

# I. OUTLINE OF THE CRUISE

*By Eiichi Honza*

The cruise for the marine geological and geophysical investigation in the Pacific side of the Tohoku and Hokkaido regions is based on the marine geological research project of the Geological Survey of Japan. The project is a part of the five years program for the marine geological investigation of the continental shelves and slopes around Japan, which is carried out by a geological research vessel, "Hakurei-Maru".

This cruise report is mainly concerned with the results of on-board observations by the scientific staff and also, in part, the analytical results obtained after the cruise.

The survey covered the whole of the Pacific side of the Tohoku Arc, the southern part of the Kurile Arc and the northern margin of the Izu-Ogasawara (Bonin) Arc. The surveyed area covered the continental shelves, slopes, trenches and Pacific basin along the trenches (Fig. I-1). Scientific staff aboard consisted of seven scientists of the Geological Survey of Japan, a guest scientist from McGill University, Canada, and nine technical assistants in total of under-graduate and post-graduate students from various universities (Table I-1).

The ship left Funabashi Port on the 17th of March, 1976 and surveyed the southern part of the Japan Trench for 16 days and entered Kamaishi Port on the 2nd of May. The ship left Kamaishi Port on the 5th of May and surveyed the southern part of the Kurile Trench and the eastern area off Tsugaru Strait for 15 days and entered Hakodate

Table I-1 Scientific staff on board.

Name	Institute	Speciality
Eiichi HONZA	G.S.J.	Chief scientist, geology
Kouji ONODERA	G.S.J.	Vice-chief scientist, geomorphology
Makoto YUASA	G.S.J.	lithology
Kensaku TAMAKI	G.S.J.	structural geology
Yoshio INOUCHI	G.S.J.	structural geology and sedimentology
Kiyokazu NISHIMURA	G.S.J.	geophysics
****Fumitoshi MURAKAMI	G.S.J.	geophysics
***Reinhard HESSE	McGill Univ.	sedimentology
Masahiro SHIBA	Tokai Univ.	Technical assistant
**Yoichiro OTOFUJI	Kyoto Univ.	Technical assistant
**Toshifumi IMAIZUMI	Tohoku Univ.	Technical assistant
**Tsuneo IMAI	Tokyo Fisheries Univ.	Technical assistant
**Saburo TAGUCHI	Tokyo Fisheries Univ.	Technical assistant
*Tsuneo INAZUKI	Hokkaido Univ.	Technical assistant
***Manabu KIMURA	Hokkaido Univ.	Technical assistant
****Izumi KATO	Tokai Univ.	Technical assistant
****Shiro HASEGAWA	Tohoku Univ.	Technical assistant

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\*\*Funabashi-Hakodate.

\*\*\*Kamaishi-Funabashi.

\*\*\*\*Hakodate-Funabashi.

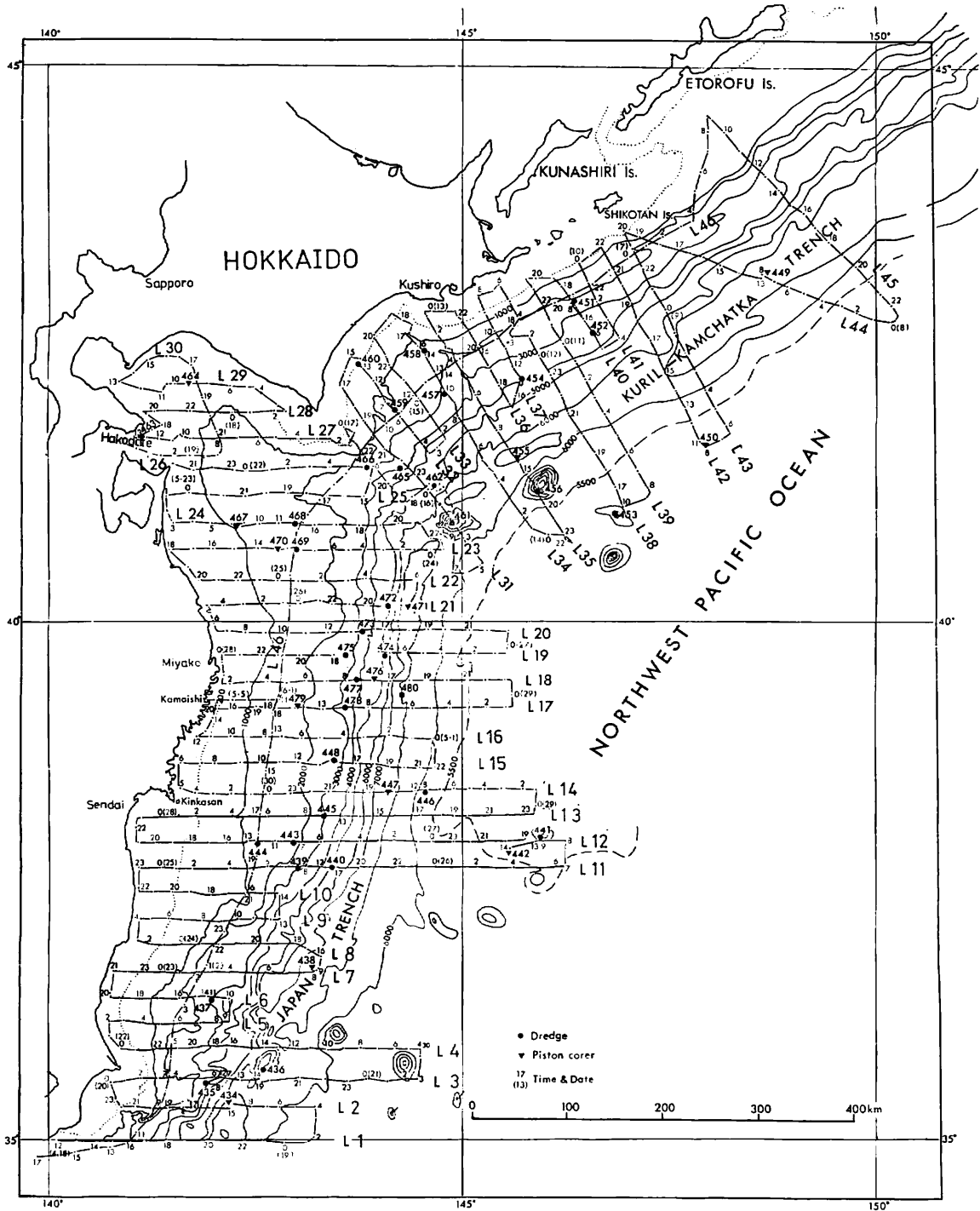


Fig. I-1 Sampling sites and tracks by geophysical survey.

Table I-2 Schedule of the cruise.

April 17th	Lv. the Funabashi Port. Geological and geophysical survey in the southern part of the Japan Trench and in the northern margin of the Izu-Ogasawara Trench.
May 2nd	Ar. at the Kamaishi Port.
May 5th	Lv. the Kamaishi Port. Geological and geophysical survey in the south-western part of the Kuril Trench and in the east off the Tsugaru Strait.
May 19th	Ar. at the Hakodate Port.
May 21st	Lv. the Hakodate Port. Geological and geophysical survey in the northern part of the Japan Trench and grid survey around the proposed IPOD sites.
June 4th	Ar. at the Funabashi Port.

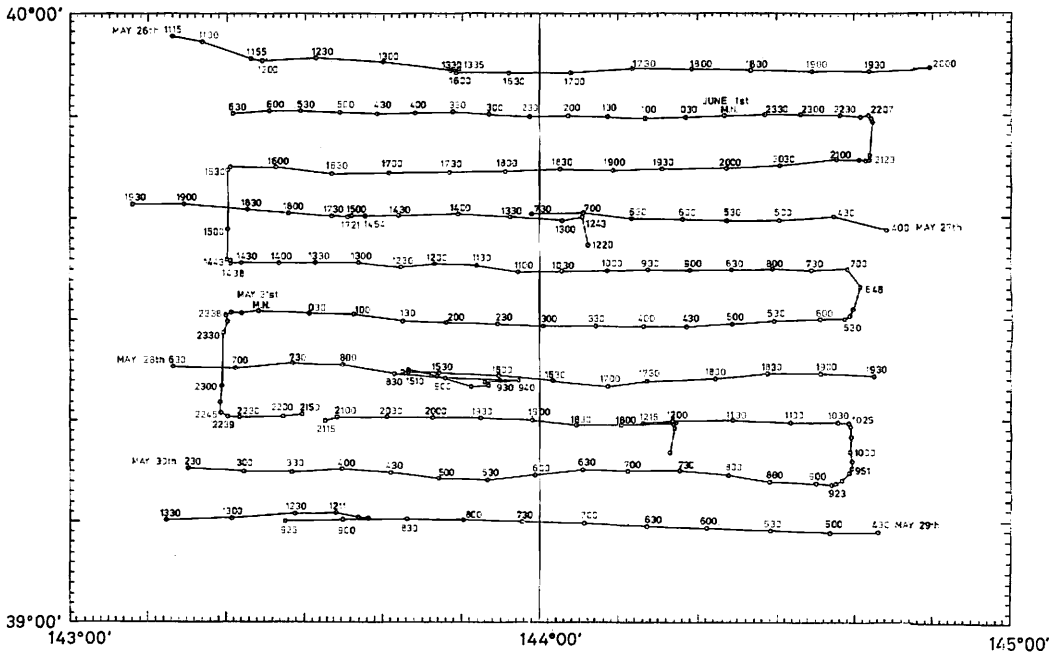


Fig. I-2 Tracks by geophysical survey in the detailed surveyed area off Miyako.

Table I-3 Observation methods.

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Cruising and positioning by NNSS, Loran C and Decca
Geophysical methods
Bathymetric survey by 12 kHz PDR
—Prospecting of bottom topography
Subbottom profiling by 3.5 kHz PDR
—Prospection of sedimentary surficial layers and surficial structure
Continuous seismic profiling survey by air-gun and sparker
—Prospecting of sedimentary layers and geological structure
Magnetic survey by proton magnetometer
Gravity measurement by on-board gravimeter
—Auxiliary consideration of general geological structure
Surficial current measurement by GEK
—Reference for dredge operation
Geological methods
Bottom sampling by chain-bag and cylinder dredges
—Sampling of sediments and rocks
Bottom sampling by piston corer with 6 m core-barrel
—Observation of vertical sequence of surficial sedimentary columns

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Port on the 19th of May. The ship left Hakodate Port on the 21st of May and surveyed the northern part of the Japan Trench. A grid survey off the Sanriku area for the proposed IPOD sites was undertaken for a few days during this part of the cruise (Fig. I-2).

The survey was usually carried out with a Bolt-type air-gun, proton magnetometer which was towed from the ship's stern. 3.5 kHz and 12 kHz echo sounders, onboard gravity meter were also carried out in order to take bottom and subbottom information. Dredge holes and piston coring sites were selected to ascertain and correlate the seismic profiling results of the material which constituted the bottom (Table I-3). A few dredge sites were selected for a lithological study of the seamounts and several sites for piston coring were selected to study the sedimentology of the slopes and trenches. The ship position was ascertained by use of NNSS, Loran C and Decca equipment. Decca stations on land do not cover the whole of the surveyed area and are available only for the northern part of the area. The ship covered a total distance of 8523.2 nautical miles during 49 days. The results of the stationary observations are summarized in Table I-4.

Table I-4 Results of stationary observations.

Station No.	Sample No.	Position* Latitude	Longitude	Depth (m)	Area	Samples
434	P 74	35°23.1'N	142°13.2'E	7,900	Northernmost part of Izu-Ogasawara Trench, foot of the inner trench slope.	Pebbles (of basalt, chert and mudstone). basalt: phenocryst (olivine, altered), groundmass (plagioclase, glass), pore filled by zeolite. 4.3 × 3.0 × 1.4 cm in size. chert: grey in color, 2.7 × 2.4 × 1.6 cm in size.
435	D 139	35°35.3'N ~ 35°35.3'N	141°54.7'E ~ 141°55.9'E	2,800 ~ 2,800	Off Inubosaki, trench slope break.	Silty clay or silt, and pumice.
436	D 140	35°43.3'N ~ 35°44.1'N	142°37.1'E ~ 142°37.4'E	4,550 ~ 4,400	Kashima the 1st Seamount.	Many amounts of basaltic, rocks, oolitic limestone, and silt.
437	D 141	36°24.6'N ~ 36°26.0'N	141°58.4'E ~ 141°58.3'E	3,050 ~ 2,850	Off Nakaminato, continental slope.	Micritic limestone, sandy limestone, and tuffaceous sand. limestone: 11 × 7 × 5.5 cm, pale blueish green in color, involving the grains of plagioclase, hypersthene, augite, and brownish glass and rock fragment.
438	P 75	36°42.7'N	143°13.0'E	7,300	Japan Trench.	arenite: 11 × 7 × 4 cm, pale greyish brown in color, and involving the grains of quartz, plagioclase, clinopyroxene, and siliceous rock fragment. Core length 475 cm, clay intercalating sand and tuff layers.
439	D 142	37°40.6'N ~ ditto	143°01.6'E ~ ditto	2,520 ~ 2,500	Off Abukuma, trench slope break.	Olive brown sandy silt, pebbles (chert, slate and sandstone), sedimentary rock fragments and scoria.
440	D 143	37°39.8'N ~ 37°39.8'N	143°26.1'E ~ 143°24.7'E	4,980 ~ 4,950	Off Abukuma, inner trench slope.	Olive greyish brown silt, sedimentary rock fragments, gravels, pumice and scoria.
441	D 144	37°59.2'N ~ 37°59.2'N	145°58.4'E ~ 145°58.7'E	3,350 ~ 3,150	Ryofu the 1st Seamount.	Brecciated pillow basalt, manganese nodules and crusts, and pebbles (chert and pumice). basalt: maximum size, 16 × 15 × 14 cm, well developed chilled margin and radial joint, partly coated by manganese oxide. Nonporphyritic basalt and slightly altered in general.

Station No.	Sample No.	Position* Latitude	Longitude	Depth (m)	Area	Samples
442	P 76	37°51.0'N	145°35.4'E	5,400	Oceanic floor, southwest of Ryofu the 1st Seamount.	Core length 464 cm, clay and silt intercalating tuff and sand layers.
443	D 145	37°55.2'N ~ 37°55.6'N	142°57.8'E ~ 142°57.3'E	1,710 ~ 1,700	Off Sendai, trench slope break.	Many amounts of cobbles and pebbles, and sandy silt. Sedimentary rocks: sandstone, tuff and limestone. Volcanic rocks: rhyolite, augite andesite, hornblende andesite, and olivine augite andesite. Plutonic rocks: biotite granite and diorite. Metamorphic rocks: biotite hornfels (derived from siltstone, sandstone), metavolcanic rock (chlorite, epidote and white mica) and partly calcareous metamorphic rock.
444	D 146	37°55.3'N ~ 37°55.3'N	142°31.9'E ~ 142°31.5'E	1,080 ~ 1,080	Off Sendai, continental slope.	Olive brown silt and pebbles (pumice, scoria and siltstone).
445	D 147	38°11.0'N ~ 38°11.7'N	143°20.2'E ~ 143°20.3'E	3,120 ~ 3,050	Off Sendai, trench slope break.	Fine sand bearing olive brown silt, pebbles and gravels (chert, siltstone and pumice).
446	D 148	38°23.7'N ~ 38°23.5'N	144°32.2'E ~ 144°32.5'E	5,790 ~ 5,740	Off Sendai, outer trench slope.	Reddish brown clay including manganese nodules and manganese oxide coated pebbles, and pale greenish grey clay. pebbles: pumice (plagioclase and green hornblende phenocryst), glassy tuff, biotite granite and hornblende andesite.
447	P 77	38°25.8'N	144°05.6'E	7,400	Off Sendai, Japan trench bottom.	Core length 442 cm, clay intercalating sand layers.
448	D 149	38°40.6'N ~ 38°40.8'N	143°28.1'E ~ 143°27.6'E	2,520 ~ 2,500	Off south Kitakami, trench slope break.	Medium sand bearing olive brown silt, pebbles (granite and chert), and siltstone (involving foraminifera).
449	P 78	43°09.4'N	148°36.9'E	8,805	Off Shikotan Is., Kuril Trench bottom.	Core length 542 cm, clay intercalating pumice layer and sand layers, many amounts of blackish layers.
450	P 79	41°37.3'N	147°54.2'E	5,180	Off Shikotan Is., oceanic floor.	Core length 538 cm, clay intercalating ash layers (may be crystal tuff) and pumice.

451	D 150	42°56.0'N ~ 42°56.5'N	146°20.7'E ~ 146°34.5'E	2,475 ~ 2,500	Off Nosappu, trench slope break.	Olive brown tuffaceous sandy silt, many amounts of gravels (boulders, cobbles and pebbles). gravels: sandstone, slate, chert, limestone, con- glomerate, green schist and hornfels.
452	D 151	42°37.9'N ~ 42°38.5'N	146°33.8'E ~ 146°34.5'E	3,360 ~ 3,406	Off nosappu, bench of inner trench slope.	Fine sandy silt (olive brown in color and loose), and a small quantity of pebbles (chert, acidic plutonic rock, and pumice).
453	D 152	41°00.9'N ~ 41°00.8'N	146°49.0'E ~ 146°49.5'E	5,000 ~ 4,450	Un-named seamount (top depth 3,450 m).	Medium sand bearing brown clay or silt, basaltic rock, pebbles (sandstone and pumice) and micro- manganese nodule and manganese oxide coated pebbles.
454	D 153	42°14.9'N ~ 42°15.2'N	145°42.8'E ~ 145°43.0'E	3,600 ~ 3,557	Off Kushiro, trench slope break.	Greenish grey sandy silt (stacy), tuffaceous mud- stone, rubble (andesite) and pebbles (granitic rock and so on).
455	P 80	41°31.1'N	145°40.9'E	7,050	Off Kushiro, Kuril Trench.	Core length 497 cm, clay intercalating silt and tuff layers.
456	D 154	41°14.9'N ~ 41°15.0'N	145°55.4'E ~ 145°55.5'E	3,605 ~ 3,510	Takuyo the 1st Sea- mount.	Fine sand bearing pale brown silt, brecciated volcanic rock, pebbles (granite, diorite, shale, gneissose rock).
457	D 155	42°06.0'N ~ 42°06.2'N	144°46.2'E ~ 144°46.4'E	2,250 ~ 2,140	Wall of Hiro canyon.	Fine sand bearing greenish brown silt, siltstone, cobbles (dolerite) and pebbles (shale, sandstone).
458	D 156	42°30.3'N ~ 42°30.5'N	144°28.3'E ~ 144°28.5'E	1,600 ~ 1,550	Wall of Kushiro can- yon.	Silt involving ash size pumice, semi-consolidated greenish brown silt and pebbles (pumice).
459	D 157	41°56.1'N ~ 41°56.1'N	144°11.1'E ~ 144°11.6'E	1,390 ~ 1,420	Canyon wall, south- west of Hiro Spur.	Slightly consolidated olive brown silt, cobbles (sand- stone), pebbles (sandstone, mudstone, pumice, chert, hornfels, volcanic rocks and plutonic rocks), and a tooth of shark.
460	D 158	42°21.5'N ~ 42°22.1'N	143°44.7'E ~ 143°44.6'E	175 ~ 179	Off Hiro, continental slope.	Medium sand and a few pebbles.
461	D 159	40°54.6'N ~ 40°55.0'N	144°53.3'E ~ 144°53.7'E	4,000 ~ 3,850	Erimo (Sisoev) Sea- mount, slope.	Greenish brown silt and pebbles (pumice and mud- stone).

Station No.	Sample No.	Position*		Depth (m)	Area	Samples
		Latitude	Longitude			
462	D 160	41°16.5'N~ 41°17.1'N 41°17.5'N	144°38.4'E~ 144°37.1'E 144°36.9'E	4,000 4,020	Off Erimo Spar, inner trench slope.	Silty fine sand, slightly consolidated greenish brown silt, cobbles (granite and sandstone), and pebbles (chert, granite, sandstone, volcanic rocks, plutonic rocks and hornfels).
463	D 161	41°40.0'N~ 41°40.3'N	141°08.0'E~ 141°10.5'E	145~ 170	South of Esan Cape, continental slope break.	Medium sandy silt, pumice and volcanic rock blocks, and pebbles (chert, shale).
464	P 81	42°10.0'N	141°41.6'E	750	Off Tomakomai, continental slope.	Core length 340 cm, clay intercalating pumice and sand layers.
465	D 162	41°25.6'N~ 41°25.8'N	144°15.0'E~ 144°15.2'E	3,150~ 3,120	Lower part of Erimo Spur.	Pale greenish brown silt, pebbles (chert, granite, sandstone, slate, biotite gneiss) and sandstone fragmentation.
466	D 163	41°24.6'N~ 41°24.5'N 41°24.4'N~ 41°24.3'N	143°51.0'E~ 143°51.3'E 143°52.0'E~ 143°52.0'E	2,380~ 2,400 2,400~ 2,410	Southeast of Erimo Cape, cliff.	Greenish brown silt including many amounts of foraminifera and pumice, and pebbles (sandstone, pumice and igneous rocks).
467	P 82	40°53.7'N	142°16.7'E	1,150	Off Hachinohe, continental slope.	Core length 377 cm, silt and clay intercalating sand layers.
468	D 164	40°56.5'N~ 40°56.4'N	142°57.2'E~ 142°57.0'E	1,740~ 1,730	ditto	Medium sand (volcanic origin?), cobbles and pebbles, cobbles: pale green hornblende bearing volcanic rock, white mica bearing weakly metamorphosed rock, and clinopyroxene-olivine basalt. pebbles: chert, pumice, shale and volcanics.
469	D 165	40°41.1'N~ 40°41.7'N	143°02.5'E~ 143°02.5'E	1,420~ 1,415	ditto	Fine sand, pumice and pebble (shale?).
470	P 83	40°40.7'N	142°47.0'E	1,650	ditto	Core length 376 cm, clay intercalating sand layers.
471	P 84	40°07.0'N	144°21.9'E	7,330	Off Kuji, Japan Trench bottom.	Core length 541 cm, clay intercalating tuffaceous sand and sand layers.



472	D 166	40°08.6'N ~ 40°09.4'N	144°06.8'E ~ 144°05.5'E	4,870 ~ 4,560	Off Kuji, inner trench slope.	Dark yellowish brown clay (ill-sorted) including pebbles, and semi-consolidated silt. Pumice and tuffaceous siltstone fragment (?).
473	D 167	39°54.6'N ~ 39°54.6'N	143°47.1'E ~ 143°46.5'E	3,110 ~ 3,050	Off Miyako, inner trench slope.	Light brown ~ greenish brown silt, semi-consolidated siltstone (both soft and hard types), and pebbles (chert, volcanic and metamorphic rocks).
474	D 168	39°40.248'N ~ 39°39.6'N	144°04.480'E ~ 144°04.0'E	5,280 ~ 5,150	ditto	Greenish brown silt, greenish grey siltstone (semi-consolidated), and light greyish brown siltstone.
475	D 169	39°40.2'N ~ 39°40.3'N	143°36.3'E ~ 143°36.4'E	2,510 ~ 2,510	Off Miyako, trench slope break.	Dark olive brown clay and pumice.
476	P 85	39°23.7'N	143°53.3'E	4,770	Off Kamaishi, inner trench slope.	Core length 566 cm, clay intercalating sand and silt layers.
477	D 170	39°25.0'N ~ 39°24.9'N	143°42.4'E ~ 143°36.4'E	3,330 ~ 3,290	ditto	Dark brownish olive silt, siltstone and pumice.
478	D 171	39°10.5'N ~ 39°10.6'N	143°36.8'E ~ 143°36.4'E	3,400 ~ 3,380	Off Kesen-numa, inner trench slope.	Olive brown silt, cobbles, and pebbles. cobble: siltstone and biotite hornfels (andesitic rock origin). pebble: pumice, siltstone, igneous rock, and shale.
479	P 86	39°11.2'N	142°58.8'E	1,850	Off Kesen-numa, inner trench slope.	Core length 462 cm, silt intercalating sand layers.
480	D 172	39°19.0'N ~ 39°18.6'N	144°16.6'E ~ 144°17.2'E	7,000 ~ 6,850	Off Kesen-numa, outer trench slope.	Greyish olive brown silty clay, siltstone and doleritic rock.

\*Positions represent from "Hit" to "Lift off".