.03	4.47	0.93	0.23	10.59	99.55
6	92RLC01-06	19.97	0.29	6.00	2.78	1.18	0.45	1.80	29.18	0.06	3.66	0.78	0.06	33.80	100.01
7	92ROG02	36.66	1.25	10.17	3.28	5.57	0.20	3.13	18.19	0.02	3.41	0.86	0.25	15.01	98.00
8	92RPG03-01	36.19	0.66	10.40	3.68	2.48	0.19	3.21	18.47	0.03	3.90	1.06	0.20	19.04	99.51
9	92RPG03-02	43.59	0.88	12.32	4.02	2.99	0.15	4.39	12.61	0.03	4.31	1.05	0.25	13.52	100.11
10	92RLC04-01	41.12	0.61	11.14	4.08	1.73	0.58	3.04	14.24	0.05	4.35	1.26	0.23	17.72	100.15
11	92RLC04-02	47.65	0.78	12.70	2.71	3.32	0.18	3.95	10.59	0.03	4.75	1.33	0.23	12.37	100.59
12	92RLC04-03	41.74	0.37	9.49	3.06	1.30	0.46	1.51	16.60	0.05	4.19	1.44	0.27	20.20	100.68
13	92RLC04-04	34.41	0.50	8.71	3.06	1.61	0.24	1.86	20.09	0.05	4.02	0.94	0.14	24.00	99.63
14	92RLC04-05	52.05	0.75	12.09	2.43	2.30	0.17	1.81	10.70	0.03	5.02	1.14	0.22	11.92	100.53
15	92RPG05-01	35.29	0.44	9.16	3.27	1.67	0.24	1.78	21.77	0.03	3.67	1.07	0.15	21.56	100.10
16	92RPG05-02	20.40	0.32	5.88	2.34	1.33	0.07	1.57	32.77	0.02	2.92	0.65	0.01	31.18	99.46
17	92RPG06-01	39.83	0.48	10.88	4.18	1.61	0.46	2.17	16.71	0.04	3.97	1.27	0.23	17.81	99.84
18	92RPG06-02	45.11	0.49	10.99	3.24	1.99	0.12	1.86	14.71	0.03	4.39	1.43	0.19	15.68	100.23
19	92RPG06-03	45.84	0.38	10.12	2.31	1.33	0.11	1.40	15.90	0.03	4.37	1.30	0.13	17.24	100.46
20	92RGC07-01	26.70	0.38	7.70	3.89	1.49	0.76	2.18	25.25	0.03	3.33	1.05	0.19	26.35	99.31
21	92RGC07-02	68.84	0.39	14.06	2.26	1.49	0.08	1.22	3.57	0.11	3.50	2.78	0.17	1.53	100.00
22	92RGC07-03	12.15	0.19	3.15	1.46	0.84	0.14	1.37	39.96	0.01	2.31	0.52	<0.01	37.00	99.10
23	92RGC07-04	24.85	0.47	7.03	2.70	1.62	0.11	1.93	27.21	0.03	3.65	0.95	0.10	29.14	99.79
24	92RGC07-05	40.67	1.23	12.37	2.37	6.51	0.16	4.95	15.64	0.02	3.39	0.78	0.17	9.14	97.40
25	92RGC08-01	33.78	0.67	9.14	2.19	2.97	0.12	2.15	22.07	0.03	3.29	1.25	0.14	19.90	97.70
26	92RGC08-02	29.85	0.87	10.15	3.67	2.81	0.16	3.31	23.74	0.02	2.46	0.79	0.12	19.98	97.93
27	92RGC08-03	11.28	0.27	4.52	1.86	0.43	0.03	1.54	38.82	0.01	2.08	0.38	<0.01	37.56	98.78
28	92RGC08-04	26.37	0.78	8.97	3.29	2.59	0.13	3.04	26.54	0.01	2.98	0.88	0.11	23.59	98.68
29	92RGC08-05	21.37	0.62	7.00	2.62	1.71	0.13	2.16	31.57	0.01	2.33	0.66	0.04	28.23	98.45
30	92RGC08-06	18.42	2.06	9.73	9.45	0.68	0.24	4.59	19.44	0.02	2.99	0.96	0.46	29.10	97.74
31	92RGC09-01	15.70	2.70	14.32	12.49	0.35	0.24	10.35	3.01	0.01	3.62	0.32	0.80	30.60	94.51
32	92RGC09-02	41.42	0.54	11.25	4.33	1.45	0.58	2.25	14.92	0.05	4.17	1.25	0.22	17.15	99.54
33	92RGC09-03	35.52	0.43	9.80	3.08	1.43	0.10	1.96	19.93	0.05	3.80	1.17	0.12	22.23	99.62
34	92RGC09-04	36.44	0.54	10.11	3.23	2.00	0.12	2.05	19.80	0.04	3.68	1.04	0.12	19.84	99.01
35	92RGC10-01	29.19	0.46	9.09	3.31	1.98	0.10	2.24	24.03	0.04	2.93	1.00	0.08	24.13	98.58
36	92RGC10-02	48.51	0.67	14.58	5.56	4.33	0.48	3.33	8.65	0.03	3.63	1.78	0.35	6.03	97.94
37	92RGC10-03	45.17	0.54	11.66	4.18	1.75	0.39	2.15	12.96	0.05	4.32	1.48	0.23	15.24	100.12
38	92RGC10-04	49.94	0.39	10.76	3.25	1.54	0.15	1.61	11.63	0.04	4.82	1.40	0.16	14.78	100.47
39	92RGC10-05	34.43	0.51	10.05	3.32	2.43	0.11	2.48	19.21	0.04	4.11	1.24	0.13	21.93	99.99
40	92RGC11-01	32.52	0.50	10.05	3.75	2.64	0.11	2.52	20.30	0.04	3.56	1.27	0.12	21.86	99.24
41	92RGC11-02	47.63	0.63	15.55	5.06	5.31	0.24	4.25	10.53	0.02	2.92	1.38	0.29	3.55	97.46
42	92RGC11-03	45.99	0.66	13.65	6.39	3.27	0.69	3.61	8.13	0.04	4.01	1.63	0.35	9.51	97.93
43	92RGC11-04	49.88	0.70	14.97	4.88	5.36	0.24	3.43	7.82	0.03	3.59	1.68	0.35	4.87	97.90
44	92RGC11-05	49.36	0.70	15.43	4.55	6.22	0.27	3.83	9.31	0.02	3.27	1.51	0.31	5.07	99.95
45	92RGC11-06	43.69	0.61	12.82	4.88	2.37	0.29	2.96	12.08	0.04	4.10	1.39	0.27	15.25	100.75
46	92RGC11-07	50.45	0.68	14.48	4.25	5.05	0.24	3.22	7.99	0.03	3.86	1.78	0.37	6.40	98.80
47	92RGC11-08	31.96	0.45	10.02	4.14	1.31	0.52	2.72	20.33	0.06	3.22	1.15	0.14	24.24	100.26
48	92RGC12-01	50.08	0.67	14.42	4.32	4.70	0.25	3.05	7.30	0.03	3.78	2.23	0.36	7.80	98.99
49	92RGC12-02	34.41	0.51	9.10	5.86	0.48	0.30	2.12	18.65	0.06	4.23	1.09	0.25	23.32	100.45
50	92RGC12-03	35.62	0.48	10.11	5.46	1.18	1.92	2.29	17.19	0.05	4.18	1.18	0.29	21.09	100.44

No.	Sample No.	SiO2 %	TiO2 %	Al2O3 %	Fe2O3 %	FeO %	MnO %	MgO %	CaO %	BaO %	Na2O %	K2O %	P2O5 %	LOI %	Total
51	92RGC12-04	33.20	0.40	9.39	3.96	1.54	0.25	2.12	20.74	0.05	4.31	1.05	0.15	23.43	100.59
52	92RGC12-05	42.56	0.36	9.62	3.77	1.17	0.22	1.62	16.23	0.05	4.37	1.23	0.18	19.04	100.42
53	92RGC13-01	38.59	0.84	10.89	3.78	3.02	0.33	2.58	17.13	0.03	4.19	0.93	0.22	17.15	99.68
54	92RGC13-02	21.11	0.44	6.23	4.80	0.87	0.20	2.25	27.74	0.07	3.88	0.76	0.16	32.27	100.78
55	92RGC13-03	42.13	0.56	12.28	5.80	2.26	0.55	2.83	12.69	0.04	4.29	1.43	0.30	14.35	99.51
56	92RGC13-04	49.68	0.69	15.24	5.77	4.58	0.66	3.41	8.37	0.03	3.53	1.74	0.37	4.43	98.50
57	92RGC14-01	47.86	0.56	12.32	3.80	2.20	0.26	2.14	12.04	0.04	4.44	1.47	0.25	13.40	100.78
58	92RGC14-02	48.52	0.53	12.46	3.79	3.30	0.18	2.34	11.17	0.04	4.19	1.61	0.26	11.51	99.90
59	92RGC14-03	41.82	0.52	11.67	5.18	1.71	0.74	2.39	14.35	0.05	4.13	1.37	0.27	15.88	100.08
60	92RGC14-04	39.91	0.42	9.98	3.78	1.36	0.25	1.76	17.43	0.05	4.25	1.22	0.20	20.31	100.92
61	92RGC14-05	30.09	0.41	9.27	3.74	2.13	0.16	2.23	23.27	0.05	3.58	1.12	0.14	24.36	100.55
62	92RGC14-06	66.29	0.33	12.29	1.32	1.19	0.13	0.83	5.32	0.03	4.98	1.59	0.12	6.56	100.98
63	92RGC14-07	36.20	0.55	10.65	3.67	2.97	0.16	2.68	18.95	0.04	3.68	1.24	0.14	18.97	99.90
64	92RGG15-01	39.31	0.52	11.40	4.09	3.28	0.36	2.50	16.87	0.03	3.73	1.49	0.26	15.54	99.38
65	92RGG15-02	40.54	0.49	10.53	3.27	2.24	0.27	1.93	18.08	0.04	3.78	1.41	0.19	17.22	99.99
66	92RGC16-01	43.74	0.53	11.91	4.06	2.24	0.55	2.32	13.55	0.04	4.42	1.56	0.25	15.12	100.29
67	92RGC16-02	40.71	0.42	10.32	5.02	0.37	0.25	1.85	16.85	0.04	4.22	1.38	0.17	20.04	101.64
68	92RGC16-03	43.80	0.40	10.35	3.78	0.47	0.27	1.60	16.37	0.04	4.20	1.33	0.14	18.62	101.37
69	92RGC16-04	62.25	0.38	12.28	2.22	1.10	0.12	1.12	8.91	0.03	5.01	1.55	0.14	8.07	101.18
70	92RGC16-05	39.81	0.51	11.80	3.68	2.55	0.17	2.25	17.34	0.04	3.77	1.54	0.21	17.15	100.82
71	92RGC16-06	30.00	0.44	9.76	4.27	1.52	0.12	2.20	23.03	0.05	3.74	1.16	0.13	24.48	100.90
72	92RGC16-07	24.81	0.42	8.39	3.61	0.93	0.10	1.92	27.59	0.04	3.21	0.94	0.07	29.03	101.06
73	92RGC17-01	41.91	0.46	11.13	3.30	2.06	0.20	2.08	16.02	0.04	4.25	1.36	0.18	18.06	101.05
74	92RGC17-02	45.60	0.61	13.47	5.11	2.77	0.69	2.77	11.93	0.04	3.98	1.43	0.30	12.44	101.14
75	92RGC17-03	43.72	0.47	11.21	3.71	1.71	0.14	1.92	14.57	0.04	4.33	1.31	0.18	17.94	101.25
76	92RGC17-04	67.17	0.34	12.61	1.77	0.86	0.11	0.92	4.83	0.03	5.06	1.46	0.15	6.29	101.60
77	92RGG18-01	29.31	0.38	7.98	4.10	1.31	0.59	1.87	25.08	0.04	3.31	1.01	0.17	25.32	100.47
78	92RGG18-02	24.23	0.31	6.52	2.98	1.25	0.24	1.44	30.34	0.04	3.06	0.73	0.10	29.97	101.23
79	92RGC19-01	31.29	0.45	9.87	3.44	2.11	0.16	2.47	21.33	0.05	4.03	1.21	0.12	24.55	101.09
80	92RGC19-02	40.08	0.55	12.39	6.84	0.67	1.92	2.89	13.09	0.05	4.20	1.48	0.28	16.78	101.22
81	92RGC19-03	30.85	0.39	8.90	3.71	1.27	0.14	2.25	22.72	0.06	3.54	1.14	0.12	25.44	100.53
82	92RGC19-04	26.81	0.43	8.60	3.21	1.62	0.13	2.24	24.55	0.05	3.22	1.00	0.08	27.03	98.97
83	92RGC20-01	22.88	0.24	5.87	2.03	0.69	0.06	1.26	32.34	0.03	2.99	0.89	0.02	30.76	100.06
84	92RGC20-02	18.05	0.26	5.64	2.11	1.30	0.07	1.51	35.33	0.02	2.42	0.83	0.05	32.37	99.76
85	92RGC20-03	14.34	0.19	4.74	1.83	0.95	0.04	1.29	38.68	0.02	2.14	0.50	<0.01	34.93	99.65
86	92RGC21-01	17.26	0.24	5.12	1.70	0.94	0.06	1.40	34.94	0.03	3.01	0.67	0.02	34.48	99.87
87	92RGC21-02	30.90	0.39	8.86	3.28	1.93	0.31	2.03	23.73	0.04	3.76	1.17	0.16	23.71	100.27
88	92RGC21-03	15.08	0.24	5.13	1.87	0.99	0.06	1.45	36.08	0.04	2.82	0.61	0.03	34.46	99.86
89	92RGC21-04	13.66	0.22	4.56	1.90	0.46	0.04	1.28	37.67	0.03	2.14	0.57	<0.01	35.86	98.39
90	92RGC22-01	34.27	0.45	10.52	3.64	2.29	0.23	2.84	18.47	0.05	4.34	1.25	0.16	22.24	100.75
91	92RGC22-02	39.86	0.52	12.16	5.77	0.92	1.35	3.15	12.68	0.05	4.36	1.43	0.26	18.48	100.99
92	92RGC22-03	41.81	0.47	12.27	3.93	2.19	0.20	3.05	13.42	0.05	4.12	1.55	0.18	17.59	100.83
93	92RGC22-04	49.33	0.71	14.69	4.41	3.41	0.25	3.43	9.33	0.03	3.60	1.73	0.34	4.87	98.13
94	92RGC23-01	31.56	0.40	9.20	3.37	1.67	0.24	2.36	21.24	0.06	4.20	1.16	0.14	25.12	100.72
95	92RGC23-02	36.85	0.49	11.13	5.81	0.63	1.52	2.68	15.51	0.05	4.24	1.43	0.24	20.54	101.12
96	92RGC23-03	34.78	0.39	9.64	3.53	1.35	0.20	2.23	19.16	0.06	3.88	1.27	0.14	23.47	100.10
97	92RGC23-04	24.39	0.40	8.45	3.21	1.50	0.18	2.27	25.43	0.05	2.90	1.02	0.08	29.23	99.12
98	92RGC24-01	28.72	0.37	8.41	2.76	1.89	0.26	2.06	24.68	0.04	3.83	1.08	0.12	26.41	100.64
99	92RGC24-02	23.44	0.32	7.08	2.61	1.25	0.10	1.90	28.81	0.04	3.57	0.90	0.07	30.78	100.87
100	92RGC24-03	38.18	0.50	11.28	4.15	2.84	0.55	2.65	16.54	0.04	3.94	1.39	0.24	17.11	99.41

No.	Sample No.	SiO2 %	TiO2 %	Al2O3 %	Fe2O3 %	FeO %	MnO %	MgO %	CaO %	BaO %	Na2O %	K2O %	P2O5 %	LOI %	Total
101	92RGC24-04	33.17	0.35	8.71	2.50	1.57	0.10	1.76	22.30	0.05	3.78	1.38	0.11	24.65	100.43
102	92RGC24-05	23.65	0.30	6.84	2.77	1.01	0.08	1.79	29.27	0.05	3.10	0.87	0.08	30.34	100.15
103	92RGC24-06	19.22	0.31	6.40	2.53	0.91	0.07	1.65	31.95	0.04	2.67	0.78	0.02	32.59	99.14
104	92RGC25-01	23.19	0.27	6.41	2.10	1.34	0.18	1.73	28.62	0.04	3.97	0.91	0.11	31.67	100.54
105	92RGC25-02	30.39	0.40	8.93	3.52	2.29	0.45	2.29	22.82	0.03	3.66	1.06	0.20	23.33	99.37
106	92RGC25-03	20.21	0.23	5.61	2.12	0.63	0.09	1.48	31.53	0.04	3.35	0.77	0.08	33.75	99.90
107	92RGC25-04	25.60	0.27	6.54	1.88	0.95	0.09	1.46	28.05	0.04	3.68	1.05	0.08	30.26	99.95
108	92RGC25-05	18.22	0.34	5.78	1.89	1.15	0.10	1.71	32.63	0.03	2.74	0.58	0.08	33.30	98.55
109	92RGC26-01	24.33	0.38	7.28	2.32	1.92	0.12	1.93	27.31	0.04	3.55	0.77	0.08	29.06	99.10
110	92RGC26-02	30.42	0.39	8.83	4.41	0.98	1.03	2.10	21.93	0.05	4.03	1.04	0.20	24.32	99.73
111	92RGC26-03	28.97	0.33	7.69	2.78	1.32	0.13	1.60	24.51	0.05	3.80	1.01	0.14	27.68	100.01
112	92RGC26-04	34.01	0.33	8.28	3.10	1.31	0.13	1.51	21.25	0.05	3.98	1.31	0.13	24.14	99.53
113	92RGC26-05	31.88	0.30	7.66	2.23	0.96	0.09	1.34	23.97	0.05	3.75	1.19	0.08	25.39	99.89
114	92RGC26-06	22.18	0.39	6.78	2.39	1.39	0.10	1.81	28.94	0.03	3.35	0.68	0.08	31.19	99.31
115	92RGC26-07	33.51	0.52	9.96	3.32	2.89	0.15	2.33	21.22	0.03	3.44	1.08	0.17	20.31	98.93
116	92RGC27-01	12.09	0.15	3.41	1.75	0.60	0.05	1.09	39.91	0.01	2.61	0.45	<0.01	37.69	99.81
117	92RGC27-02	10.30	0.12	2.95	1.20	0.46	0.02	0.95	42.08	0.01	2.38	0.38	<0.01	38.72	99.57
118	92HPG01	21.92	0.09	2.99	17.22	1.14	0.08	1.07	3.10	0.01	3.17	0.49	1.38	22.63	75.29
119	92BGC01-1	20.42	0.35	5.90	2.47	1.40	0.10	1.72	31.49	0.03	3.26	0.56	0.03	31.63	99.36
120	92BGC01-2	29.94	0.38	8.09	3.47	1.79	0.44	1.82	24.08	0.03	3.27	0.83	0.16	24.21	98.51
121	92BGC01-3	34.12	0.29	7.57	3.29	0.98	0.11	1.22	21.99	0.03	3.74	0.88	0.11	24.20	98.53
122	92BGC01-4	36.12	0.31	8.01	3.26	1.02	0.10	1.34	21.12	0.03	3.79	0.94	0.11	22.79	98.94
123	92BGC01-5	27.56	0.35	8.21	3.06	2.25	0.10	2.12	25.88	0.03	3.23	0.66	0.08	25.05	98.58
124	92BGC02-1	21.26	0.28	5.91	3.07	0.79	0.24	1.34	30.21	0.04	3.13	0.60	0.08	32.59	99.54
125	92BGC02-2	14.72	0.23	4.46	2.80	0.61	0.06	1.30	35.98	0.03	2.66	0.42	0.01	36.12	99.40
126	92BGC02-3	13.28	0.23	4.07	1.99	0.88	0.04	1.25	37.21	0.02	2.64	0.44	0.01	37.33	99.39
127	92BGC02-4	16.06	0.25	4.56	5.07	0.54	0.08	1.41	33.34	0.02	2.72	0.53	0.05	35.03	99.56
128	92BGC03-1	33.04	0.36	8.18	5.10	0.32	0.36	1.79	19.63	0.04	4.56	0.84	0.24	24.87	99.23
129	92BGC03-2	32.85	0.46	9.38	7.01	0.33	2.53	2.39	17.08	0.05	4.17	0.96	0.36	22.15	99.72
130	92BGC03-4	60.16	0.32	11.21	2.39	0.89	0.17	0.98	8.10	0.01	4.75	1.17	0.16	9.95	100.27
131	92BGC03-6	30.72	0.59	11.39	3.83	1.48	0.14	2.64	17.95	0.02	3.25	0.80	0.15	25.57	98.53
132	92BGC04-1	34.61	0.46	9.61	5.12	1.99	0.55	2.23	17.32	0.04	4.44	1.00	0.31	21.73	99.41
133	92BGC04-2	34.31	0.38	8.45	4.66	1.17	0.15	1.61	19.99	0.04	3.97	0.94	0.23	24.97	100.87
134	92BGC04-3	42.61	0.35	9.31	3.29	1.52	0.14	1.44	16.12	0.04	4.23	0.97	0.19	19.21	99.42
135	92BGC05-1	36.46	0.50	10.38	4.88	2.44	0.62	2.42	16.68	0.04	4.20	1.05	0.31	19.48	99.46
136	92BGC05-2	37.47	0.44	9.40	3.95	1.97	0.15	1.82	17.80	0.04	4.25	1.00	0.28	21.26	99.83
137	92BGC05-3	30.78	0.36	7.84	6.59	1.62	0.16	1.90	20.28	0.04	3.62	1.01	0.36	24.19	98.75
138	92BGC05-4	22.71	0.59	5.60	7.14	1.55	0.37	1.82	25.64	0.03	3.07	0.59	0.32	29.31	98.74
139	92BGC05-5	20.18	0.45	6.15	5.19	0.80	0.60	1.94	28.92	0.04	3.34	0.54	0.17	31.44	99.76
140	92BGC05-6	25.14	0.43	7.79	4.59	1.69	0.43	2.19	26.13	0.03	3.36	0.61	0.13	26.76	99.29
141	92BGC07-1	38.79	0.71	11.24	3.99	3.98	0.30	2.89	16.46	0.03	3.62	1.02	0.27	14.78	98.08
142	92BGC07-2	32.66	0.41	8.59	4.15	1.31	0.31	1.79	21.85	0.04	3.81	0.88	0.20	23.96	99.97
143	92BGC08	36.08	0.45	9.60	4.60	1.85	0.44	2.14	17.41	0.04	4.31	1.07	0.26	21.19	99.45
144	92BGC09-1	36.84	0.45	9.39	4.57	1.91	0.15	1.87	16.17	0.04	4.50	1.04	0.19	21.62	98.74
145	92BGC09-2	36.30	0.33	7.12	9.72	1.40	0.11	1.77	13.56	0.04	3.61	1.23	0.45	22.00	97.74
146	92BGC14-1	35.73	0.51	10.09	4.55	2.08	0.59	2.21	17.72	0.04	3.97	0.98	0.23	20.65	99.35
147	92BGC14-2	35.29	0.61	9.34	4.00	2.34	0.23	2.00	18.34	0.04	3.96	0.96	0.24	21.60	98.95
148	92BGC15-1	36.35	0.48	10.21	4.29	2.11	0.58	2.22	17.12	0.04	4.12	1.04	0.22	20.44	99.22
149	92BGC15-2	36.65	0.42	8.96	3.69	1.74	0.13	1.72	18.62	0.04	4.03	0.96	0.17	22.42	99.54
150	92BGC15-3	44.55	0.38	9.68	2.45	1.54	0.11	1.40	15.87	0.04	4.39	0.98	0.11	18.40	99.90

No.	Sample No.	SiO2 %	TiO2 %	Al2O3 %	Fe2O3 %	FeO %	MnO %	MgO %	CaO %	BaO %	Na2O %	K2O %	P2O5 %	LOI %	Total
151	92BGC15-4	67.90	0.31	12.07	1.44	1.24	0.10	0.81	4.50	0.02	5.03	1.22	0.13	6.25	101.02
152	92BGC15-5	31.21	0.40	8.72	3.14	1.99	0.13	1.89	23.77	0.04	3.53	0.93	0.14	24.14	100.03
153	92BGC16-1	34.88	0.45	9.70	4.06	1.79	0.39	2.07	18.83	0.04	4.20	0.94	0.19	21.38	98.92
154	92BGC16-3	20.39	0.34	5.92	2.47	1.36	0.06	1.60	31.91	0.47	2.91	0.55	0.01	31.80	99.79
155	92BGC16-4	16.59	0.25	5.16	2.72	0.79	0.06	1.43	34.01	0.03	2.66	0.55	0.01	35.26	99.63
156	92BGC17-1	43.82	0.84	13.57	2.46	4.66	0.17	3.74	14.92	0.02	3.34	0.64	0.16	9.22	97.57
157	92BGC17-2	40.54	0.74	12.51	2.80	3.98	0.24	3.45	16.78	0.03	3.50	0.66	0.16	13.12	98.51
158	92BGC17-3	46.79	0.93	14.69	2.89	4.94	0.16	4.30	12.38	0.02	3.63	0.59	0.18	6.38	97.88
159	92BGC18-1	27.31	0.35	7.56	2.61	1.67	0.11	1.82	25.87	0.04	3.64	0.73	0.04	27.84	99.51
160	92BGC18-2	36.12	0.47	9.74	3.67	1.52	0.44	1.98	18.88	0.04	3.85	0.97	0.15	21.47	99.31
161	92BGC18-3	33.28	0.37	8.42	3.68	1.07	0.10	1.73	21.15	0.04	3.73	0.86	0.08	24.31	98.82
162	92BGC18-4	20.84	0.31	6.34	2.32	1.17	0.09	1.70	30.84	0.05	2.99	0.60	0.01	32.73	99.99
163	92BGC19-1	31.00	0.39	8.73	3.73	1.42	0.52	2.12	20.79	0.06	4.01	0.89	0.13	26.09	99.88
164	92BGC19-2	38.49	0.54	11.25	5.26	0.41	1.67	2.57	13.34	0.05	4.34	1.17	0.24	19.58	98.74
165	92BGC19-3	36.92	0.44	9.93	4.49	0.99	0.42	2.17	16.88	0.05	3.93	0.97	0.17	22.83	100.19
166	92BGC20-1	43.79	0.63	13.35	5.78	2.93	0.94	3.03	10.78	0.04	4.01	1.30	0.29	11.44	98.31
167	92BGC20-2	36.60	0.51	10.60	5.38	0.53	1.22	2.35	15.76	0.05	4.15	1.03	0.21	21.89	100.29
168	92BGC20-3	41.83	0.43	10.26	3.92	1.34	0.23	1.90	14.90	0.04	4.16	1.03	0.17	19.65	99.87
169	92BGC20-4	40.05	0.45	10.47	3.32	2.19	0.28	2.13	16.65	0.04	3.84	1.12	0.16	17.70	98.40
170	92BGC21-1	40.10	0.56	11.88	5.52	1.75	0.97	2.71	13.06	0.04	4.50	1.14	0.26	17.47	99.96
171	92BGC21-2	58.37	0.36	11.43	2.33	1.28	0.15	1.23	8.48	0.03	4.76	1.21	0.15	10.66	100.44
172	92BGC21-3	34.13	0.44	9.65	4.34	1.93	0.18	2.21	18.76	0.05	3.71	1.06	0.17	21.98	98.60
173	92BGC22-1	42.85	0.64	13.00	5.14	3.01	0.80	2.92	11.20	0.04	4.06	1.28	0.27	12.45	97.65
174	92BGC22-2	46.46	1.34	19.14	2.14	5.66	0.16	4.08	11.73	0.02	3.43	0.43	0.23	2.29	97.11
175	92BGC22-3	45.45	0.43	10.63	3.11	1.52	0.21	1.74	13.96	0.04	4.38	1.04	0.14	17.67	100.32
176	92BGC22-4	41.89	0.49	11.08	4.01	2.49	0.20	2.25	14.91	0.04	3.94	1.19	0.20	16.60	99.31
177	92BGC24-1	29.43	0.43	8.76	4.53	0.86	0.50	2.13	21.29	0.04	4.03	0.87	0.13	26.42	99.43
178	92BGC25-1	32.98	0.39	8.75	3.63	1.68	0.29	1.99	19.48	0.05	3.95	0.92	0.12	23.80	98.03
179	92BGC25-2	45.81	0.63	13.19	5.28	3.59	0.77	3.06	9.54	0.03	4.07	1.35	0.28	9.71	97.31
180	92BGC25-3	54.23	0.37	10.98	3.06	1.41	0.16	1.38	9.56	0.04	4.70	1.12	0.16	13.05	100.23
181	92BGC26-1	43.30	1.09	22.71	5.14	4.88	0.82	3.54	11.33	0.03	3.78	1.02	0.27	10.03	97.74
182	92BGC27-1	42.11	0.55	11.73	6.22	1.23	1.32	2.64	11.48	0.05	4.59	1.22	0.25	16.06	99.45
183	92BGC27-2	40.96	0.45	10.31	4.93	1.42	0.29	2.05	14.04	0.05	4.50	1.06	0.18	19.50	99.74
184	92BGC27-3	42.97	0.56	11.95	4.99	3.06	0.21	2.68	12.15	0.04	4.02	1.35	0.21	14.37	98.56
185	92BGC27-4	26.28	1.05	7.41	5.52	3.04	0.23	2.33	22.78	0.05	3.34	0.66	0.22	25.55	98.56
186	92BGC28-1	44.85	0.64	13.09	5.40	2.59	1.06	3.16	8.83	0.04	4.42	1.39	0.29	11.76	98.52
187	92BGC28-2	46.10	0.65	13.29	4.50	4.38	0.40	3.11	9.39	0.03	4.15	1.41	0.28	9.80	97.50
188	92BGC28-3	39.28	0.52	10.70	5.40	0.98	1.08	2.30	14.02	0.06	4.45	1.13	0.22	20.45	100.59
189	92BGC29-1	33.98	0.45	8.99	5.04	0.87	0.61	1.95	15.70	0.05	4.13	1.03	0.17	21.46	100.44
190	92BGC29-2	50.47	0.39	10.62	3.54	1.37	0.25	1.42	10.71	0.04	4.46	1.12	0.13	14.26	98.78
191	92BGC29-3	42.84	0.55	11.73	4.78	3.25	0.21	2.56	13.09	0.04	3.82	1.37	0.22	14.59	99.05
192	92BGC29-4	30.79	0.43	8.04	5.15	2.35	0.19	2.29	20.45	0.06	3.70	1.05	0.15	24.35	100.00
193	92BGC30-1	44.64	0.61	10.26	4.60	3.86	0.35	2.95	11.19	0.03	3.97	1.29	0.28	10.81	97.85
194	92BGC30-2	52.46	0.39	11.12	2.81	1.34	0.24	1.39	11.68	0.04	4.48	1.07	0.16	13.70	100.88
195	92BGC30-3	40.55	0.53	11.25	4.15	2.81	0.30	2.32	15.33	0.04	3.65	1.20	0.23	15.90	98.26
196	92BOG11	48.00	2.13	12.05	3.06	9.20	0.26	2.97	8.72	0.02	3.76	0.97	0.86	4.71	96.71
197	92BOG13-1	38.34	0.50	10.56	4.29	2.31	0.39	2.23	16.23	0.04	3.94	1.09	0.23	18.62	98.77
198	92BOG13-2	37.99	0.47	9.88	3.91	1.74	0.24	1.90	17.57	0.04	3.84	1.01	0.20	20.00	98.78
199	92BPG12-1	36.28	0.46	9.64	3.54	2.29	0.23	2.01	18.53	0.03	4.17	0.95	0.22	20.90	99.25
200	92BPG12-2	42.90	0.42	9.45	2.82	1.58	0.21	1.45	16.85	0.03	4.14	0.94	0.16	16.86	97.82

No.	Sample No.	SiO2 %	TiO2 %	Al2O3 %	Fe2O3 %	FeO %	MnO %	MgO %	CaO %	BaO %	Na2O %	K2O %	P2O5 %	LOI %	Total
201	92HOG11	46.50	0.70	10.41	3.98	5.17	0.39	1.36	12.10	0.03	4.27	1.21	0.31	10.90	97.32
202	92HOG12	45.82	0.63	10.13	3.86	4.43	0.38	1.46	12.68	0.03	4.30	1.19	0.27	12.45	97.62
203	92HOG16	41.23	0.51	10.86	12.42	1.04	1.62	2.70	6.94	0.04	4.62	1.14	0.65	14.31	98.09
204	92HOG20	34.27	0.58	9.58	4.02	2.69	0.78	2.34	19.71	0.03	3.59	0.87	0.24	19.88	98.58
205	92HOG22	38.06	0.53	11.16	4.01	3.56	0.26	2.58	16.97	0.03	3.92	0.93	0.25	16.78	99.05
206	92HOG24	42.74	0.59	12.67	4.84	3.24	0.44	2.86	11.84	0.03	4.06	1.26	0.29	13.16	98.02
207	92HPG07-1	17.08	0.01	1.22	18.85	0.65	0.02	1.03	1.11	0.01	6.53	0.34	0.56	26.53	73.93
208	92HPG10-1	41.87	0.45	8.81	2.59	3.19	0.17	1.14	18.04	0.02	4.24	1.41	0.16	17.64	99.73
209	92HPG13	48.32	0.77	9.90	12.07	6.61	0.59	0.86	3.65	0.03	4.57	1.17	0.76	6.60	95.89
210	92HPG15-1	44.06	0.18	3.39	24.07	1.18	0.08	2.71	1.60	0.01	4.23	0.95	0.27	17.38	100.11
211	92HPG15-2	46.78	0.48	10.32	3.20	2.09	0.09	1.84	12.31	0.04	4.69	1.03	0.18	16.38	99.43
212	92HPG15-3	34.69	0.30	6.69	24.68	1.33	0.57	2.17	2.80	0.04	4.67	0.82	1.85	19.41	100.02
213	92HPG25	52.64	0.33	10.19	4.63	0.69	0.52	1.35	9.06	0.04	4.72	1.07	0.19	13.87	99.30
214	92RGC28-1	48.52	0.90	16.01	5.55	3.25	0.16	3.59	1.97	0.03	3.48	1.66	0.32	12.52	97.97
215	92RGC28-2	47.33	0.88	16.03	5.79	3.12	0.39	3.73	1.90	0.03	3.77	1.63	0.33	13.36	98.29
216	92RGC29-1	25.96	0.42	7.52	3.21	1.78	0.10	2.00	26.91	0.05	2.97	0.65	0.08	27.85	99.50
217	92RGC29-2	22.91	0.36	6.79	2.65	1.33	0.08	1.81	29.61	0.05	2.94	0.62	0.04	30.28	99.47
218	92RGC30-1	33.75	0.46	10.46	3.33	2.55	0.12	2.63	19.04	0.04	3.66	0.94	0.15	21.82	98.94
219	92RGC30-2	48.43	0.69	14.62	4.64	5.25	0.26	3.46	8.77	0.03	3.63	1.45	0.35	5.70	97.28
220	92RGC30-3	38.16	0.53	11.35	4.49	1.65	0.46	2.75	14.42	0.04	4.11	1.12	0.23	20.08	99.39
221	92RGC30-4	40.98	0.53	11.43	1.09	2.04	0.17	2.57	13.80	0.04	4.13	1.13	0.22	18.13	96.26
222	92RGC31-1	41.10	0.62	12.45	4.30	2.99	0.36	3.42	10.68	0.04	4.15	1.32	0.23	17.03	98.69
223	92RGC31-2	46.38	0.68	13.68	5.84	3.38	0.62	3.54	7.29	0.03	4.10	1.46	0.34	10.19	97.53
224	92RGC31-3	51.24	0.73	15.38	5.00	5.31	0.28	3.53	7.90	0.03	3.70	1.53	0.36	4.35	99.35
225	92RGC31-4	47.45	0.74	13.80	5.31	2.14	0.78	3.50	6.65	0.04	4.08	1.14	0.28	12.76	98.67
226	92RGC31-5	45.52	0.65	13.30	4.35	4.12	0.24	3.41	9.05	0.03	3.98	1.54	0.32	11.36	97.87
227	92RGC32-1	48.10	0.87	15.49	4.93	3.74	0.24	3.74	3.35	0.03	3.67	1.55	0.29	11.61	97.61
228	92RGC32-2	47.30	0.96	16.28	5.42	3.44	0.14	4.08	1.99	0.02	3.40	1.56	0.27	13.11	97.97
229	92RGC32-3	58.20	0.91	14.70	3.43	3.32	0.11	3.29	2.37	0.03	3.02	1.39	0.22	8.41	99.40
230	92RGC33-1	30.79	0.43	9.20	3.00	2.03	0.20	2.31	20.61	0.05	4.03	0.94	0.12	25.95	99.66
231	92RGC33-2	38.39	0.54	11.60	6.30	0.55	1.69	2.72	13.75	0.05	4.11	1.13	0.26	19.45	100.55
232	92RGC33-3	36.05	0.45	10.15	3.73	1.74	0.16	2.32	16.88	0.05	3.94	1.09	0.16	23.00	99.73
233	92RGC34-1	43.52	0.75	13.80	5.36	2.92	0.29	4.13	7.15	0.03	4.17	1.45	0.25	15.45	99.26
234	92RGC34-2	44.56	0.71	13.94	5.82	3.01	0.61	3.67	5.98	0.03	4.05	1.44	0.31	13.87	99.00
235	92RGC34-3	70.56	0.33	12.77	1.35	1.37	0.12	0.94	3.07	0.02	4.89	1.31	0.15	4.69	101.57
236	92RGC34-4	49.02	0.67	13.88	8.26	2.92	1.36	3.40	5.77	0.03	3.64	1.62	0.88	6.37	97.82
237	92RGC35-1	45.03	0.71	14.18	4.85	3.21	0.29	4.27	6.97	0.03	4.06	1.35	0.23	13.88	99.05
238	92RGC35-2	43.75	0.71	13.71	5.91	2.88	0.36	4.02	7.33	0.03	4.13	1.37	0.30	14.20	98.70
239	92RGC35-3	47.79	0.71	14.23	4.47	5.40	0.24	3.93	8.01	0.03	3.79	1.46	0.36	7.64	98.06
240	92RGC35-4	46.08	0.82	14.89	5.43	3.05	0.16	4.25	5.57	0.02	3.58	1.46	0.25	13.33	98.90
241	92RGC36-1	48.52	0.94	15.94	5.26	3.19	0.14	3.91	1.95	0.02	3.83	1.53	0.28	12.98	98.49
242	92RGC36-3	64.24	0.80	13.65	2.86	3.00	0.07	3.06	2.20	0.03	2.82	1.35	0.20	5.05	99.33
243	92RGC37-1	46.35	0.93	15.95	6.18	2.72	0.16	4.38	2.43	0.02	3.90	1.58	0.26	13.47	98.33
244	92RGC37-2	52.05	0.90	15.01	5.15	2.83	0.14	4.25	3.36	0.02	3.58	1.41	0.24	9.63	98.57
245	92RGC38-1	47.06	0.91	16.01	5.30	3.30	0.16	3.96	1.97	0.02	3.79	1.58	0.26	13.73	98.07
246	92RGC38-2	50.68	0.96	15.83	5.37	3.00	0.17	4.00	2.21	0.02	3.44	1.46	0.26	11.17	98.57
247	92RGC39-1	36.84	0.51	11.02	3.68	2.39	0.21	2.85	15.84	0.05	4.16	1.16	0.19	21.46	100.36
248	92RGC39-2	39.28	0.60	12.58	6.42	0.61	1.57	3.13	10.70	0.05	4.21	1.25	0.27	19.35	100.03
249	92RGC39-3	43.64	0.60	12.63	4.23	2.34	0.21	2.84	11.25	0.04	4.20	1.32	0.24	16.69	100.23
250	92RGC39-4	51.53	0.69	14.78	3.55	5.68	0.24	2.86	9.03	0.03	3.95	1.70	0.37	5.72	100.13

Appendix 7. List of the Results of Chemical Analysis for Minor Elements

No.	Sample No.	Ag ppm	Ni ppm	Cu ppm	Co ppm	Pb ppm	Zn ppm	Mn ppm	Cd ppm	As ppm	Sb ppm	Mo ppm	Ga ppm	Sr ppm	Hg ppb	Ba ppm	Au ppb	S %	T-R2O3ppm	P %	Cl ppm
1	92RLC01-01	0.04	36	38.4	21	5.5	68	4930	0.1	4.4	0.4	1.2	13	548	50	410	<5	0.074	157	0.087	17500
2	92RLC01-02	0.18	25	34.8	18	5.5	54	1230	0.5	0.6	<0.2	0.2	14	730	40	305	<5	0.070	163	0.074	13000
3	92RLC01-03	0.02	57	38.2	16	5.5	56	>10000	0.2	7.8	0.6	3.8	11	610	50	500	<5	0.070	134	0.070	16500
4	92RLC01-04	0.18	45	48.6	14	7.0	77	2000	0.4	3.4	0.4	0.2	8	1008	40	470	<5	0.099	109	0.022	28600
5	92RLC01-05	0.04	13	14.8	16	0.5	28	1490	0.2	1.4	<0.2	0.2	17	581	30	225	<5	0.110	174	0.100	11000
6	92RLC01-06	0.28	75	57.6	15	7.5	126	3405	1.1	6.2	2.8	1.0	7	1007	90	570	<5	0.500	113	0.026	30100
7	92RGG02	0.02	18	29.8	26	7.5	49	1490	0.1	4.4	<0.2	0.6	16	649	60	195	<5	0.091	176	0.109	12900
8	92RPG03-01	0.04	27	35.4	19	5.5	66	1385	0.1	5.0	<0.2	0.4	14	915	60	310	<5	0.078	140	0.087	17400
9	92RPG03-02	0.02	29	33.2	21	6.0	82	1085	<0.1	3.2	<0.2	0.4	17	607	50	260	<5	0.057	168	0.109	14900
10	92RLC04-01	0.04	33	41.2	19	6.0	71	4195	0.1	6.0	<0.2	1.2	15	607	60	430	<5	0.066	153	0.100	18800
11	92RLC04-02	0.08	28	32.4	16	4.5	65	1215	0.3	1.8	<0.2	0.2	15	567	50	300	<5	0.072	173	0.100	15900
12	92RLC04-03	0.04	34	32.4	9	4.0	54	3440	0.2	25.6	<0.2	0.2	11	693	50	490	<5	0.063	226	0.118	19000
13	92RLC04-04	0.16	39	38.0	9	6.5	85	1705	0.8	6.8	1.2	1.8	12	754	50	450	<5	0.366	142	0.061	19500
14	92RLC04-05	0.06	15	15.2	8	2.0	40	1165	0.2	2.0	<0.2	1.6	17	526	30	285	<5	0.202	190	0.096	12300
15	92RPG05-01	0.04	24	25.8	14	5.0	42	1790	0.1	6.4	<0.2	0.6	10	807	40	290	not/ss	0.081	123	0.065	16700
16	92RPG05-02	0.08	16	21.8	9	4.5	43	500	0.3	1.8	<0.2	0.2	7	1086	40	220	<5	0.074	102	0.004	19400
17	92RPG06-01	0.04	34	41.8	16	5.5	53	3280	0.1	7.6	<0.2	1.4	14	712	50	335	<10	0.067	133	0.100	19600
18	92RPG06-02	0.04	23	22.0	10	4.0	44	690	0.1	6.4	<0.2	0.2	14	593	40	305	<5	0.056	128	0.083	19400
19	92RPG06-03	0.06	23	18.6	7	4.0	42	760	0.2	1.2	<0.2	0.2	13	628	50	300	<5	0.058	131	0.057	18000
20	92RGC07-01	0.04	27	39.6	15	5.0	51	5745	0.2	8.6	<0.2	2.4	10	1418	50	270	<10	0.075	122	0.083	20300
21	92RGC07-02	0.20	4	67.4	7	11.0	45	510	0.1	3.2	0.4	6.6	14	279	30	965	50	0.041	153	0.074	800
22	92RGC07-03	0.06	14	10.4	8	2.0	28	980	0.3	3.8	0.4	0.2	4	1731	40	90	<5	0.165	143	<0.002	800
23	92RGC07-04	0.20	27	22.6	12	5.0	57	770	0.4	4.0	0.4	0.2	10	1153	40	270	<5	0.128	94	0.044	16800
24	92RGC07-05	0.04	28	44.8	37	2.5	84	1195	0.2	2.6	<0.2	0.6	17	610	40	210	<10	0.163	164	0.074	9800
25	92RGC08-01	0.06	19	19.4	15	2.0	40	880	0.2	9.0	<0.2	1.2	14	908	30	285	<5	0.398	152	0.061	13600
26	92RGC08-02	0.04	38	15.2	24	2.5	51	1115	0.1	9.4	<0.2	0.2	13	2728	30	145	<5	0.080	143	0.052	8100
27	92RGC08-03	<0.02	19	19.2	12	4.0	44	260	0.4	4.8	<0.2	0.2	7	3675	30	45	<5	0.132	84	<0.002	17300
28	92RGC08-04	<0.02	21	34.4	22	3.0	53	870	0.2	6.4	<0.2	0.4	13	1776	30	115	<5	0.092	138	0.048	14000
29	92RGC08-05	<0.02	20	33.8	18	3.0	44	920	0.2	6.2	0.2	0.2	9	2343	30	130	<5	0.090	125	0.017	11700
30	92RGC08-06	<0.02	89	56.2	24	4.5	139	1730	0.6	58.0	2.2	0.4	9	1280	30	145	<5	0.681	231	0.201	14500
31	92RGC09-01	<0.02	163	44.6	28	3.0	190	1690	0.5	88.2	3.6	0.4	10	240	30	115	<5	1.950	292	0.349	15400
32	92RGC09-02	0.04	39	39.2	17	7.0	59	4040	<0.1	9.8	<0.2	1.8	14	583	50	410	<5	0.090	136	0.096	20400
33	92RGC09-03	0.12	33	42.4	12	7.5	69	670	0.5	3.6	<0.2	0.2	13	687	60	450	<10	0.082	136	0.052	22000
34	92RGC09-04	0.14	26	30.2	15	4.5	48	880	0.4	2.0	<0.2	0.2	14	694	50	315	<5	0.063	139	0.052	19200
35	92RGC10-01	0.18	38	41.2	17	6.0	60	710	0.6	3.6	0.4	0.4	13	779	50	325	<5	0.108	121	0.035	17300
36	92RGC10-02	0.02	21	98.6	25	4.0	55	3375	<0.1	4.8	<0.2	1.0	21	607	50	280	<5	0.063	199	0.153	11300
37	92RGC10-03	0.04	36	40.0	18	7.0	56	2235	0.1	9.2	<0.2	0.4	18	559	70	430	<10	0.072	139	0.100	19500
38	92RGC10-04	0.08	26	32.4	9	8.0	53	1050	0.1	13.2	<0.2	0.2	15	518	70	385	<5	0.065	135	0.070	21800
39	92RGC10-05	0.38	45	50.2	18	6.0	65	780	0.3	3.2	0.6	0.2	12	742	90	385	<5	0.099	135	0.057	27800
40	92RGC11-01	0.26	38	63.6	19	6.0	59	770	0.1	1.0	<0.2	0.2	12	736	80	350	<5	0.078	140	0.052	21700
41	92RGC11-02	0.02	17	71.0	28	2.0	40	1430	0.1	2.8	<0.2	<0.2	18	551	40	190	<5	0.084	167	0.126	11800
42	92RGC11-03	0.02	31	110.8	34	4.5	67	5595	0.1	5.8	<0.2	4.2	16	666	70	345	20	0.086	165	0.153	7000
43	92RGC11-04	0.02	12	109.0	25	2.0	46	1820	<0.1	3.4	<0.2	0.2	19	604	60	245	<10	0.107	181	0.153	10400
44	92RGC11-05	0.02	16	61.2	30	1.0	36	1800	<0.1	1.8	<0.2	<0.2	19	613	40	220	<5	0.109	163	0.135	7800
45	92RGC11-06	0.12	47	58.4	21	6.5	75	2015	0.1	10.2	0.2	0.4	16	543	70	395	<5	0.082	138	0.118	20800
46	92RGC11-07	0.04	15	102.4	24	2.0	45	1595	0.1	4.6	<0.2	0.2	19	589	50	265	<5	0.103	172	0.161	19100
47	92RGC11-08	0.06	64	61.0	19	8.0	88	3675	0.2	4.2	0.4	0.2	12	692	90	540	<5	0.087	122	0.061	21000
48	92RGC12-01	0.04	12	100.0	22	4.0	64	1800	<0.1	2.4	<0.2	0.2	18	568	40	275	<5	0.117	183	0.157	9000
49	92RGC12-02	0.06	48	53.8	19	8.5	70	9470	0.1	16.8	0.6	2.0	13	803	90	495	<5	0.087	127	0.109	24700
50	92RGC12-03	0.14	46	48.8	14	11.5	80	2225	0.6	27.0	0.8	0.6	12	745	100	490	<5	0.096	120	0.126	27800

not/ss: not sufficient sample

No.	Sample No.	Ag ppm	Ni ppm	Cu ppm	Co ppm	Pb ppm	Zn ppm	Mn ppm	Cd ppm	As ppm	Sb ppm	Mo ppm	Ga ppm	Sr ppm	Hg ppb	Ba ppm	Au ppb	S %	T-R2O3ppm	P %	Cl ppm
51	92RGC12-04	0.10	37	48.0	14	22.5	64	1850	0.3	8.0	0.6	0.4	12	794	70	480	<10	0.091	115	0.065	31500
52	92RGC12-05	0.06	32	36.0	11	7.5	54	1570	0.1	17.0	0.2	0.2	12	681	70	430	<5	0.090	127	0.078	24000
53	92RGC13-01	0.14	39	29.6	16	5.0	64	2335	0.4	11.4	0.6	0.2	16	644	60	270	<5	0.123	151	0.096	20500
54	92RGC13-02	0.28	50	51.6	14	8.5	87	1485	0.2	9.6	0.8	0.2	10	1022	100	615	<10	0.112	117	0.070	34500
55	92RGC13-03	0.06	31	75.4	22	7.0	63	3845	0.1	10.0	<0.2	2.8	18	615	70	350	<10	0.072	190	0.131	23800
56	92RGC13-04	0.02	16	95.8	26	2.0	46	4650	<0.1	3.8	<0.2	2.0	22	590	60	260	<5	0.048	172	0.161	9200
57	92RGC14-01	0.02	28	38.4	15	5.0	43	1860	<0.1	7.2	0.6	0.4	15	515	60	390	<5	0.067	146	0.109	19400
58	92RGC14-02	0.02	21	40.8	16	4.0	53	1265	<0.1	5.8	<0.2	<0.2	16	590	50	340	<5	0.055	145	0.113	15800
59	92RGC14-03	0.04	37	53.4	18	7.0	58	5430	0.1	11.4	0.2	1.6	14	674	60	435	<10	0.066	139	0.118	21400
60	92RGC14-04	0.06	36	34.4	11	9.5	57	1830	0.1	16.6	0.2	0.6	13	671	60	450	<50	0.082	137	0.087	21700
61	92RGC14-05	0.16	35	52.8	15	7.0	64	1185	0.6	5.4	0.8	<0.2	11	862	40	490	<20	0.138	129	0.051	22800
62	92RGC14-06	0.04	11	13.8	3	1.0	15	895	0.1	2.8	<0.2	0.2	15	322	50	250	not/ss	0.041	139	0.052	11000
63	92RGC14-07	0.14	41	43.2	18	5.5	55	1140	0.4	4.6	0.8	0.4	14	672	50	325	<10	0.211	145	0.061	20400
64	92ROG15-01	0.06	24	54.2	19	7.0	46	2530	0.1	9.6	<0.2	1.0	15	703	50	305	<10	0.079	154	0.113	17600
65	92ROG15-02	0.02	20	30.6	14	7.5	40	1935	<0.1	8.8	<0.2	0.4	13	661	50	325	<5	0.071	139	0.083	15500
66	92RGC16-01	0.04	31	43.2	16	5.5	50	3700	0.1	8.0	<0.2	1.2	14	580	50	360	<10	0.084	163	0.109	22200
67	92RGC16-02	0.02	32	29.8	10	7.5	56	1730	0.1	13.0	<0.2	2.2	13	614	50	370	<20	0.086	137	0.074	22400
68	92RGC16-03	0.04	23	30.4	9	6.5	49	1795	0.1	6.0	0.2	1.6	13	589	40	365	<50	0.083	135	0.061	18800
69	92RGC16-04	0.04	10	16.8	6	1.5	21	800	0.1	1.4	<0.2	0.2	15	372	40	255	not/ss	0.054	141	0.061	not/ss
70	92RGC16-05	0.04	21	50.2	17	5.0	49	1170	0.3	3.4	<0.2	0.2	15	715	50	355	<50	0.082	132	0.092	17600
71	92RGC16-06	0.16	28	49.8	14	5.0	55	855	0.2	3.4	<0.2	0.2	13	837	40	420	<50	0.095	119	0.057	25900
72	92RGC16-07	0.14	36	36.0	13	6.0	61	690	0.6	3.6	0.4	0.6	12	903	50	350	not/ss	0.223	116	0.031	22100
73	92RGC17-01	0.06	27	48.2	13	8.0	51	1360	0.1	3.8	<0.2	0.4	16	637	50	380	<20	0.085	128	0.078	22600
74	92RGC17-02	0.02	30	68.4	20	5.0	54	4605	0.1	6.8	0.2	3.2	21	595	50	350	<5	0.069	146	0.131	16400
75	92RGC17-03	0.08	27	39.8	10	6.5	55	985	<0.1	11.8	<0.2	0.4	12	558	20	390	<50	0.081	134	0.078	20600
76	92RGC17-04	0.04	8	13.8	2	1.0	16	745	0.2	0.6	<0.2	0.2	13	297	60	245	<10	0.040	120	0.065	12200
77	92ROG18-01	0.04	30	32.4	14	11.5	50	4185	0.1	17.2	<0.2	1.8	11	788	50	345	<5	0.078	139	0.074	18200
78	92ROG18-02	0.06	27	25.6	10	11.5	50	1690	<0.1	17.4	<0.2	0.6	8	889	60	325	<10	0.084	111	0.044	18300
79	92RGC19-01	0.20	49	47.4	17	7.0	67	1090	0.6	4.0	0.6	0.6	13	750	60	415	25	0.168	129	0.052	28900
80	92RGC19-02	0.04	68	73.8	25	8.0	79	>10000	0.3	9.4	1.2	13.2	17	612	80	425	<10	0.093	144	0.122	22700
81	92RGC19-03	0.12	49	50.0	17	7.0	74	1015	0.3	2.8	<0.2	0.2	11	797	70	500	<20	0.091	116	0.052	22200
82	92RGC19-04	0.18	55	47.8	19	8.0	80	900	0.7	6.2	0.8	1.4	11	822	70	430	<20	0.338	121	0.035	21200
83	92RGC20-01	0.08	19	15.4	8	4.0	32	450	0.2	1.4	0.2	0.2	8	1221	40	240	<20	0.072	96	0.009	18200
84	92RGC20-02	0.10	22	21.2	10	3.5	34	505	0.4	1.4	0.4	0.2	7	1243	40	215	<50	0.074	94	0.022	15400
85	92RGC20-03	0.10	20	19.0	8	3.0	35	340	0.4	2.8	<0.2	0.2	6	1172	40	190	<10	0.130	93	<0.002	15600
86	92RGC21-01	0.14	25	20.2	8	5.0	39	405	0.3	1.8	<0.2	0.2	8	1236	40	275	<50	0.086	94	0.009	23300
87	92RGC21-02	0.06	30	36.6	16	4.5	41	2230	0.1	5.0	<0.2	0.6	13	951	50	325	<10	0.119	126	0.070	22900
88	92RGC21-03	0.10	29	23.0	9	3.5	44	445	0.3	1.2	<0.2	0.2	8	1410	40	340	<20	0.124	96	0.013	22200
89	92RGC21-04	0.14	34	21.2	9	4.5	44	375	0.3	2.4	<0.2	0.2	7	1368	40	280	<5	0.143	97	<0.002	16200
90	92RGC22-01	0.18	53	51.4	19	6.5	76	1670	0.4	8.0	0.2	0.4	15	715	60	455	160	0.114	132	0.070	30100
91	92RGC22-02	0.08	67	57.4	25	8.5	82	9400	0.1	10.4	0.6	2.8	17	572	60	445	<5	0.118	149	0.113	27100
92	92RGC22-03	0.08	60	47.6	21	8.0	77	1460	0.3	4.8	0.2	0.2	17	583	60	420	<20	0.108	140	0.078	25200
93	92RGC22-04	0.06	22	72.0	27	2.0	37	1755	0.1	3.2	0.2	0.4	17	579	40	270	<10	0.155	165	0.148	9800
94	92RGC23-01	0.18	53	52.6	18	7.0	75	1765	0.3	4.6	0.4	0.6	10	783	40	515	<50	0.114	125	0.061	29600
95	92RGC23-02	0.06	66	55.4	25	7.0	73	>10000	0.1	10.0	0.8	4.0	14	640	90	485	<20	0.109	147	0.105	23100
96	92RGC23-03	0.12	61	54.2	18	7.5	78	1515	0.2	7.0	0.2	0.2	12	693	90	510	<10	0.103	128	0.061	23700
97	92RGC23-04	0.24	70	57.8	20	9.5	116	1290	0.9	4.4	1.2	1.6	11	833	90	480	<10	0.422	134	0.035	21000
98	92RGC24-01	0.12	40	39.0	16	5.5	55	1890	0.3	3.8	<0.2	0.8	10	902	70	380	<50	0.104	123	0.052	25800
99	92RGC24-02	0.16	38	31.0	13	6.0	56	675	0.4	2.4	<0.2	0.2	9	977	70	360	<20	0.115	105	0.031	25400
100	92RGC24-03	0.04	41	59.8	22	5.0	56	3795	0.1	5.4	<0.2	2.2	15	705	60	350	<10	0.089	252	0.105	19700

not/ss: not sufficient sample

No.	Sample No.	Ag ppm	Ni ppm	Cu ppm	Co ppm	Pb ppm	Zn ppm	Mn ppm	Cd ppm	As ppm	Sb ppm	Mo ppm	Ca ppm	Sr ppm	Hg ppb	Ba ppm	Au ppb	S %	T-R2O3ppm	P %	Cl ppm
101	92RGC24-04	0.14	37	28.6	11	6.5	51	705	0.1	6.6	0.4	0.2	11	739	60	445	<20	0.096	128	0.048	20100
102	92RGC24-05	0.14	36	33.2	11	6.0	55	600	0.2	1.6	0.2	0.2	8	1037	60	410	<5	0.083	106	0.035	19900
103	92RGC24-06	0.12	43	31.6	11	6.5	61	545	0.4	2.4	1.2	0.6	8	1044	50	350	<10	0.265	110	0.009	18700
104	92RGC25-01	0.10	33	30.4	11	6.0	48	1345	0.2	4.8	0.4	0.6	9	1810	50	320	<50	0.142	109	0.048	28200
105	92RGC25-02	0.06	32	52.6	18	4.5	47	3295	0.1	6.6	0.4	1.0	12	1521	40	290	<50	0.107	126	0.087	20400
106	92RGC25-03	0.22	34	25.4	8	4.5	45	715	0.2	3.0	0.2	0.2	8	1978	40	330	<50	0.107	110	0.035	23800
107	92RGC25-04	0.14	31	22.0	7	5.0	47	625	0.2	0.8	<0.2	0.2	10	1666	40	335	<50	0.103	123	0.035	22900
108	92RGC25-05	0.08	39	22.8	10	4.5	52	730	0.3	7.2	<0.2	0.6	9	1679	40	245	<20	0.332	105	0.035	19000
109	92RGC26-01	0.14	35	33.4	14	6.0	52	905	0.4	4.6	0.2	0.6	11	1090	40	330	<50	0.216	115	0.035	24100
110	92RGC26-02	0.06	54	48.8	19	7.0	61	7550	0.2	10.4	0.4	4.0	13	950	40	410	<50	0.100	125	0.087	23700
111	92RGC26-03	0.12	33	32.0	13	7.0	57	945	0.1	13.2	<0.2	0.4	8	942	40	415	not/ss	0.093	137	0.061	23400
112	92RGC26-04	0.20	37	27.6	9	6.5	55	915	0.1	9.6	<0.2	0.4	11	853	40	455	<50	0.078	138	0.057	20300
113	92RGC26-05	0.12	31	25.4	8	5.5	47	660	0.3	1.6	0.6	0.2	9	1021	40	440	<20	0.080	129	0.035	20600
114	92RGC26-06	0.22	39	28.8	11	5.5	58	725	0.7	2.4	0.2	0.4	9	1186	40	305	<20	0.106	111	0.035	23600
115	92RGC26-07	0.10	26	48.2	16	4.5	44	1635	0.4	4.2	<0.2	0.4	13	926	40	300	<5	0.189	130	0.074	16200
116	92RGC27-01	0.08	16	13.6	7	4.5	27	370	0.1	3.6	<0.2	0.2	4	1285	40	130	<10	0.072	82	<0.002	20400
117	92RGC27-02	0.16	16	11.4	6	4.0	24	195	0.1	1.2	<0.2	0.2	2	1366	40	120	<10	0.077	188	<0.002	19100
118	92HPG01	<0.02	2	10.0	<1	7.5	34	630	<0.1	104.0	1.4	79.4	6	303	20	95	<10	0.687	240	0.602	23800
119	92BGC01-1	0.18	19	24.2	12	5.5	41	720	0.3	4.0	0.4	0.2	7	997	80	240	<5	0.125	101	0.013	22600
120	92BGC01-2	0.04	23	35.8	16	4.5	42	3160	0.1	9.6	0.2	1.2	9	868	80	310	<5	0.095	114	0.070	16900
121	92BGC01-3	0.08	19	18.6	8	5.0	42	765	<0.1	19.0	0.2	0.4	9	809	70	305	<5	0.088	111	0.048	18100
122	92BGC01-4	0.08	15	20.2	10	4.0	43	740	0.2	7.6	0.4	0.2	10	845	70	300	<5	0.090	114	0.048	17600
123	92BGC01-5	0.04	15	37.8	16	3.5	37	730	0.3	3.6	0.2	<0.2	10	910	50	300	<5	0.099	142	0.035	19500
124	92BGC02-1	0.04	23	25.2	13	6.0	49	1700	0.1	12.2	0.4	0.4	7	1045	70	315	<5	1.150	130	0.035	20900
125	92BGC02-2	0.10	18	29.2	10	4.5	46	420	0.5	8.4	0.4	0.4	6	1165	70	255	<5	0.090	120	0.004	19400
126	92BGC02-3	0.54	23	21.8	11	4.5	47	340	0.1	3.2	0.4	0.4	5	1115	60	195	<5	0.092	117	<0.002	20100
127	92BGC02-4	0.12	20	19.0	13	4.5	46	580	0.1	15.8	0.6	1.4	6	1920	60	155	<5	0.072	99	0.022	20100
128	92BGC03-1	<0.02	38	15.2	15	5.5	59	9570	0.1	82.0	0.4	2.6	10	730	70	395	<5	0.086	106	0.105	28700
129	92BGC03-2	0.06	43	56.8	21	8.5	72	>10000	0.3	23.8	1.4	8.2	11	808	70	405	<5	0.094	118	0.157	not/ss
130	92BGC03-4	0.08	4	15.8	<1	3.5	28	365	<0.1	7.4	0.2	0.2	3	127	50	90	<5	0.052	109	0.070	13500
131	92BGC03-5	0.06	36	67.6	14	6.5	62	915	0.2	11.8	0.2	1.8	14	1070	40	170	<5	0.565	124	0.065	23100
132	92BGC04-1	0.06	31	51.8	18	9.0	64	3910	0.1	21.6	0.2	1.0	12	746	80	400	<5	0.089	117	0.135	28700
133	92BGC04-2	0.12	25	33.8	10	13.0	62	1045	0.1	28.0	0.4	0.6	10	706	80	395	<5	0.086	125	0.100	21900
134	92BGC04-3	0.06	20	26.4	9	7.0	48	965	<0.1	18.4	0.2	0.2	10	652	70	325	<5	0.067	105	0.083	19500
135	92BGC05-1	0.06	28	54.8	21	7.0	57	4630	0.1	15.0	<0.2	1.2	12	756	80	360	<5	0.096	128	0.135	22200
136	92BGC05-2	0.12	22	30.2	11	7.5	50	1035	<0.1	24.6	0.2	0.4	11	658	70	355	<5	0.070	120	0.122	22700
137	92BGC05-3	<0.02	27	29.6	13	6.5	56	1115	<0.1	53.0	0.2	0.4	10	788	50	330	<5	0.075	118	0.157	21500
138	92BGC05-4	0.10	24	37.0	14	11.5	65	2740	0.2	21.4	0.8	3.4	8	838	60	295	<5	0.083	115	0.140	19300
139	92BGC05-5	<0.02	24	30.4	15	6.0	54	4430	0.1	26.0	0.2	2.8	7	989	60	325	<5	0.092	114	0.074	23300
140	92BGC05-6	<0.02	27	45.0	19	7.0	52	3070	0.1	14.6	<0.2	1.6	9	907	60	310	<5	0.083	112	0.057	21000
141	92BGC07-1	0.04	21	51.2	23	5.0	44	2140	<0.1	11.0	<0.2	0.6	14	665	60	275	<5	0.075	150	0.118	16500
142	92BGC07-2	0.02	22	34.6	13	9.0	53	2200	0.1	15.2	<0.2	0.6	10	770	60	390	<5	0.107	136	0.087	20100
143	92BGC08	0.04	28	47.6	14	11.5	65	3090	0.1	17.6	0.2	1.0	12	690	90	380	not/ss	0.113	139	0.113	24700
144	92BGC09-1	0.08	24	36.6	12	13.0	65	1070	<0.1	17.4	0.2	0.6	11	620	80	395	<5	0.125	142	0.083	27200
145	92BGC09-2	0.14	22	30.0	9	11.0	61	800	<0.1	35.2	0.2	0.4	9	596	90	315	<5	0.088	122	0.196	19100
146	92BGC14-1	0.02	25	50.4	19	7.0	55	4110	0.1	13.6	0.2	1.8	12	723	80	360	<5	0.116	130	0.100	21800
147	92BGC14-2	0.08	23	36.2	15	7.5	45	1625	0.1	16.8	0.4	0.4	11	701	70	375	<5	0.084	137	0.105	21500
148	92BGC15-1	0.04	31	50.8	18	7.5	52	4080	0.1	14.0	0.2	1.4	12	714	80	390	<5	0.105	139	0.096	22100
149	92BGC15-2	0.12	26	29.0	11	8.5	49	925	0.1	25.8	0.2	0.4	11	676	80	340	<5	0.071	126	0.074	20200
150	92BGC15-3	0.10	20	21.4	8	6.0	41	795	0.1	6.6	0.2	0.2	11	604	80	335	<5	0.071	133	0.048	18500

not/ss: not sufficient sample

No.	Sample No.	Ag ppm	Ni ppm	Cu ppm	Co ppm	Pb ppm	Zn ppm	Mn ppm	Cd ppm	As ppm	Sb ppm	Mo ppm	Ga ppm	Sr ppm	Hg ppb	Ba ppm	Au ppb	S %	T-R2O3ppm	P %	Cl ppm
151	92BGC15-4	0.02	4	9.0	2	1.0	13	615	<0.1	2.6	<0.2	<0.2	12	195	50	180	<5	0.039	115	0.057	11000
152	92BGC15-5	0.08	19	43.2	12	6.0	53	915	0.2	5.2	0.2	0.2	10	879	70	340	not/ss	0.083	122	0.061	18800
153	92BGC16-1	0.04	28	46.0	15	7.5	50	2580	0.1	12.0	<0.2	0.8	11	675	80	335	<5	0.097	131	0.083	23300
154	92BGC16-3	0.20	22	29.4	11	5.0	45	445	0.1	2.0	<0.2	<0.2	7	1045	60	4220	<5	0.073	114	<0.002	19400
155	92BGC16-4	0.04	34	26.8	10	9.0	69	445	0.3	2.2	0.2	<0.2	7	948	60	305	<5	0.083	118	<0.002	20200
156	92BGC17-1	0.04	20	20.4	22	2.5	28	1050	<0.1	1.6	<0.2	<0.2	15	441	40	205	<5	0.032	161	0.070	9300
157	92BGC17-2	0.02	25	26.6	21	3.0	29	1520	<0.1	4.2	<0.2	0.2	14	499	40	240	<5	0.046	172	0.070	12500
158	92BGC17-3	0.04	25	19.0	23	1.0	22	1000	<0.1	1.8	<0.2	0.2	17	342	40	185	<5	0.042	166	0.078	10900
159	92BGC18-1	0.14	24	40.6	9	6.0	50	720	0.3	3.2	0.4	0.2	8	753	90	355	not/ss	0.081	107	0.017	25300
160	92BGC18-2	0.04	29	40.4	17	7.5	51	2940	0.1	9.4	<0.2	0.6	11	648	110	395	<5	0.078	135	0.065	20100
161	92BGC18-3	0.12	26	36.2	11	7.5	55	680	0.1	11.6	<0.2	0.4	10	667	80	370	<5	0.148	127	0.035	22500
162	92BGC18-4	0.10	27	39.6	11	6.5	57	595	0.2	2.4	0.2	<0.2	8	931	80	465	<5	0.074	112	<0.002	21200
163	92BGC19-1	0.12	43	60.0	16	10.0	76	3640	0.3	14.2	0.2	0.8	10	734	90	495	not/ss	0.080	122	0.057	27700
164	92BGC19-2	0.04	53	76.6	24	8.5	81	>10000	0.2	11.8	0.8	4.0	13	564	90	440	<5	0.114	178	0.105	24900
165	92BGC19-3	0.26	47	62.4	15	9.5	87	2820	0.3	14.0	0.4	0.6	11	609	100	455	<5	0.083	138	0.074	21300
166	92BGC20-1	0.02	34	90.6	26	5.5	68	6090	0.2	7.2	0.2	4.8	15	552	100	325	<5	0.095	184	0.126	18200
167	92BGC20-2	0.06	55	61.4	23	10.0	85	8550	0.2	12.6	0.6	2.4	12	628	110	485	<5	0.084	149	0.092	24400
168	92BGC20-3	0.08	38	42.8	13	7.0	69	1630	0.1	17.4	<0.2	0.4	11	554	90	395	<5	0.068	131	0.074	20900
169	92BGC20-4	0.16	31	70.6	17	5.5	68	1955	0.2	5.4	0.2	0.2	12	648	90	390	<5	0.070	131	0.070	17800
170	92BGC21-1	0.04	40	73.2	23	7.5	72	6620	0.2	9.0	0.2	4.6	13	593	100	380	<5	0.115	141	0.113	25800
171	92BGC21-2	0.04	14	25.8	7	3.5	33	940	<0.1	8.0	<0.2	0.2	12	354	80	285	<5	0.059	118	0.065	15400
172	92BGC21-3	0.06	30	51.8	17	5.5	69	1230	0.1	12.8	<0.2	0.4	11	703	80	435	5	0.088	131	0.074	21300
173	92BGC22-1	0.02	35	78.8	25	5.0	64	5450	0.2	6.6	<0.2	3.6	15	576	80	345	<5	0.093	184	0.118	19700
174	92BGC22-2	0.02	26	40.8	20	0.5	61	1100	<0.1	4.2	<0.2	0.4	19	350	50	140	<5	0.084	165	0.100	8400
175	92BGC22-3	0.18	30	43.4	11	6.0	65	1370	0.1	10.4	<0.2	0.4	11	504	90	375	<5	0.062	130	0.061	21100
176	92BGC22-4	0.02	23	45.2	17	5.0	55	1320	0.1	8.2	<0.2	0.2	13	621	80	385	<5	0.068	138	0.087	18500
177	92BGC24-1	0.02	36	50.0	18	8.0	64	3400	0.1	9.4	<0.2	1.2	10	698	100	380	<5	0.098	125	0.057	28700
178	92BGC25-1	0.06	32	49.2	15	10.0	64	2030	0.1	6.2	0.4	0.6	10	670	100	410	<5	0.068	121	0.052	25900
179	92BGC25-2	0.02	26	86.8	24	3.5	53	5110	0.1	5.4	<0.2	3.0	16	538	100	290	<5	0.050	156	0.122	18000
180	92BGC25-3	0.08	22	29.4	8	4.5	37	1105	<0.1	8.8	<0.2	0.4	11	403	90	320	<5	0.042	125	0.070	18800
181	92BGC26-1	0.06	35	68.0	32	4.0	58	5630	0.2	6.4	<0.2	3.6	17	522	70	265	5	0.074	149	0.118	15000
182	92BGC27-1	0.02	44	68.6	25	6.0	67	9180	0.2	10.6	0.6	4.4	13	556	90	405	<5	0.096	133	0.109	23200
183	92BGC27-2	0.08	35	50.8	17	9.0	70	2140	0.1	18.4	0.2	0.8	11	577	90	425	<5	0.063	129	0.078	29100
184	92BGC27-3	0.10	26	73.4	20	4.0	59	1405	0.2	6.8	0.2	0.4	13	589	80	340	<5	0.075	136	0.092	18400
185	92BGC27-4	0.04	30	56.6	18	6.5	79	1590	0.1	22.2	0.2	0.8	11	715	100	465	<5	0.090	138	0.096	23900
186	92BGC28-1	0.02	28	105.0	27	5.0	68	7360	0.2	7.8	0.2	6.4	15	541	100	330	<5	0.057	136	0.126	22100
187	92BGC28-2	0.08	25	95.6	24	4.5	52	2700	0.1	7.0	<0.2	0.4	15	541	90	295	<5	0.134	146	0.122	19600
188	92BGC28-3	0.08	49	58.8	23	7.5	81	7280	0.2	14.8	0.4	1.4	12	586	100	500	10	0.111	142	0.096	26600
189	92BGC29-1	0.06	37	49.4	18	16.0	70	4200	0.1	15.8	<0.2	0.8	11	621	100	480	5	0.112	128	0.074	28900
190	92BGC29-2	0.08	21	28.4	10	6.5	50	1720	<0.1	15.6	<0.2	0.4	12	445	90	360	<5	0.064	126	0.057	18700
191	92BGC29-3	0.10	22	61.8	19	5.0	55	1435	0.2	10.8	<0.2	0.2	14	625	80	360	<5	0.080	137	0.096	16300
192	92BGC29-4	0.08	34	57.8	19	7.0	77	1380	0.1	21.0	0.4	0.4	11	779	90	520	<5	0.109	121	0.065	25900
193	92BGC30-1	0.04	19	74.2	25	4.0	46	2390	0.1	5.0	<0.2	0.8	14	596	90	300	<5	0.073	145	0.122	18800
194	92BGC30-2	0.04	14	27.4	9	4.5	38	1525	<0.1	6.2	<0.2	0.4	12	457	80	335	<5	0.066	121	0.070	16300
195	92BGC30-3	<0.02	17	55.6	18	5.0	50	2020	0.1	6.0	<0.2	0.6	13	656	70	350	<5	0.080	227	0.100	16100
196	92BOG11	0.02	7	22.0	23	10.0	54	1785	<0.1	4.2	<0.2	1.0	22	377	50	220	<5	0.104	366	0.375	10200
197	92BOG13-1	0.04	20	49.0	19	6.0	48	2760	0.1	11.0	<0.2	1.0	12	691	80	325	<5	0.097	135	0.100	21500
198	92BOG13-2	0.04	17	36.0	13	5.0	47	1615	0.1	11.6	<0.2	0.4	12	663	80	330	<5	0.088	145	0.087	20000
199	92BPG12-1	0.06	15	37.2	15	6.0	42	1610	0.1	9.4	<0.2	0.4	11	698	60	295	<5	0.089	136	0.096	25500
200	92BPG12-2	<0.02	17	21.8	11	5.5	37	1510	0.1	7.2	<0.2	0.4	11	659	60	295	<5	0.095	130	0.070	19700

not/ss: not sufficient sample

No.	Sample No.	Ag ppm	Ni ppm	Cu ppm	Co ppm	Pb ppm	Zn ppm	Mn ppm	Cd ppm	As ppm	Sb ppm	Mo ppm	Ga ppm	Sr ppm	Hg ppb	Ba ppm	Au ppb	S %	T-R2O3ppm	P %	Cl ppm
201	92HOG11	0.02	11	16.8	10	8.5	27	2580	0.1	15.4	<0.2	4.0	19	445	50	245	<5	0.078	444	0.135	16200
202	92HOG12	<0.02	20	18.0	12	4.0	34	2620	0.1	14.4	0.2	5.0	19	471	90	235	<5	0.081	365	0.118	17700
203	92HOG16	0.04	27	63.4	37	6.0	68	>10000	<0.1	33.8	1.4	8.4	13	486	100	400	<5	0.110	140	0.283	29500
204	92HOG20	0.06	18	44.6	26	5.0	43	5420	0.1	9.8	0.2	7.8	12	701	70	270	<5	0.086	128	0.105	not/ss
205	92HOG22	0.04	12	56.6	20	5.0	45	1745	0.1	8.0	<0.2	0.6	13	737	60	270	<5	0.097	130	0.113	not/ss
206	92HOG24	0.02	27	74.0	23	5.0	60	2760	0.1	6.2	<0.2	1.8	15	551	80	305	<5	0.070	142	0.126	not/ss
207	92HPG07-1	<0.02	<1	4.6	<1	0.5	8	225	<0.1	38.2	0.2	51.6	2	123	20	50	not/ss	0.214	168	0.244	not/ss
208	92HPG10-1	<0.02	13	13.0	8	4.5	26	1130	0.1	11.2	<0.2	1.8	16	572	30	215	<5	0.088	318	0.070	not/ss
209	92HPG13	<0.02	1	5.4	8	127.5	36	3980	<0.1	30.4	<0.2	20.2	23	198	10	235	<5	0.095	551	0.331	not/ss
210	92HPG15-1	<0.02	6	23.2	8	4.5	27	530	<0.1	16.6	<0.2	1.8	8	96	30	110	<5	0.085	88	0.118	not/ss
211	92HPG15-2	0.02	13	32.4	10	5.0	46	590	<0.1	2.2	<0.2	0.4	11	445	30	340	<5	0.101	167	0.078	not/ss
212	92HPG15-3	<0.02	12	31.6	17	5.5	32	3730	<0.1	97.8	0.6	5.0	7	348	50	340	<5	0.120	119	0.807	not/ss
213	92HPG25	0.02	22	28.8	8	5.0	47	3400	<0.1	11.8	0.2	0.8	12	400	60	325	<5	0.067	135	0.083	not/ss
214	92RGC28-1	0.08	87	61.4	23	13.0	100	1100	0.1	10.6	<0.2	1.0	20	137	70	230	<5	0.128	201	0.140	not/ss
215	92RGC28-2	0.08	89	64.4	24	12.0	103	2420	0.1	13.6	<0.2	3.4	20	138	70	225	<5	0.120	203	0.144	not/ss
216	92RGC29-1	0.18	27	47.0	13	5.5	59	665	0.6	7.0	<0.2	0.4	9	774	70	405	<5	0.074	115	0.035	not/ss
217	92RGC29-2	0.06	23	41.0	14	5.5	55	570	0.1	2.0	<0.2	0.2	8	852	80	425	<5	0.062	105	0.017	not/ss
218	92RGC30-1	0.14	35	50.4	18	5.0	61	845	0.2	1.6	<0.2	0.2	12	667	50	335	<5	0.089	125	0.065	not/ss
219	92RGC30-2	0.06	19	91.0	30	2.0	44	1860	0.1	1.6	<0.2	0.4	16	576	60	260	<5	0.072	162	0.153	not/ss
220	92RGC30-3	0.06	57	51.2	26	7.0	72	3250	0.1	8.8	<0.2	0.8	13	544	80	400	<5	0.099	138	0.100	not/ss
221	92RGC30-4	0.12	43	42.2	20	5.5	65	1155	<0.1	8.2	<0.2	0.4	13	511	60	345	<5	0.087	139	0.096	not/ss
222	92RGC31-1	0.10	61	73.6	26	6.5	90	2450	0.2	4.0	0.2	0.4	15	470	80	335	10	0.100	151	0.100	not/ss
223	92RGC31-2	0.04	30	104.5	30	5.0	72	4240	0.1	5.0	<0.2	1.8	16	456	70	260	<5	0.060	160	0.148	not/ss
224	92RGC31-3	0.02	35	94.4	24	2.0	46	1990	<0.1	2.8	<0.2	0.2	17	625	40	270	<5	0.085	174	0.157	not/ss
225	92RGC31-4	0.04	68	56.8	28	6.5	85	5500	0.1	9.4	<0.2	0.8	16	310	60	320	<5	0.068	155	0.122	not/ss
226	92RGC31-5	0.06	30	88.4	26	4.0	55	1670	0.2	3.4	<0.2	0.2	16	513	50	280	<5	0.081	160	0.140	not/ss
227	92RGC32-1	0.08	78	78.6	30	10.0	93	1655	0.1	7.0	<0.2	1.4	19	224	60	230	<5	0.131	185	0.126	not/ss
228	92RGC32-2	0.08	94	72.8	28	11.0	108	905	0.1	6.8	<0.2	0.6	20	126	60	195	<5	0.118	189	0.118	not/ss
229	92RGC32-3	0.06	88	89.0	25	8.0	83	660	0.1	4.6	<0.2	0.6	17	154	60	230	<5	0.115	196	0.096	not/ss
230	92RGC33-1	0.16	50	50.4	19	6.0	76	1475	0.3	3.0	0.2	0.4	10	720	80	445	<5	0.076	135	0.052	not/ss
231	92RGC33-2	0.04	68	68.8	29	8.0	85	>10000	0.1	10.4	0.1	4.8	14	577	100	460	<5	0.085	141	0.113	not/ss
232	92RGC33-3	0.24	59	61.6	21	8.5	85	1135	0.2	8.0	0.2	0.2	13	642	100	470	<5	0.103	138	0.070	not/ss
233	92RGC34-1	0.10	73	75.6	28	7.5	91	1670	0.2	5.2	<0.2	0.6	17	311	60	260	<5	0.089	151	0.109	not/ss
234	92RGC34-2	0.04	49	96.6	28	6.5	87	4040	0.1	7.0	<0.2	2.8	17	376	80	270	<5	0.070	179	0.135	not/ss
235	92RGC34-3	<0.02	8	11.8	4	0.5	17	780	<0.1	0.4	<0.2	0.2	13	196	20	195	<5	0.035	117	0.065	not/ss
236	92RGC34-4	0.02	30	62.2	32	3.0	53	9510	<0.1	15.4	<0.2	3.6	18	522	30	270	<5	0.047	165	0.384	not/ss
237	92RGC35-1	0.08	64	69.0	28	5.5	80	1975	0.1	5.4	<0.2	0.4	17	334	50	230	<5	0.127	155	0.100	not/ss
238	92RGC35-2	0.06	56	91.6	30	6.5	88	2320	0.1	6.4	<0.2	1.0	18	388	80	260	<5	0.092	161	0.131	not/ss
239	92RGC35-3	0.04	25	116.0	23	2.0	52	1500	0.1	3.0	<0.2	0.2	18	560	50	250	<5	0.130	161	0.157	not/ss
240	92RGC35-4	0.06	61	69.8	27	6.5	82	1060	0.1	3.8	<0.2	0.4	19	279	50	215	<5	0.147	156	0.109	not/ss
241	92RGC36-1	0.08	86	62.4	25	11.5	96	840	<0.1	7.6	<0.2	0.8	22	123	60	195	<5	0.185	199	0.122	not/ss
242	92RGC36-3	0.02	92	27.2	19	6.5	76	455	<0.1	3.2	<0.2	<0.2	18	169	50	255	<5	0.060	194	0.087	not/ss
243	92RGC37-1	0.08	82	78.8	27	9.5	104	1000	0.1	5.0	<0.2	0.6	20	159	80	190	<5	0.137	189	0.113	not/ss
244	92RGC37-2	0.04	75	56.8	26	6.5	86	875	0.1	4.2	<0.2	0.4	18	213	40	180	<5	0.092	202	0.105	not/ss
245	92RGC38-1	0.06	87	68.6	24	11.5	102	950	0.1	7.8	<0.2	0.8	21	115	50	180	<5	0.147	213	0.122	not/ss
246	92RGC38-2	0.06	86	63.2	27	9.5	100	1015	<0.1	6.6	<0.2	0.6	21	136	50	190	<5	0.118	230	0.113	not/ss
247	92RGC39-1	0.14	50	58.4	19	6.5	82	1345	0.3	3.4	0.2	0.4	13	594	90	415	<5	0.120	133	0.083	not/ss
248	92RGC39-2	0.08	78	64.0	30	9.0	96	>10000	0.1	11.8	0.6	3.4	16	465	110	450	<5	0.131	154	0.118	not/ss
249	92RGC39-3	0.20	52	53.8	20	7.5	78	1330	0.1	9.0	0.2	0.2	16	436	80	380	15	0.101	153	0.105	not/ss
250	92RGC39-4	0.06	11	70.2	23	3.0	40	1485	0.1	3.0	<0.2	0.2	18	520	40	260	<5	0.093	178	0.161	not/ss

not/ss: not sufficient sample

Appendix 8. Weather and Sea-state Data

Monthly Frequency Distribution of Wind Velocity in 1992

(W.V : m/sec)

W.V / Month	CALM	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
August	3		9	14	19	38	59	70	63	27	26	8						336
%	0.89		2.68	4.17	5.65	11.31	17.56	20.83	18.75	8.04	7.74	2.38						100
September	20	1	28	83	76	83	85	64	69	52	23	9	3	2	1	1		600
%	3.33	0.17	4.67	13.83	12.67	13.83	14.17	10.67	11.50	8.67	3.83	1.50	0.50	0.33	0.17	0.17		100
October			1	15	19	21	33	26	10	11	7	1						144
%			0.69	10.42	13.19	14.58	29.92	18.06	6.94	7.64	4.86	0.69						100

Monthly Frequency Distribution of Wind Direction in 1992

W.D / Month	CALM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
August	3	15	7	16	11	19	16	74	113	29	5	2	3	3		13	7	336
%	0.89	4.46	2.08	4.76	3.27	5.65	4.76	22.02	33.63	8.63	1.49	0.60	0.89	0.89		3.87	2.08	100
September	20	11	13	8	9	53	88	203	94	42	17	20	8	3	4	1	6	600
%	3.33	1.83	2.17	1.33	1.50	8.83	14.67	33.83	15.67	7.00	2.83	3.33	1.33	0.50	0.67	0.17	1.00	100
October					7	17	33	41	36	9	1							144
%					4.86	11.81	22.92	28.47	25.00	6.25	0.69							100

Monthly Frequency Distribution of Weather in 1992

Weather / Month	Fine	Cloudy	Rain	Not Clear	Total	Light rain
August	10		2	2	14	3
%	71.43		14.29	14.29	100	21.43
September	18	4	2	1	25	6
%	72.00	16.00	8.00	4.00	100	24.00
October	6				6	2
%	100				100	33.33

Monthly Frequency Distribution of Atmospheric Pressure (daily average) in 1992

(A.P : mb)

A.P / Month	1001.0 ~ 1001.9	1004.0 ~ 1004.9	1005.0 ~ 1005.9	1006.0 ~ 1006.9	1007.0 ~ 1007.9	1008.0 ~ 1008.9	1009.0 ~ 1009.9	1010.0 ~ 1010.9	1011.0 ~ 1011.9	1012.0 ~ 1012.9	1013.0 ~ 1013.9	1014.0 ~ 1014.9	1018.0 ~ 1018.9	1030.0 ~ 1030.9	Total
August		1	3	9	17	50	77	99	41	37	1		1		336
%		0.30	0.89	2.68	5.06	14.88	22.92	29.46	12.20	11.01	0.30		0.30		100
September	2			10	44	82	121	149	109	65	14	3		1	600
%	0.33			1.67	7.33	13.67	20.17	24.33	18.17	10.83	2.33	0.50		0.17	100
October				3	5	31	44	36	25						144
%				2.08	3.47	21.53	30.56	25.00	17.36						100

Monthly Frequency Distribution of Swell Direction in 1992

S.D / Month	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Not Clear	Total
August							10	90	32	3					9		192	336
%							2.98	26.79	9.52	0.89					2.68		57.14	100
September	3			3		13	70	189		12							310	600
%	0.50			0.50		2.17	11.67	31.50		2.00							51.67	100
October							33	39									72	144
%							22.92	27.08									50.00	100

Monthly Frequency Distribution of Swell Cycle in 1992

(S.C : sec)

S.C / Month	1	2	3	4	5	6	7	8	9	10	Not Clear	Total
August				2	74	59	6	3			192	336
%				0.60	22.02	17.56	1.79	0.89			57.14	100
September			9	12	82	132	55				310	600
%			1.50	2.00	13.67	22.00	9.17				51.67	100
October					24	45	3				72	144
%					16.67	31.25	2.08				50.00	100

Monthly Frequency Distribution of Swell Height in 1992

(S.H : m)

S.H / Month	0	1	2	3	4	5	Not Clear	Total
August		82	62				192	336
%		24.40	18.45				57.14	100
September		212	69	9			310	600
%		35.33	11.50	1.50			51.67	100
October		60	12				72	144
%		41.67	8.33				50.00	100

Monthly Frequency Distribution of Degree of Cloudiness in 1992

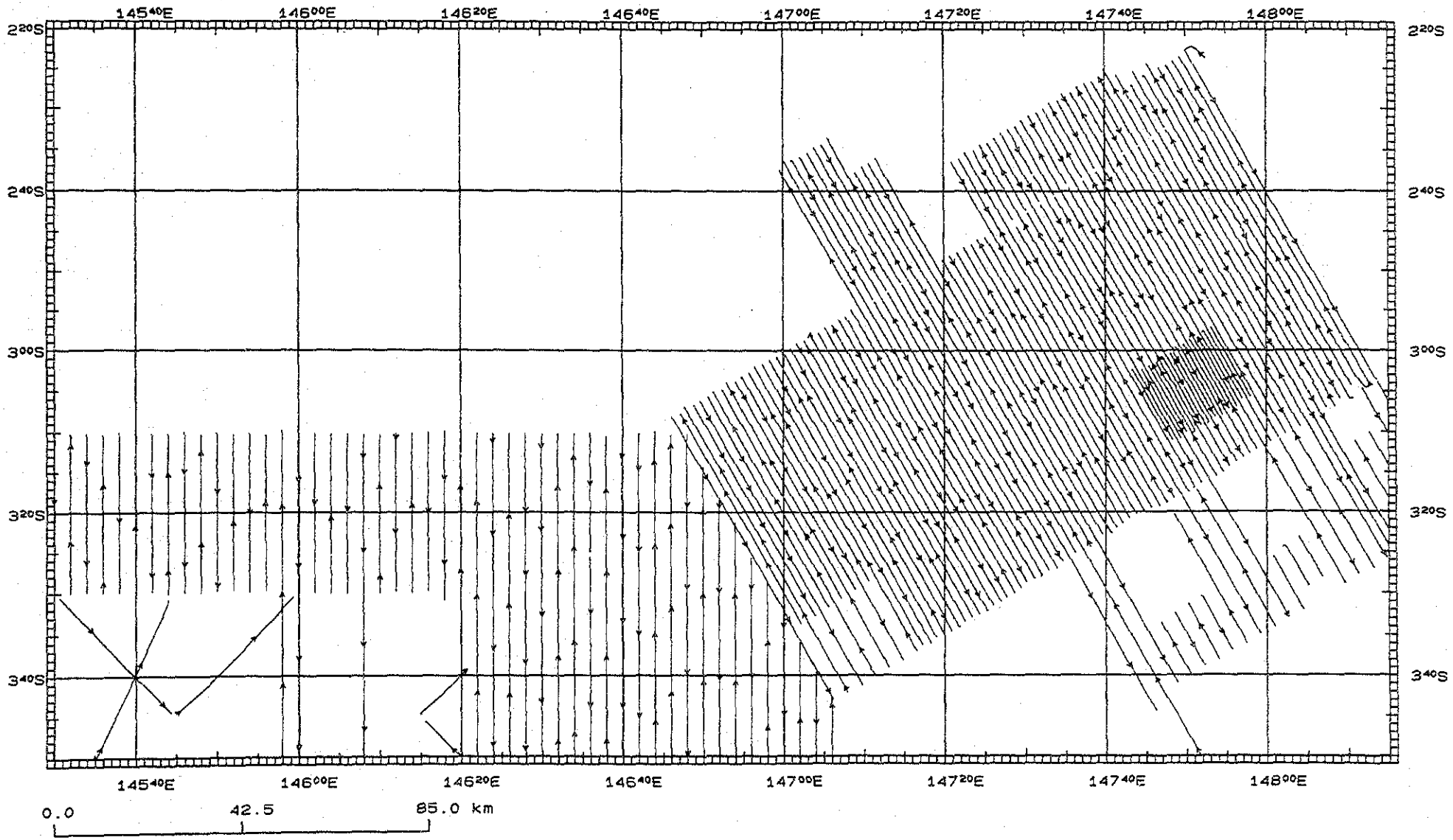
D.C / Month	0	1	2	3	4	5	6	7	8	9	Not Clear	Total
August				6	52	44	19	6	17		192	336
%				1.79	15.48	13.10	5.65	1.79	5.06		57.14	100
September				83	58	70	20	12	46	1	310	600
%				13.83	9.67	11.67	3.33	2.00	7.67	0.17	51.67	100
October				12	16	28	5	4	7		72	144
%				8.33	11.11	19.44	3.47	2.78	4.86		50.00	100

Appendix 9. Sound Velocity of Sea-water used for MBES

Water depth (m)	Sound velocity ($m \cdot s^{-1}$)
7.0	1,543.1
11.0	1,543.1
15.0	1,542.9
22.0	1,542.6
31.0	1,542.6
47.0	1,542.8
61.0	1,542.3
80.0	1,540.8
102.0	1,535.0
156.0	1,525.9
208.0	1,520.1
301.0	1,501.3
395.0	1,496.4
521.0	1,492.1
711.0	1,485.8
1,029.0	1,485.3
1,507.0	1,487.6
2,022.0	1,495.5
2,174.0	1,498.1
2,500.0	1,501.5

Measured value by CTD. Date (1992-08-18)
Station (lat. 2°30.120'S, long. 148°00.057'E)

(List of Annexed Figures)



Annexed Figure 1-1 MBES Track Line Map