III. GH74-2 CRUISE: MAY 10–29, 1974

III. 1 Outline of the Cruise

General features of the area surveyed

The area surveyed includes Sagami Bay and the adjacent sea and covers about 7,000 km^2 (Fig. 8). Sagami Bay is bordered by the Izu, the Miura and the Bōsō Peninsulas west-, north- and eastwards respectively and opens southward. The bay connects with Tokyo Bay through the Uraga Channel. Ōshima Island,

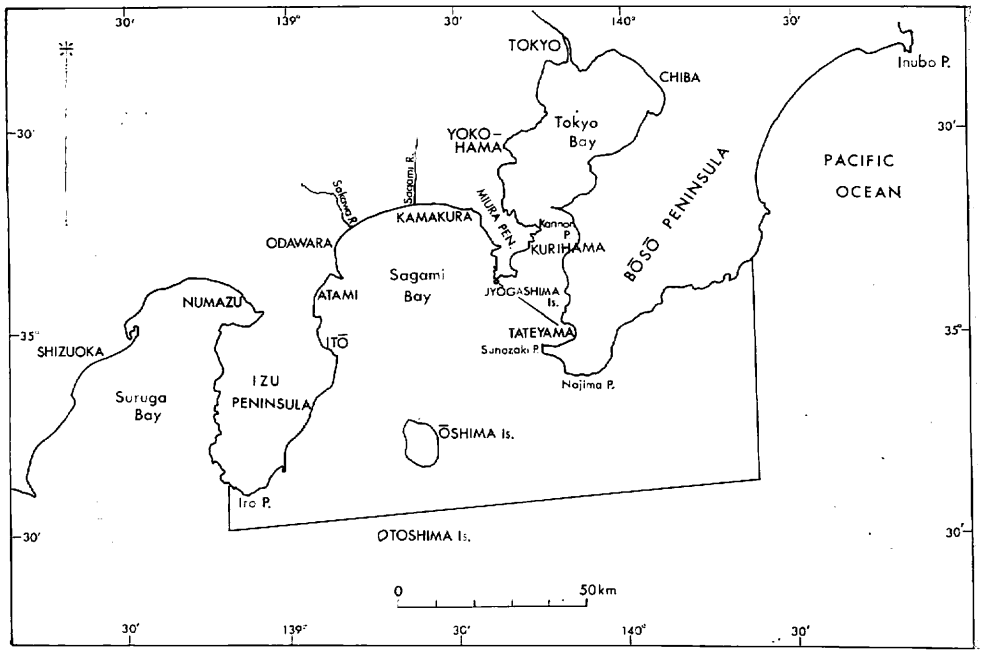

Fig. 8. Sagami-nada area surveyed in GH 74-2 cruise, May 1974.

composed of the Miharayama volcano is situated at the bay month.

There are few large rivers draining into the bay, only that of the Sagami River.

The surveyed area is strongly affected by the Kuroshio Current which flows from southwest to northeast across the vicinity of Ōshima Island with a current speed of 1–4 knots. The course of the current is somewhat sinous and changes seasonally. There is a counterclockwise current along the margin of the bay.

Most of the area surveyed has a depth of greater than 200 m and maximum depth of about 1,500 m. Sagami Bay is one of the deepest bays in Japan along with Suruga and Toyama Bays (Akio MOGI, 1973).

The topography of the area surveyed is variable as shown in Figure 9. The area has a narrow continental shelf with steep slopes, some canyons and banks, and a large trough. The trough is called the 'Sagami Trough' and runs in a NW-SE direction across the center of the bay and changes to an E-W trend east of Ōshima Island.

Geologically the area is situated to the south of the Fossa Magna and is supposed to occupy the conjunctive area between the Phillipine Sea Plate and the Asian Plate (Masaaki KIMURA, 1973). Therefore, the area surveyed is one of the most active zones of the Japanese Islands and many great earthquakes, including that of the Great Kantō Earthquake in 1923, have occurred in Sagami Bay and its adjacent area. Dr. Masaaki KIMURA suggests that an active tectonic line running along the Sagami Trough is a transform fault with right-lateral displacement.

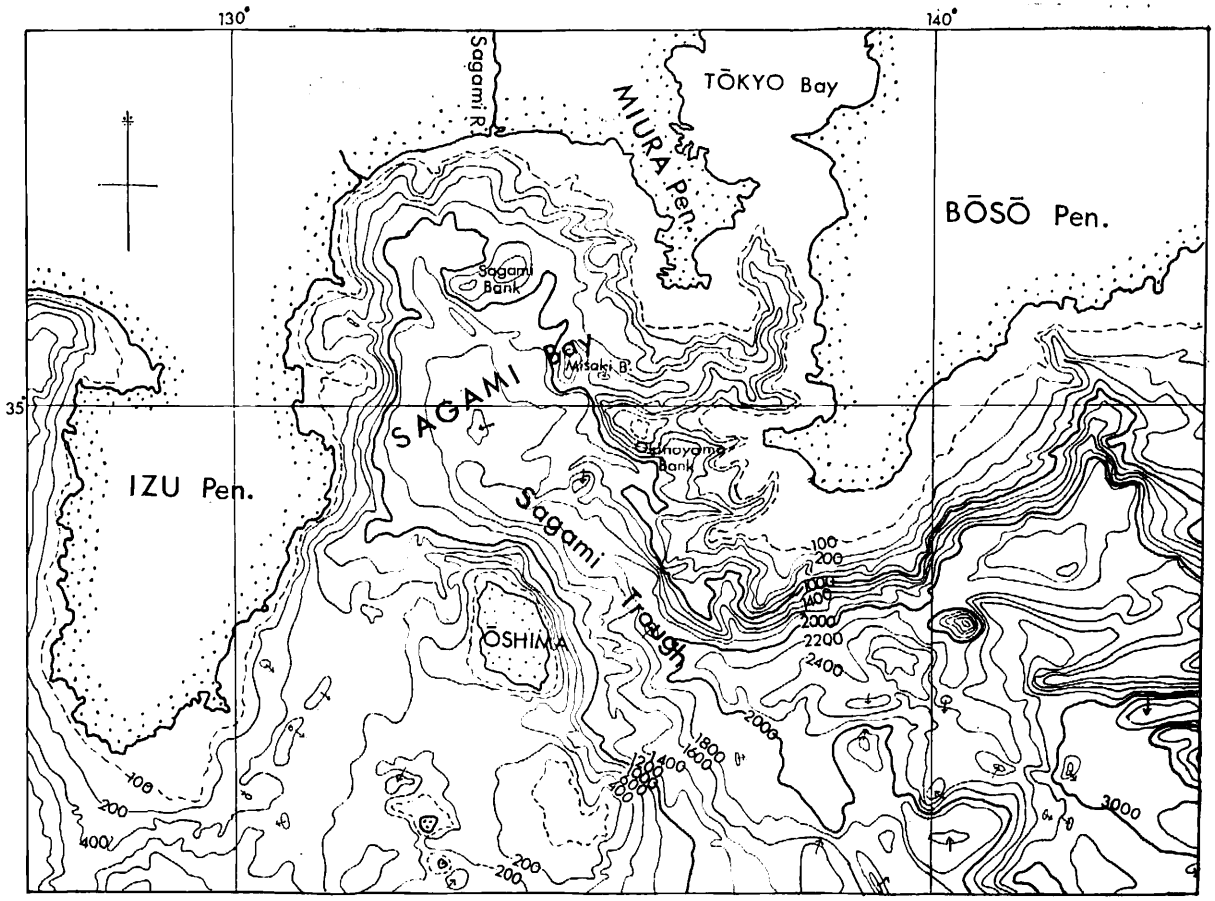

Fig. 9. Submarine topography of Sagami-nada area compiled from Depth Curve Chart of Offing of Ensyū Nada published by Maritime Safety Agency.

The Izu Peninsula is mostly composed of andesitic and basaltic lavas and associated pyroclastic and sedimentary rocks of the Neogene Green Tuff zone. In contrast to this the Miura and the Bōsō Peninsulas are composed of material of the Tuff Zone of Oligocene to Pleistocene age. As Sagami Bay is adjacent to both areas, the geological relationship between the Green Tuff and the non-Green Tuff Zones, which is covered by alluvial material on land, may be clarified by the study of the bay sediments.

Object and method

The initial object of the research cruise was to investigate the geological structure of the sea bed in Sagami Bay and its adjacent sea for the purpose of making geological and sedimentological maps to the scale 1: 200,000.

To obtain data on the geological structure a geophysical survey and sampling of rock and sediment were carried out. Usually the former work was done by night, while the latter was made in daytime. The geophysical survey was made by using the seismic reflection method by means of an air-gun, 30,000-joule sparker and a 3.5 kHz sub-bottom profiler, a gravity survey using an on-board gravity meter was also made. The air-gun was usually used in deep water, while the sparker was operated in shallow water. During the seismic reflection survey the ship's speed ranged between 8 and 10 knots. The sub-bottom profiler of 3.5 kHz and the gravity-meter were simultaneously operated during the seismic reflection survey. The tracks of the geophysical survey are shown in Figure 10. The complicated traverse lines were mainly due to the following;- the lines were closely spaced in the geologically important areas and were made further apart in areas where a lot of geological data had been obtained previously; surveys were repeated on the same courses to take better records; the survey's courses were flexibly decided everyday in consideration of the results of the preceding surveys.

Sampling was carried out at geologically important places based on the geophysical results. The sampling stations are shown in Figure 10. For sampling two cylinder-type dredges, a chain-bag, a Smith-McIntyre grab and a piston-corer were selectively used according to bottom conditions. For instance, the cylinder-type dredges and the chain-bag were used for sampling rocks from rocky bottoms. In dredging determination of a sampling position was made by the examination of seismic records obtained on previous days. The Smith-McIntyre grab was used to take soft sediments in four stations and the 6m piston-corer was operated on a deep and flat sea floor for taking samples of turbidite. During sampling bottom-touch and detachment of the samplers were recognized by careful observation of the tension-meter which was set in the winch control room.

Ship and personnel

The 'Hakurei-maru' was chartered from the Metal Mining Agency for use as the survey vessel. The ship was manned by Capt. S. Toki, 12 officers, 4 stewards and 12 crew.

The scientific personnel consisted of 3 geophysicists, 5 geologists, a geochemist a topographer of the G.S.J. and 2 technologists of N.R.I.P.R.; 6 students from

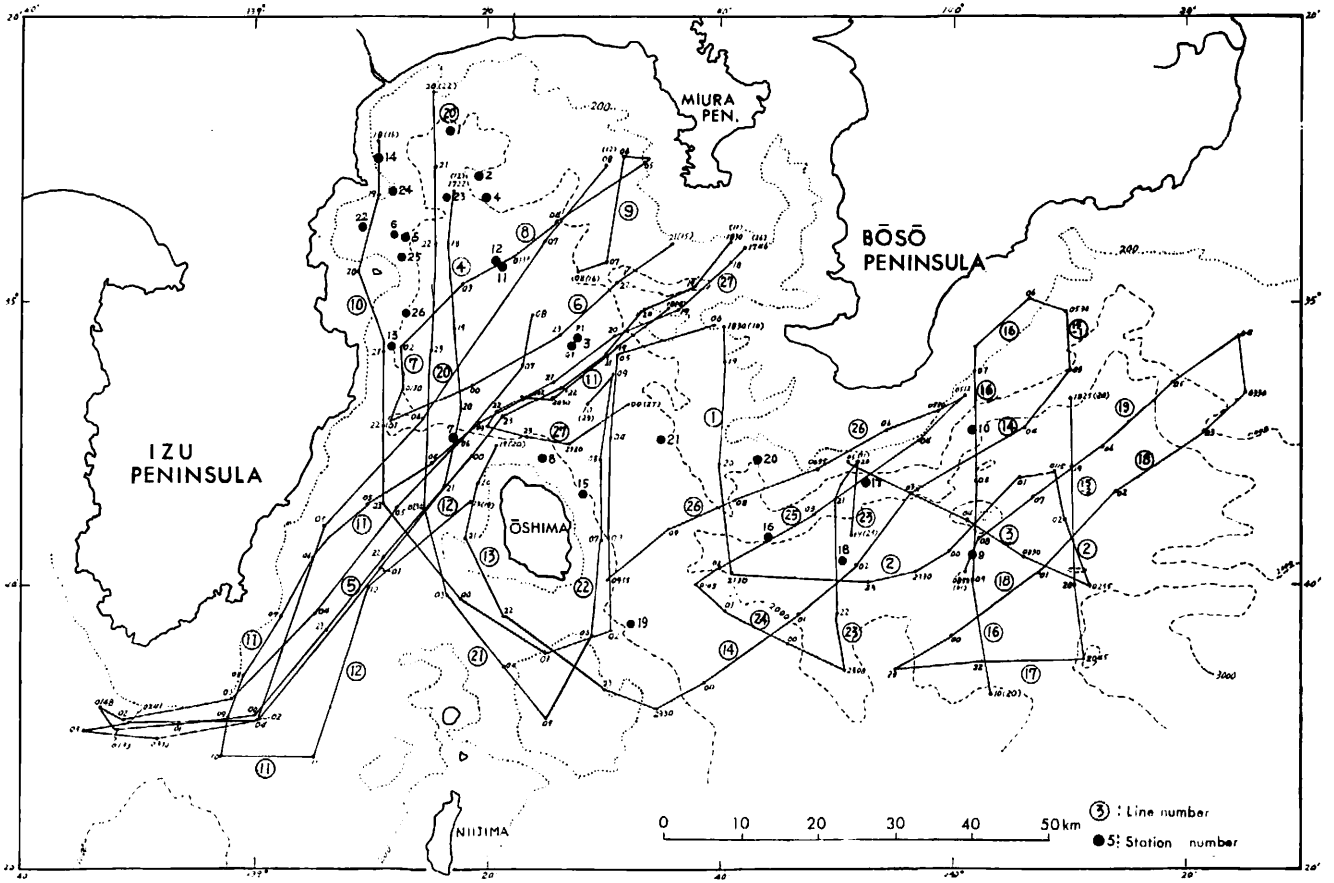

Fig. 10. Seismic traverses and sampling stations of GH 74-2 cruise in Sagami-nada area.

Table 4. Scientific staff in GH 74-2 cruise. N.R.I.P.R.: National Research Institute for Pollution and Resources.

Name	Organization	Speciality
Eiji INOUE	G. S. J.	Geologist, Chief scientist
Eiichi HONZA	G. S. J.	Geologist, Vice-chief sci.
Masaaki KIMURA	G. S. J.	Geologist
Kouji ONODERA	G. S. J.	Topographist
Toshio HIROSHIMA	G. S. J.	Geophysicist
Eiji MATSUMOTO	G. S. J.	Geochemist
Takemi ISHIHARA	G. S. J.	Geophysicist
Yoshihisa OKUDA	G. S. J.	Geologist
Makoto YUASA	G. S. J.	Petrologist
Fumitoshi MURAKAMI	G. S. J.	Geophysicist
Norio YAMAKADO	N.R.I.P.R.	Technologist
Keiji HANDA	N.R.I.P.R.	Technologist

various universities, 7 engineers from the makers of the geophysical equipment and 2 cameramen from T.V.F. as listed in Table 4. Eiji INOUE acted as party chief for the scientific group and Eiichi HONZA assisted the group as technical leader. Dr. Hiroshi ISOMI, director of the Marine Geology Department of the G.S.J., and Prof. Noriyuki NASU from the Institute of Oceanography of the University of Tokyo were on board for two days in order to examine the marine research work.

Position fixing and navigation

Satellite and Loran-C navigation systems were simulataneously used for the navigation and position fixing of all geophysical lines and sampling stations. The former was operated by the G.S.J. scientists at No. 5 laboratory and the latter was worked by the officers in the chart room behind the bridge. At 30 minute intervals fiducial marks were registered on all records and were plotted on VLC 30-7417 Loran-C charts.

For the satellite navigation a Navy Navigation Satellite System manufactured by The Magnavox Co. was used. A satellite position fix accuracy of 120 feet RNS was obtainable. Between the satellite fixes latitude and longitude were calculated by dead reckoning based on doppler sonar (or electromagnetic log) and gyrocompass inputs and the results were displayed on the CRT's and printed on the TTY. The system had two magnetic tape transports to log all navigational and geophysical data automatically, i.e. depth, magnetometer and gravity meter data. but there was some trouble with these tape transports and the data printed on the TTY were used in the post data processing. The doppler sonar was used as the speed measuring device throughout most of the cruise, but the speed inputs were not reliable when the water depth was greater than 500 m.

Programme of work

On the 10th May 1974 the Hakurei-maru sailed from Chiba to commence the

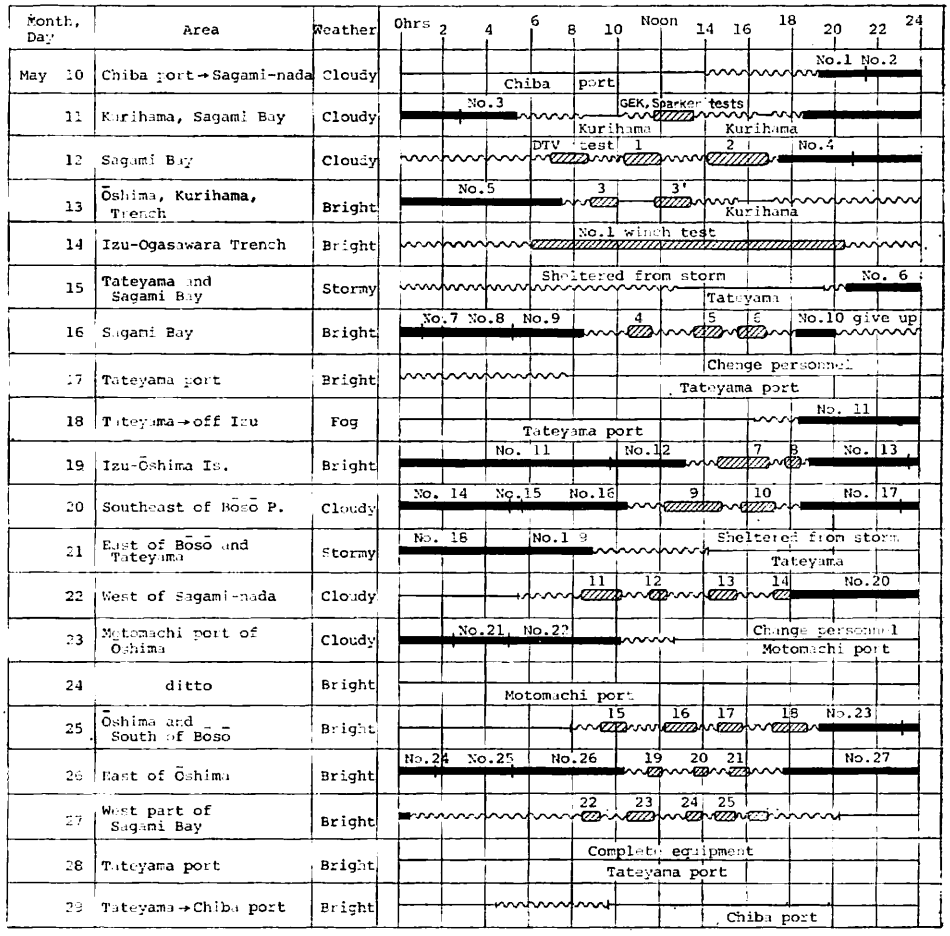

Fig. 11. Progress of GH 74-2 cruise, May 1974.

marine geological research programme. Mobilization of the equipment was completed at sea and the cruise ended in Chiba on May 29th. The Hakurei-maru touched at Kurihama on the twelfth, Tateyama on the 17th and Ōshima on the 24th for change of personnel, loading supplies and maintenance work. The programme of the work is shown in Figure 11.

The 20 days of the survey can be broken down as follows:-

i) Days sampling and traversing 14
ii) Days lost, or in harbour 6

The second item can be broken down as follows:-

a) Personnel changes and loading supplies ..... 3.5 days
b) Shelter from fog or bad weather ..... 2.5 days

Table 5. Seismic traverses carried out in

No. of Traverse	Start					Finish		
	Day	Time	Latitude N	Longitude E	Depth m	Day	Time	Latitude N
1	May 10	18:52	34°55.8′	139°40.2′	700	May 10	21:30	34°40.2′
2	10	21:30	34°40.9′	139°41.0′	2325	11	02:55	34°40.0′
3	11	02:55	34°40.0′	140°11.0′	2725	11	05:00	34°48.8′
4	12	18:30	35°01.0′	139°17.0′	780	12	20:48	34°48.1′
5	12	20:48	34°48.1′	139°17.1′	470	13	02:00	34°30.7′
6	15	20:40	35°05.2′	139°37.4′	280	16	01:00	34°51.6′
7	16	01:00	34°51.6′	139°11.6′	950	16	02:15	34°59.0′
8	16	02:15	34°59.0′	139°12.5′	760	16	05:15	35°10.0′
9	16	05:15	35°10.0′	139°34.0′	100	16	08:30	35°04.7′
10	16	18:00	35°11.4′	139°10.6′	530	16	23:00	34°45.9′
11	18	19:30	34°56.0′	139°29.3′	1280	19	09:45	34°29.2′
12	19	09:45	34°29.2′	138°54.7′	750	19	13:00	34°45.9′
13	19	18:40	34°48.8′	139°23.5′	420	19	23:30	34°31.6′
14	19	23:30	34°31.6′	139°34.4′	2360	20	05:00	34°55.2′
15-1	20	05:00	34°53.1′	140°09.9′	2135	20	05:30	34°59.5′
16	20	05:30	34°59.5′	140°09.7′	440	20	10:15	34°31.8′
15-2	20	18:25	34°53.3′	140°09.9′	2180	20	20:45	34°35.0′
17	20	20:45	34°35.0′	140°11.1′	2830	20	23:00	34°34.3′
18	20	23:00	34°34.3′	139°54.8′	2023	21	04:00	34°57.6′
19	21	04:00	34°57.6′	140°24.6′	375	21	09:00	34°40.4′
20	22	20:00	35°14.8′	139°15.2′	570	23	03:00	34°39.5′
21	23	03:00	34°39.5′	139°16.4′	562	23	05:00	34°30.8′
22	23	05:00	34°30.8′	139°24.9′	270	23	10:00	34°52.7′
23	25	19:30	34°46.6′	139°51.4′	1310	25	23:08	34°34.0′
24	25	23:08	34°34.6′	139°50.4′	2130	26	01:45	39°40.0′
25	26	01:45	39°40.0′	139°37.6′	1665	26	05:12	39°53.4′
26	26	05:12	39°53.4′	140°00.9′	330	26	10:00	34°40.5′
27	26	17:40	35°03.8′	139°42.1′	640	27	00:00	34°52.8′

Data obtained

P.D.R. and gravity-meter traverses	1,952.7	nautical miles
Seismic reflection traverses	684.4	〃 〃
Total sampling stations	26	
Dredge samples	17	stations
Smith-McIntyre samples	4	stations
Piston-corer samples	3	stations
No sample	2	stations

A total of 8 rock samples were obtained from rock exposures on sea bottom by dredging.

GH 74-2 cruise in Sagami-nada area.

Longitude E	Depth m	Speed of Ship Kt	Ext. of Trav. miles	Equipment					Remarks
				Airgun	Sparker	3.5 Kc	P.D.R.	Grav.	
139°41.0′	2,325	5–6	14.9	○		○	○	○	
140°11.6′	2,725	6	33.9	△		○	○	○	
140°50.7′	385	6–7	19.0	×		○	○	○	
139°17.1′	1,309	4–5	19.8	○		○	○	○	
138°48.8′	285	6–8	35.0	△		○	○	○	
139°11.6′	950	6–7	25.5	○		○	○	○	
139°12.5′	760	7	7.6	○		○	○	○	
139°34.0′	100	7–8	20.8	○		○	○	○	
139°23.6′	1,347	5–8	17.0	○		○	○	○	
139°11.2′	550	5–6	26.6		○	×	○	○	3.5 Kc recorder trouble
138°54.7′	750	4–7	46.2		○	○	△	○	
139°18.4′	530	4–6	28.5		○	○	○	○	
139°34.4′	2,360	6–7	25.5	○		○	○	○	
140°09.9′	2,135	6–7	38.4	○		○	○	○	
140°09.7′	440	6–7	4.3	○		○	○	○	
140°02.9′	1,950	7	32.5	○		○	○	○	
140°11.1′	2,830	7–8	18.5	○		○	○	○	
139°54.8′	2,023	7–8	13.6	○		○	○	○	
140°24.6′	375	7	36.1	○		○	○	○	
140°00.8′	2,395	4–6	26.3	○		○	○	○	
139°16.4′	562	4–7	35.6		○		○	○	
139°24.9′	270	6–7	11.2		△		○	○	
139°28.3′	1,695	4–7	28.7		○		○	○	
139°50.4′	2,130	5–6	17.7	○			○	○	
139°37.6′	1,665	5–8	15.2	○			○	○	
140°00.9′	330	6–7	23.7	○			○	○	
139°30.1′	710	5–8	29.0	○			○	○	
139°31.9′	925	5–8	33.3	○			○	○	total 684.4 miles

Notes on equipment and their operation

1) Geophysical equipment

NS–16 Precision Depth Recorder

The P.D.R. manufactured by the Nippon Electric Co. was used for deep sea bathymetry throughout the cruise. The transducer providing the sound source of 4 k watts at 12 kHz was installed in the sonar dome of the bow bottom. The receiver was equipped in No. 1 laboratory and two recorders were set in the laboratory and the winch control room separately.

Sanken 28.7–202 kHz Echo-sounder

The equipment was used in shallow sea only as a supplement of the P.D.R. When the bathymetric record of the P.D.R. was interfered with the operation of the bow-thruster the Echo-sounder gave clear records.

Lacoste and Romberg Air-Sea Gravity-Meter

Gravity measurement was made by the use of the Lacoste and Romberg Air-Sea Gravity Meter installed in No. 5 laboratory. The equipment consists of a highly damped, zero-length spring type gravity sensor mounted on a stabilized platform with associated control electronics and a recording system. The equipment has an accuracy within 1 milli-gal at horizontal and a vertical acceleration of 0.1 g. Gravity was successfully measured throughout the cruise.

Bolt Air-Gun

For the seismic reflection survey an 80 or 120 cubic inch air gun was used. The air-gun firing at 2,000 p.s.i.g., provided the sound source at 5–10 second interval. The air-compressor was installed in the stern deck. The signal received by a 15 element hydrophone array was amplified and band-pass filtered at 50–160Hz prior to display on the graphic recorder. A surveying speed of 10 knots was adopted. Sometimes the seismic surveys were interrupted by serious troubles of the air-compressor. The troubles occurred mainly in the unloading system so that the balance among the pressures of stages was broken and the values of the 3rd and the 4th stages were burned when the compressor was used for long time. It is considered that the troubles were mainly due to high temperature and humidity in the room.

NEC Sparker equipment

The equipment was mainly used for seismic reflection survey in shallow sea or as a substitution for the air-gun equipment when the latter was inoperable. The nominal 30,000-joule sparker manufactured by the Nippon Electric Co. consists of a receiver/recorder (100–600Hz filter, dry type 1,000 m range) and a transmitter (model NE 17M, with ignitrone). The sparker was operated usually with 6,000 or 10,000-joule pulses (8kv–10kv, 10MF×20) fired once each second. This apparatus were installed in No. 1 laboratory. The cables, with two electrodes and a hydrophone, were towed from starboard and port respectively and they were 80 m long. The ship's speed was between 5 and 8 knots throughout the surveys. These settings gave maximum definition in the upper 500 m of rock and sediments beneath the sea-bottom in a depth of water of 1,000 m.

3.5 kHz Sub-bottom Profiling equipment

For the survey of the thickness and the structure of superficial sediments the sub-bottom profiling equipment was operated. The equipment is composed of a transceiver, a correlation processor, a 3.5 kHz transducer, a graphic recorder and a digitizer. This apparatus was installed in No. 1 laboratory, except the transducer which was installed within the sonar dome of the bow bottom. The system was used throughout the cruise and provided clear records of the superficial sediment

structures.

2) Sampling equipment

Cylinder-type dredges

Two kinds of cylinder-type dredge were used to take rock fragments and coarse sediments. They are 30 cm and 18 cm in diameter, and 90 cm and 60 cm in length respectively. During dredging the small dredge was always used together with the large one; that is, the small was set behind the large with 10 m of wire rope. Dredging was carried out by No. 1 winch running over the gantry in the stern. The operations of the winch were made by the crew directly but the work was managed by a G.S.J. scientist. In order to succeed in sampling the rocks from rocky bottoms favourable sampling stations were carefully selected in consideration of the submarine topography, water depth, current and wind directions. Besides, the dredges were always towed from the lower to the upper parts of the slopes of the sea-bottom. Dredging time ranged from 10 to 42 minutes and the ship ran at 0.5 knots or drifted with the current (see Appendix 1).

The dredges were operated at 19 stations and succeeded in taking rock samples from 9 stations.

Chain-bag dredge

The chain-bag is a cylinder dredge with an iron net, 180 cm in length and 40 cm in diameter. The chain-bag was worked only at the first station to take rocks, but it was alternated with the cylinder-type dredges from the next stations because the operation of the chain-bag needed more experience.

Smith-McIntyre grab

For the sampling of soft sediments, the Smith-McIntyre grab was worked at 4 stations by No. 3 winch and gallows. The grab succeeded in taking undisturbed samples of sediment at all stations. Operation of the grab was easier than the other sampling equipment. The lowering speed of the wire rope was 0.5–0.8 m/sec near sea bottom (see Appendix 1). Although the grab was designed for continental shelf survey it was successful in obtaining sediments from the sea floor at a depth of 1,474 m. If the lowering speed of the wire rope was greater than 1.0 m/sec, the grab might turn upside, the rope was kinked, and no sample was obtained.

G.S.-type piston-corer

The piston-corer was used for coring soft sediments. The corer consists of an aluminium barrel which is 6 m long and 6.8 cm in diameter, 400 kg weight, with on 1.65 m tripping arm and a 1.0 m pilot corer. The corer was operated by the crew using No. 2 winch with a 12 mm wire rope running over the gallows on starboard. When the corer approached the sea floor the wire rope was stopped and orientated to the perpendicular. On-bottoming and detaching from bottom were clearly recognized on the tension-meter. The corer was worked at 3 stations of 1,340–2,445 m depth and a maximum thickness of 285 cm of sediments was

obtained.

III. 2 Preliminary results

III. 2. 1 Gravity anomalies

by Takemi Ishihara and Fumitoshi Murakami

Figure 12-a is the contoured map of the free-air anomalies of Sagami Bay. 30 minute interval positions and values of the anomalies at those points are also shown in the figure. A relatively low free air zone stretches along the Sagami Trough, with a minimum of approximately −60 milligals around 35°5′N and 139°20′E with the values decreasing to the east. There is a high anomaly of about 105 milligals just south of the Bōsō Peninsula, and of about 120 milligals south of Ōshima Island. These high anomalies seem to correspond to the regions of uplift.

Figure 12-b is the contoured map of the Bouguer anomalies of Sagami Bay. The values increase from −10 milligals northwest of the bay to the south and increase to 200 milligals off the Bōsō Peninsula. There is also a maximum of about 160 milligals just east of Ōshima Island. There is a zone of steep Bouguer gravity gradient south of the Bōsō Peninsula, but north of Ōshima Island the gravity gradient is rather slow. The large high anomaly in the southern part of the map infers that the southern part is composed of oceanic crust while the other part consists of the continental crust. These two parts seem to be bounded by the Sagami Trough.

III. 2. 2 Topography

by Kōji Onodera

The area surveyed consists of continental shelves, slopes and a deep-sea trough as shown in Figure 9. The shelves surrounding the peninsulas are narrow and have slopes beginning at depths of about 120–140 m. The slopes attain the broad bottom of the trough at the depth of 1,000 to more than 2,000 m. The slope on the east side of the trough is deeply incised by six somewhat large submarine canyons and four distinct banks lie between the canyons. On the opposite side of the trough the slope east of the Izu Peninsula is steep and short and has few canyons.

The trough is called the Sagami Trough and runs in a NNW-SSE trend across the central part of the bay, changing to an E-W direction to the east of Ōshima Island. The main part of the trough in the bay has a broad and rather smooth floor which becomes deeper towards the south. The southeastern part of the trough running in an E-W direction is narrow and deep and extends to the Izu-Ogasawara Trench.

The features described below are concerned with some topographically charac-

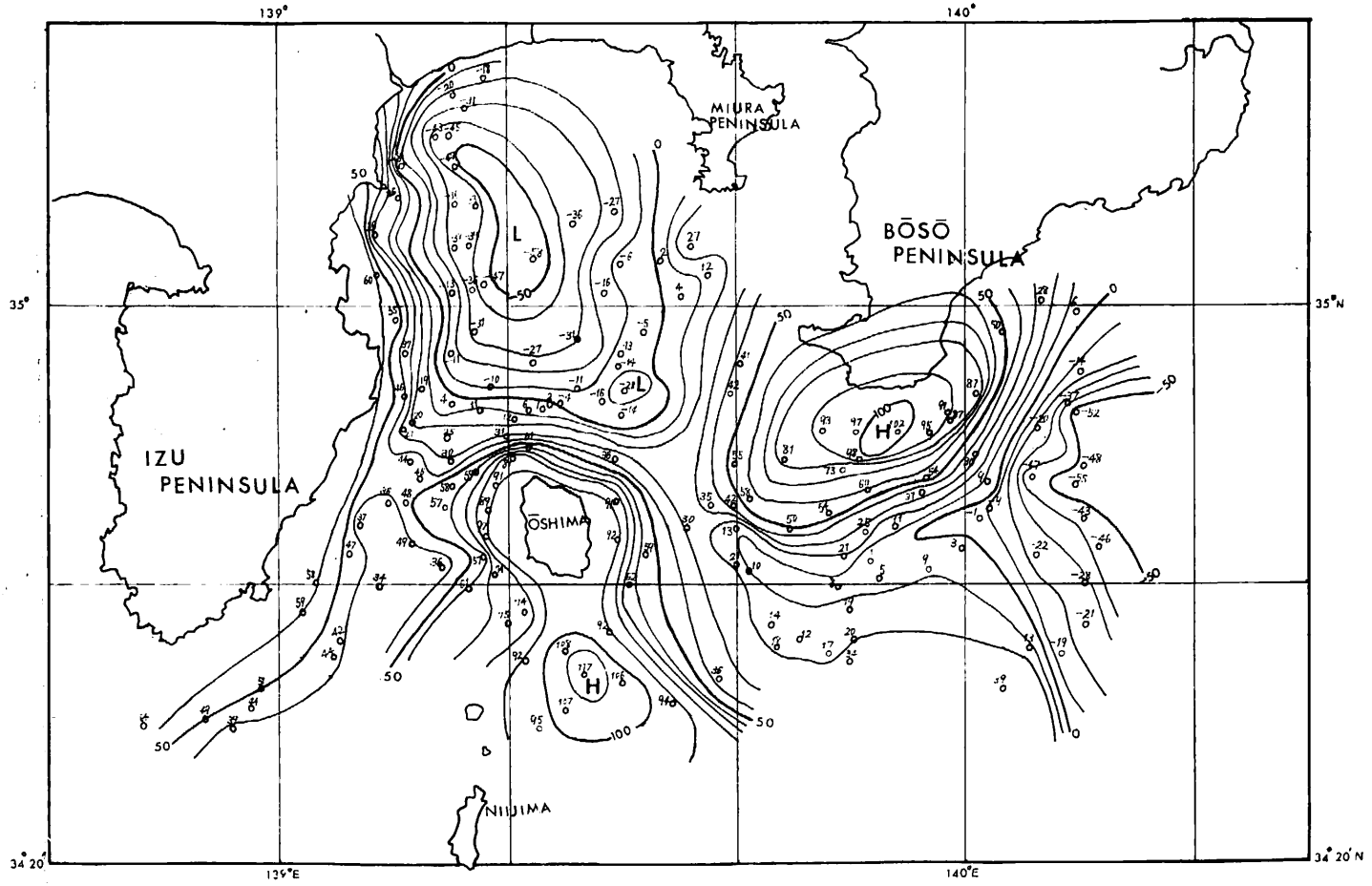

Fig. 12-a. Gravity anomalies in Sagami-nada area, free-air anomalies.

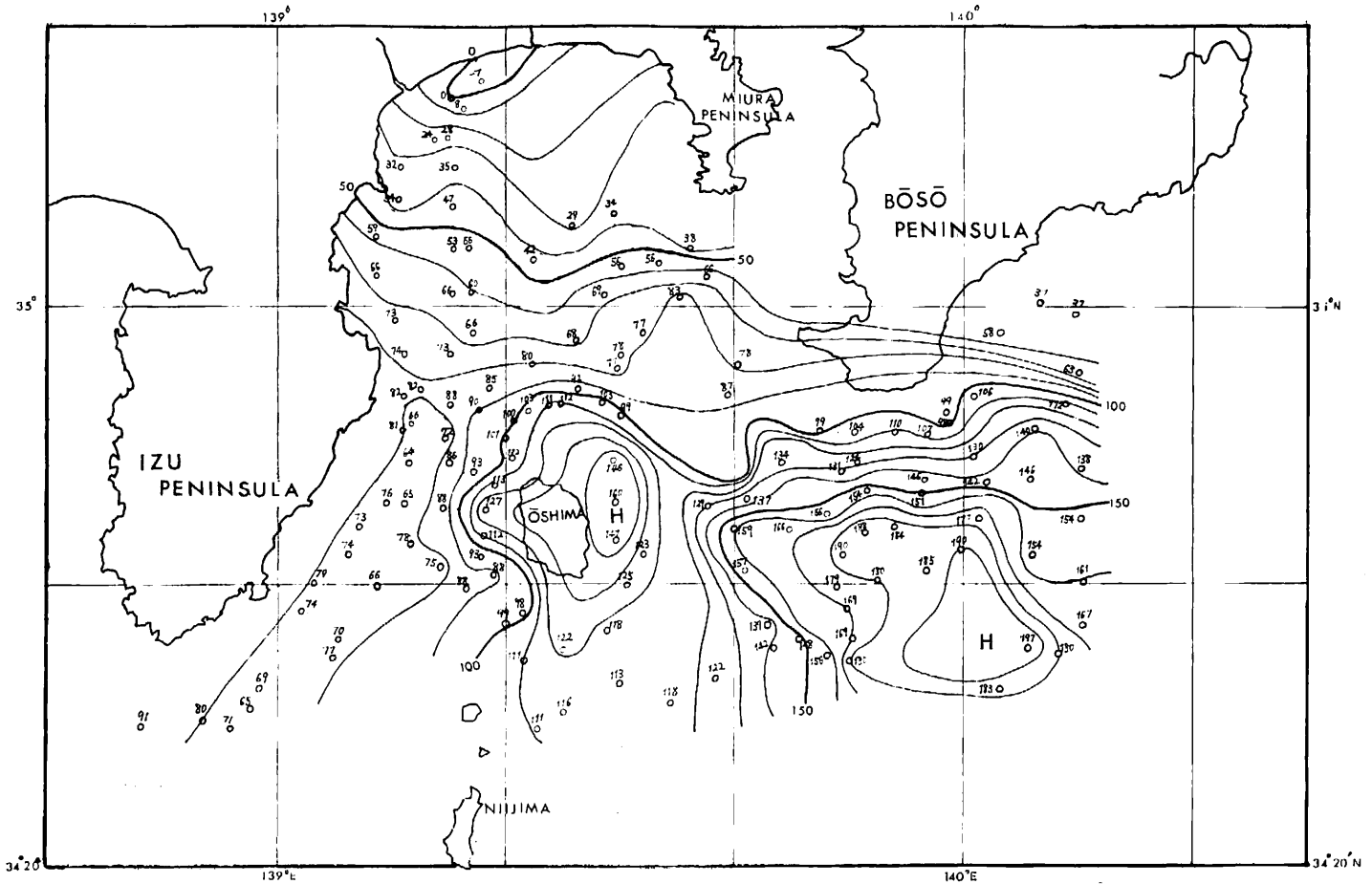

Fig. 12-b. Gravity anomalies in Sagami-nada area, Bouguer anomalies.

teristic features of the Sagami Trough, the continental slopes and the banks, on the basis of the bathymetric profiles.

Sagami Trough

Figure 13-b shows some profiles of the main part of the trough. This part of the trough has a broad U-shaped profile. The bottom depth increases from north to south. The deepest part is situated near the central axis of the trough (L 8 & L 20) in the north, but the deepest part is in the western margin of the trough and the profile becomes asymmetric in the south. It is considered that the differences in depth and the irregularity of the bottom profiles between the northern and southern parts are mainly due to differential sedimentation.

Banks

Four banks—the Sagami, the Miura, the Misaki and the Okinoyama banks from north to south form a line trending in a NW-SE direction on the eastern slope of the Sagami Trough. The banks are situated on an uplifted zone of Quaternary age. Among them, the Miura and Okinoyama banks are shown in Figure 13-b. The former is 400 m high and has a pointed summit. The latter is about 1,000 m high, has flat top at 200 m depth and a rather steep inclination of about 26°.

Continental slope south of Bōsō Peninsula

Figure 13-c shows some profiles of the continental slope south of the Bōsō Peninsula. The slope is extremely crenulated although its general inclination is about 12°. The crenulation seems to be due to erosion on land and subsequent sedimentation has scarcely affected this feature. At about 2,000 m depth, there is a terrace.

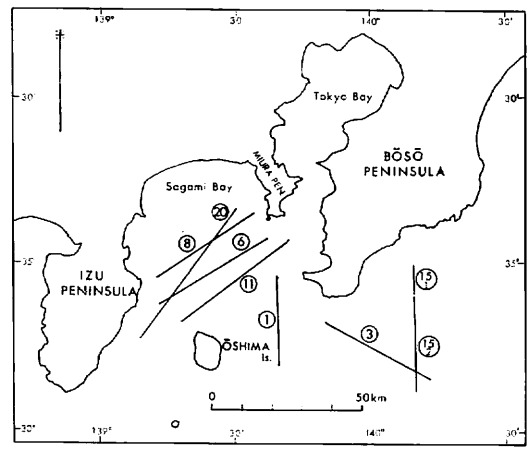

Fig. 13-a

Fig. 13. Bathymetric profiles. a: index map of traverses, b: profiles of Sagami Trough and c: profiles of continental slope off Bōsō Peninsula.

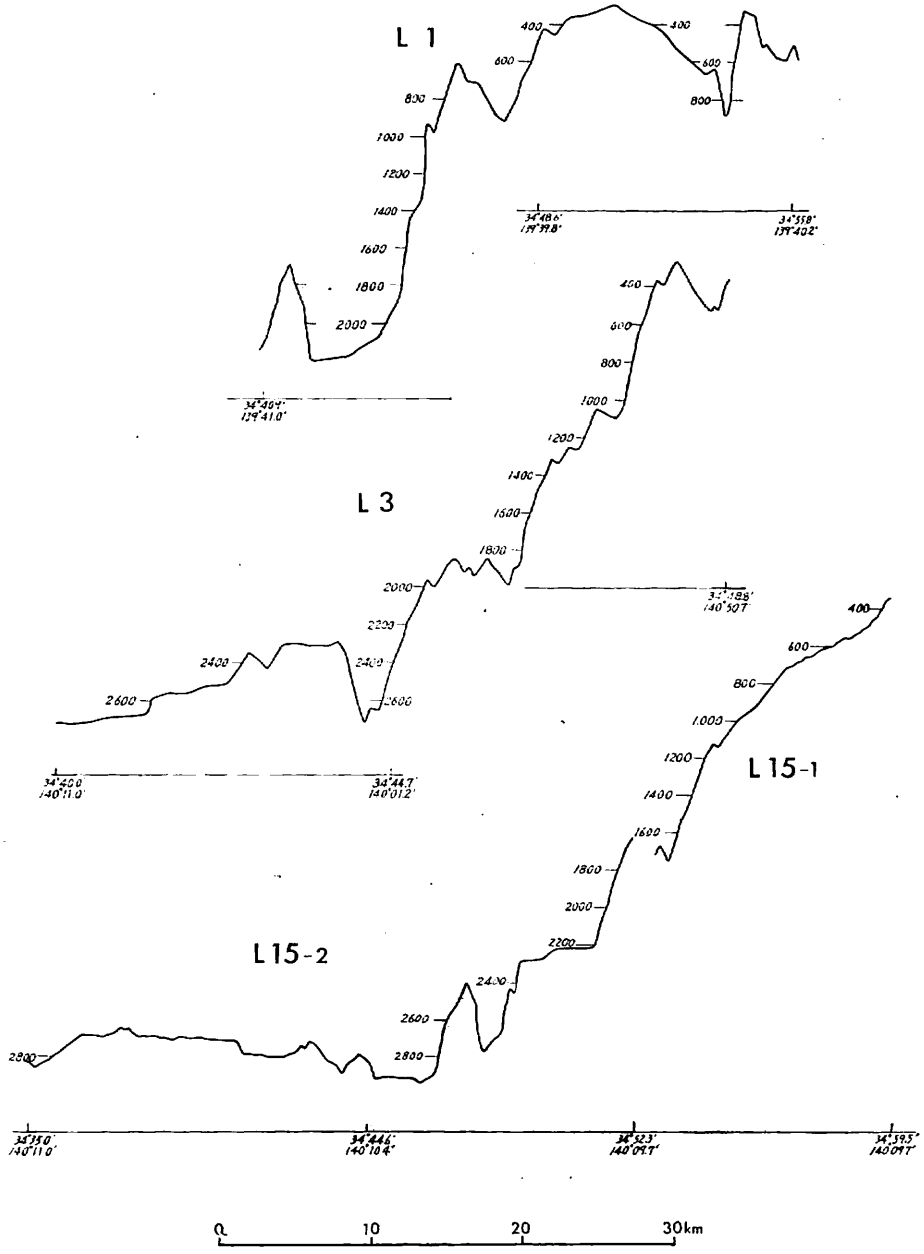

Fig. 13-b

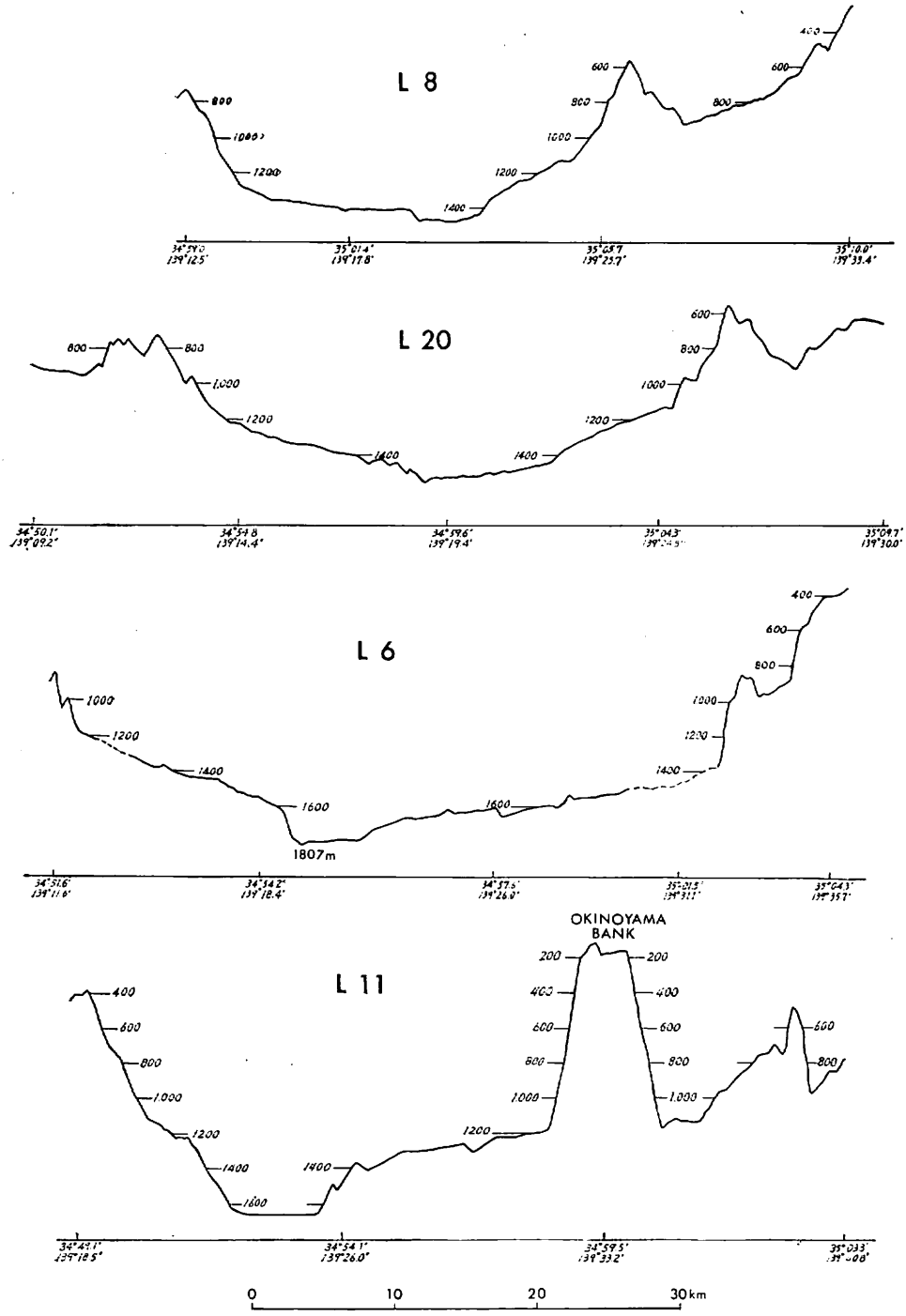

Fig. 13-c

Table 6. List of sediment and rock samples obtained

Station No.	Sample No.	Date	Time	Position		Depth m	Sampler
				Latitude N	Longitude E		
1	D 1	May 12	1021 〜 1204	35°12.1′ 〜 35°12.2′	139°16.7′ 〜 139°16.7′	1,050	Chain-bag
2	D 2	12	1403 〜 1648	35°08.9′ 〜 35°08.4′	139°18.9′ 〜 139°18.2′	780	Cylinder dredge
3	G 1	13	0851 〜 1000	34°56.9′	139°27.0′	1,375	Smith-McIntyre grab
	P 1	13	1148 〜 1313	34°57.5′	139°27.2′	1,340	Piston corer
4	D 3	16	1023 〜 1138	35°07.3′ 〜 35°07.4′	139°19.7′ 〜 139°19.8′	700	Cylinder dredge
5	D 4	16	1337 〜 1459	35°04.6′ 〜 35°04.3′	139°12.9′ 〜 139°12.3′	830	ditto
6	D 5	16	1535 〜 1650	35°04.8′ 〜 35°04.7′	139°11.9′ 〜 139°11.7′	465	ditto
7	D 6	19	1431 〜 1658	34°50.3′ 〜 34°50.3′	139°16.8′ 〜 139°16.8′	750	ditto
8	—	19	1746 〜 1811	34°49.0′	139°24.6′	330	ditto
9	D 7	20	1208 〜 1443	34°42.0′	140°01.8′	2,200	ditto
10	D 8	20	1548 〜 1714	34°51.0′ 〜 34°51.0′	140°01.5′ 〜 140°01.7′	1,400	ditto
11	G 2	22	0815 〜 1006	35°02.6′	139°21.0′	1,474	Smith-McIntyre grab
12	P 2	22	1114 〜 1219	35°03.0′	139°20.6′	1,460	Piston corer

in Sagami-nada area, in GH 74-2 cruise.

Area and topography	Samples	Remarks
Off Odawara	Dark greyish blue coloured and semi-consolidated mud including black granules.	Oxidation film, Humus, Annelids
The northern slope of the Sagami bank	Dark greyish green silty sand and granules, including pebbles.	Pebble: Tuffs, acidic breccia and basic volcanic rocks.
The bottom of the Sagami Trough	Greyish green sandy silt, including black sandstone.	
ditto	0～ 78cm: greenish grey silt, ～271cm: greenish grey silty sand with black sandy patches, ～277.5cm: greenish black muddy sand, ～285cm: greyish green silty clay.	285cm of sediment core
The southern slope of the Sagami bank	Greyish green sandy silt derived from weathered sedimentary rocks. Including pebbles of andesite.	
The southeastern slope off Manazuru	Dark greenish grey silt or clay, sorted well, including organic materials.	
ditto	Dark greyish green silty sand with concretions of black sand and scoria. Shell fragments occur.	
Submarine hill northwest of Oshima Island	Volcanic rocks abundant in vesicle, derived from basaltic lava.	Maximum size of rock fragments: 20×14×9cm
Northern slope of Oshima Island	No sample	Empty dredge
Bottom of Sagami Trough off Boso Pen.	Dark greyish silty sand with scoriaceous ash and lapilli. Bad sorted. Including oxidation layer and organic materials.	
Southern slope of Boso Pen.	Greenish grey sandy silt including pebbles of sedimentary rocks. Ill-sorted.	Pebbles: dark greyish brown mudstone, grey fine sandstone, brown mudstone and dark greyish blue fine sandstone
Central part of Sagami Bay	Light greenish grey silt including humus in upper part of samples and 1cm thick black fine sand, ill-sorted, in lower part.	
ditto	0～206cm: black coloured and polluted mud 'Hedoro', ～303cm: dark greenish grey silt with light grey tuffaceous silt.	303cm of very soft sediment core.

(Table 6. continued)

Station No.	Sample No.	Date	Time	Position		Depth m	Sampler
				Latitude N	Longitude E		
13	D 9	22	1412 〜 1529	34°56.8′	139°12.1′	860	Cylinder dredge
14	D 10	22	1705 〜 1752	35°10.2′ 〜 35°09.9′	139°10.4′ 〜 139°10.3′	440	ditto
15	D 11	25	0913 〜 1018	34°46.4′	139°27.9′	900	ditto
16	D 12	25	1206 〜 1344	34°43.6′	139°44.4′	1,510	ditto
17	D 13	25	1447 〜 1546	34°47.3′	139°52.1′	960	ditto
18	P 3	25	1702 〜 1945	34°41.6′	139°50.2′	2,445	Piston corer
19	D 14	26	1119 〜 1201	34°37.4′ 〜 34°37.3′	139°32.2′ 〜 139°32.3′	818	Cylinder dredge
20	—	26	1331 〜 1418	34°49.1′ 〜 34°49.0′	139°43.0′ 〜 139°43.0′	430	ditto
21	D 15	26	1508 〜 1609	34°50.3′	139°35.9′	1,000	ditto
22	G 3	27	0821 〜 0915	35°05.3′	139°09.4′	495	Smith-McIntyre grab
23	G 4	27	1019 〜 1148	35°07.4′	139°16.4′	1,262	ditto
24	D 16	27	1316 〜 1357	35°07.8′ 〜 35°07.9′	139°11.8′ 〜 139°11.5′	295	Cylinder dredge

Area and topography	Samples	Remarks
Eastern slope of Izu Pen.	Light greenish grey sandy silt with scoriaceous ash, lapilli and volcanic rock fragments including dacitic xenolith.	
Northeastern slope of Manazuru	Black volcanic sand.	
Eastern slope of Oshima Island	Dark brownish green fine sand, ill-sorted and having oxidated part and volcanic rock fragments.	
Near edge of Sagami Trough east of Oshima Island	Dark brown sandy silt including gravels, rock fragments, plant fragments etc. Oxidation layer. Pebbles-rounded.	Pebbles: greyish green fine sandstone, mudstone, grey mudstone, scoria and andesite.
Southern slope of Boso Pen.	Dark greenish and brownish grey silty sand, semi-consolidated. Including pebbles.	Pebbles: brownish grey shale and black shale.
Bottom of Sagami Trough east of Oshima Island	Greyish green fine sand ~ silt smelling sapropel. Black medium sand at the base.	Only 27cm of sediment core.
Southeastern slope of Oshima Island	Dark grey medium sand of volcanic origin. Well sorted. Shell occurs.	Shells: Natica sp., Olivella japonica etc.
Southwestern slope of Boso Pen.	No sample	Empty dredge.
Edge of Sagami Trough between Boso and Oshima	Dark brownish and greenish grey medium ~ very fine sand with dark green silt semi-consolidated. A lot of rock fragments, pumiceous tuff and gravels.	Gravels: dacite, glassy andesite, porphyrite. Rock fragments: tuff breccia, medium-coarse sandstone, greenish grey sandstone and fine sandstone.
Central part of small basin south of Manazuru	0~6cm: greyish and brownish green silt ~ fine sand including Foraminifera. ~12cm: dark greyish green fine ~ medium sand with dark grey very fine sandstone ~ siltstone.	2mm thick oxidation layer.
Head of Sagami Trough	Greyish green silt, homogeneous.	
Slope east of Manazuru	Greyish green silt and black coarse sand including gravels and rock fragments.	Rock fragments: green silty sandstone, lipalitic tuff, andesite and slate.

(Table 6. continued)

Station No.	Sample No.	Date	Time	Position		Depth m	Sampler
				Latitude N	Longitude E		
25	—	27	1430 〜 1525	35°03.2′	139°12.6′	550	Cylinder dredge
26	D17	27	1601 〜 1652	34°59.4′	139°13.0′	875	ditto

Note: D, G and P in sample number mean dredge, grab and piston-corer respectively, time represents start bottom, and depth is measured where a sampler arrives at sea bottom.

III. 2. 3 Sediments and rocks

by Makoto Yuasa, Eiichi Honza and Kōji Onodera

The sampling works were carried out at 26 stations on the continental slope east of the Izu Peninsula, around Oshima Island, south of the Bōsō Peninsula and on the sea-bottom of the Sagami Trough. The samples obtained are listed in Table 6 and the rocks and gravels of the samples are briefly described in Appendix 2.

Sediments

On the slope off the Izu Peninsula most of the sediments are greenish-gray coloured silt and blackish-grey coloured medium sand including grains of volcanic origin.

On the slope around Ōshima Island, as well as on the slope off the Izu Peninsula, dark brownish-green coloured fine sand, partially oxidized and including black coloured volcanic material was sampled at station 15.

At most stations on the southern slope off the Bōsō Peninsula, dark grey or greenish-grey coloured sandy silt and silty sand were sampled. They are ill-sorted.

On the floor and the edge of the Sagami Trough greyish-green silt or sandy silt was mainly obtained. Some of samples smell of sapropel. At station 12 in the north part of the trough at 1,460 m depth, 206 cm of black coloured 'hedoro', which is polluted mud was sampled by the piston-corer. On the floor, black sand was also found.

Sedimentary rocks

In the north of Sagami Bay sedimentary rocks were sampled from two stations. Tuffaceous sedimentary rocks were obtained from the flank of the Sagami bank (Station 2). The green tuffaceous sandstone seems to have been derived from the Yabe Formation of early Miocene age. Greenish-grey sandstone and slate were dredged at station 24 on the upper part of the slope off Manazuru.

Area and topography	Samples	Remarks
Eastern slope of Izu Pen.	No sample	Empty dredge
Eastern slope of Izu Pen.	Dark greenish grey silty sand including medium sand of volcanic origin and scoria.	

and finish of sampling, position represents arrival of sampler at sea bottom and detachment from sea

On the continental slope south of the Bōsō Peninsula, sedimentary rocks were dredged at stations 10, 16 and 17. Fine to medium grained sandstones including volcanic materials dredged at station 10 are assumed to be from the Sakuma Group of early Miocene age. Brownish-grey shale and black shale obtained from station 17 are correlated with the Hayama and the Mineoka Groups respectively. These sedimentary rocks mentioned above were also dredged from rocky bottom areas.

Many rounded gravels from station 16 are green, fine grained sandstone, mudstone and andesitic rock. The mudstone may be derived from the Sakuma Group.

Volcanic rocks

Rock fragments of quartz porphyrite and augite-hypersthene andesite with chilled margins were dredged at two stations on the flank of the Sagami bank together with the sedimentary rock fragments. Scoria and porous andesite were sampled from two stations—12 and 24—on the slope off the eastern coast of the Izu Peninsula. The andesite consists of phenocrysts of plagioclase, augite and hypresthene.

Augite bearing hypersthene basalt was sampled from the eastern slope of Ōshima Island. Augite is found as a reaction rim of hypersthene. The groundmass consists of plagioclase, clinopyroxene and glass. Similar rocks also were dredged from the floor of the Sagami Trough adjacent to the island.

Porous augite—hypersthene basalt fragments were sampled from station 7 on a small hill northwest of Ōshima Island. Micro-phenocrysts or groundmass plagioclase in the rock suggest rapid cooling.

III. 2.4 Geology of the sea bed

by Masaaki Kimura, Yoshihisa Okuda, Toshio Hiroshima and Eiichi Honza

From the preliminary analysis of the seismic reflection records and the sampling the general features of the submarine geology in the surveyed area is constructed as shown in Figure 14.

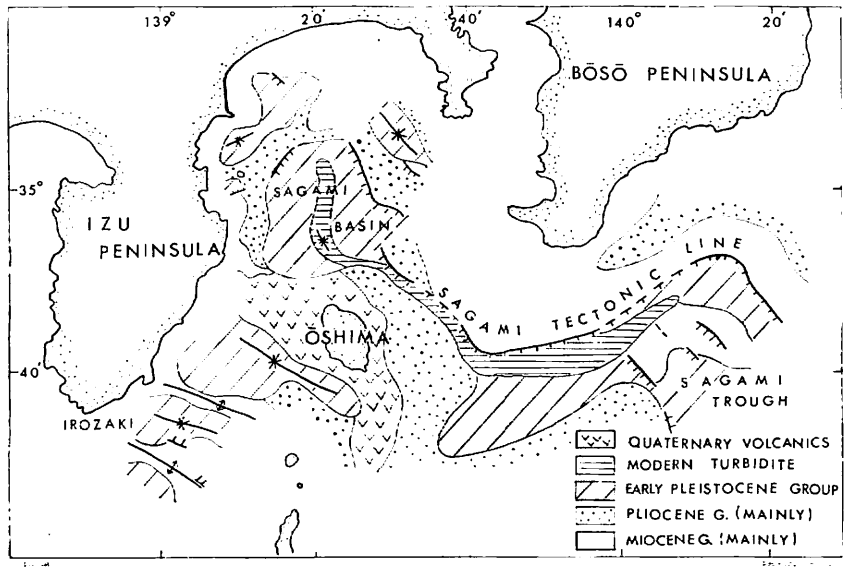

Fig. 14. Simplified submarine geology of Sagami-nada area.

Sea bed

a) The sea bed in the surveyed area is composed of five rock units; namely, Miocene and older rocks, Pliocene rocks, early Pleistocene rocks, modern turbidite and Quaternary volcanic rocks. The Miocene and older rocks are narrowly exposed on the continental slope south of the Bōsō Peninsula, on the continental shelf east of the Izu Peninsula and the eastern flank of the Sagami Trough. Among them, the oldest rocks exposed in the first and the second areas are assumed to be the Hayama Group or the Mineoka Group of Oligocene-Miocene age and the Yugashima Group of early Miocene age respectively. Such are the oldest rocks sampled from Sagami Bay during the cruise.

Pliocene strata with well developed stratification are broadly distributed on the slopes and in the Sagami Trough. Well-stratified strata were found by the seismic records on the eastern slope of Ōshima Island where no sedimentary rock had been previously reported. The strata are tentatively correlated as being Pliocene in age.

The early Pleistocene strata are thickly distributed in the northern and the eastern parts of the Sagami Trough and they are also distributed on the slope east of the Izu Peninsula and the slope of the uplifted zone forming the Sagami and Miura banks. The strata distributed in the trough are bordered by the Sagami Tectonic Line and the strata between the Izu Peninsula and Ōshima Island have a synclinal structure.

Modern turbidite buries the bottom of the Sagami Trough narrowly but thickly. The turbidite is composed of greenish-grey silt and silty sand including black sand grains.

Quaternary volcanic rocks are distributed around Ōshima Island and between the Izu Peninsula and Ōshima Island covering older strata. They are basaltic and andesitic lavas and tuffs.

Structure beneath superficial sediments

1) There is an important tectonic line along the eastern margin of the Sagami Trough. The line is called 'Sagami Tectonic Line' and is a great fault of right-lateral displacement running in a NW-SE direction. The fault is active and it has been estimated that the great Kantō earthquake occurred along the fault in 1923. According to M. KIMURA (1973), the line may be the boundary between the Philippine Sea Plate and the Asian Plate of northeastern Japan, playing an important role in plate tectonics as a transform fault.

In the cruise, the Sagami Tectonic Line, which had been confirmed only in the central part of the trough, was able to be traced as far as south the Bōsō Peninsula. However, the line along the east part of the trough is not a simple feature; that is, the line does not run continuously in a E-W direction, but is cut by NW-SE trending faults.

2) The northern part of the Sagami Trough is bordered by a NE-SW trending fault. The early Pleistocene strata are thickest in the northern part of the trough bordered by the fault.

3) Geological structure in the area off the southern part of the Izu Peninsula had not been so much studied prior to this seismic survey. The structural framework is characterized by WNW-ESE folding. Off Irōzaki Cape, the southernmost tip of the Izu Peninsula, many active faults trending in a WNW-ESE direction are present. These parallel the fault which formed during the earthquake that occurred in the southern part of the Izu Peninsula on May 9th, 1974.

III. 3 Further research

It is intended that the laboratory studies of sediment and rock samples and the data analysis of the geophysical records will be undertaken in the G.S.J. laboratory. A more detailed exploratory programme will be carried out in the same area in 1975 as the next step. Finally it is proposed to make geological and sedimentological maps on the scale of 1:200,000 based on an integrated interpretation of the geophysical and geological results.