doi : 10.17596/0003442

Mirai "Cruise Report"
MR22-04

Geological Study of Paleo-Earthquakes and Tsunamis along the Chishima Trench

Chishima Trench

June 15, 2022 – June 30, 2022

Japan Agency for Marine-Earth Science and Technology
(JAMSTEC)

Contents

1. Cruise Information

- Cruise ID: MR22-04
- Name of vessel: R/V Mirai
- Title of cruise: Geological study of paleo-earthquakes and tsunamis along the Chishima Trench
- Chief Scientist: Toshiya Fujiwara [Research Institute for Marine Geodynamics (IMG), JAMSTEC]
- Representative of Science Party: Toshiya Kanamatsu [IMG, JAMSTEC]
- Cruise period: June 15, 2022 – June 30, 2022
- Ports of departure / arrival: Shimizu / Shimizu, Japan
- Research area: Chishima Trench
- Research map:

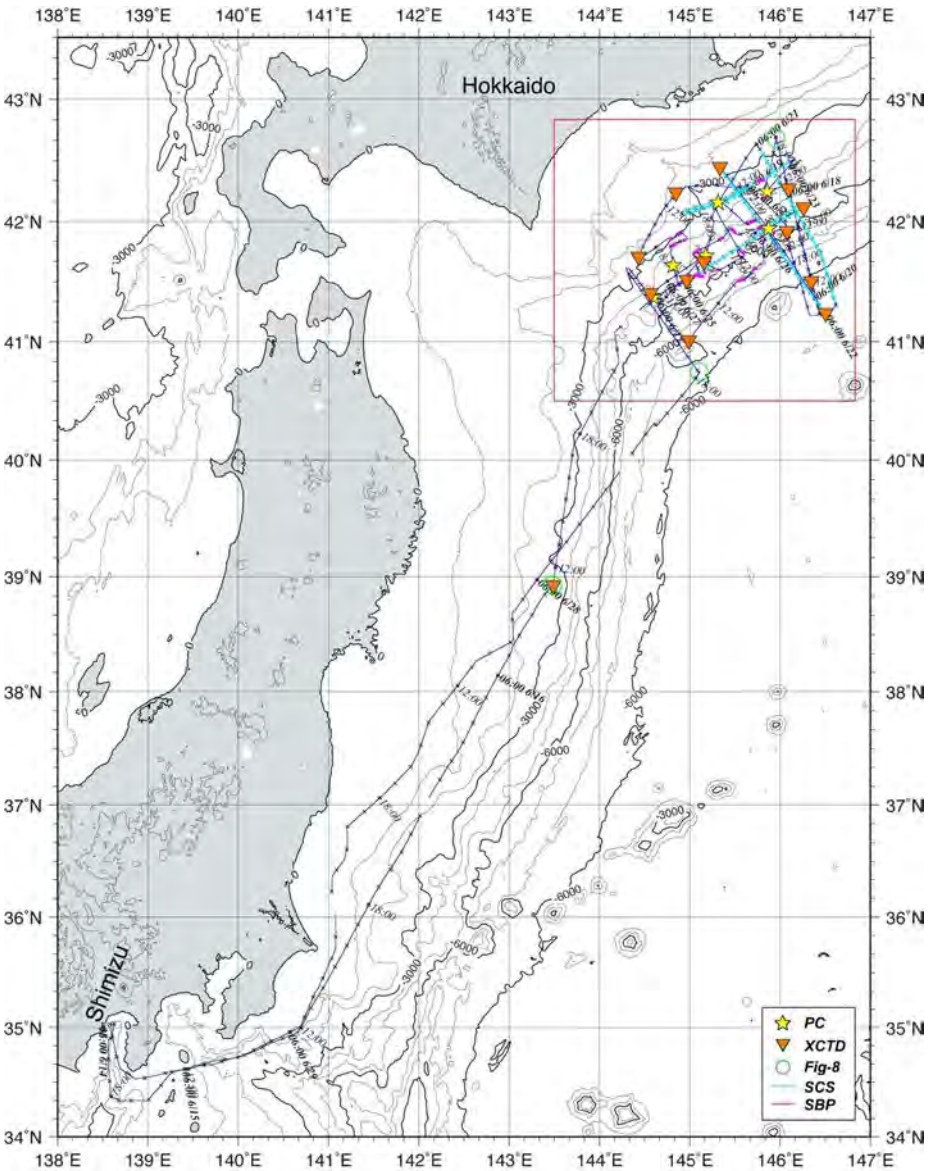


Figure 1-1: Survey lines and locations in the cruise area. Blue lines show the R/V "Mirai" ship tracks. PC: piston core, Fig-8: "Figure-8" sailing, SCS: single-channel seismic reflection survey, SBP: sub-bottom profiling.

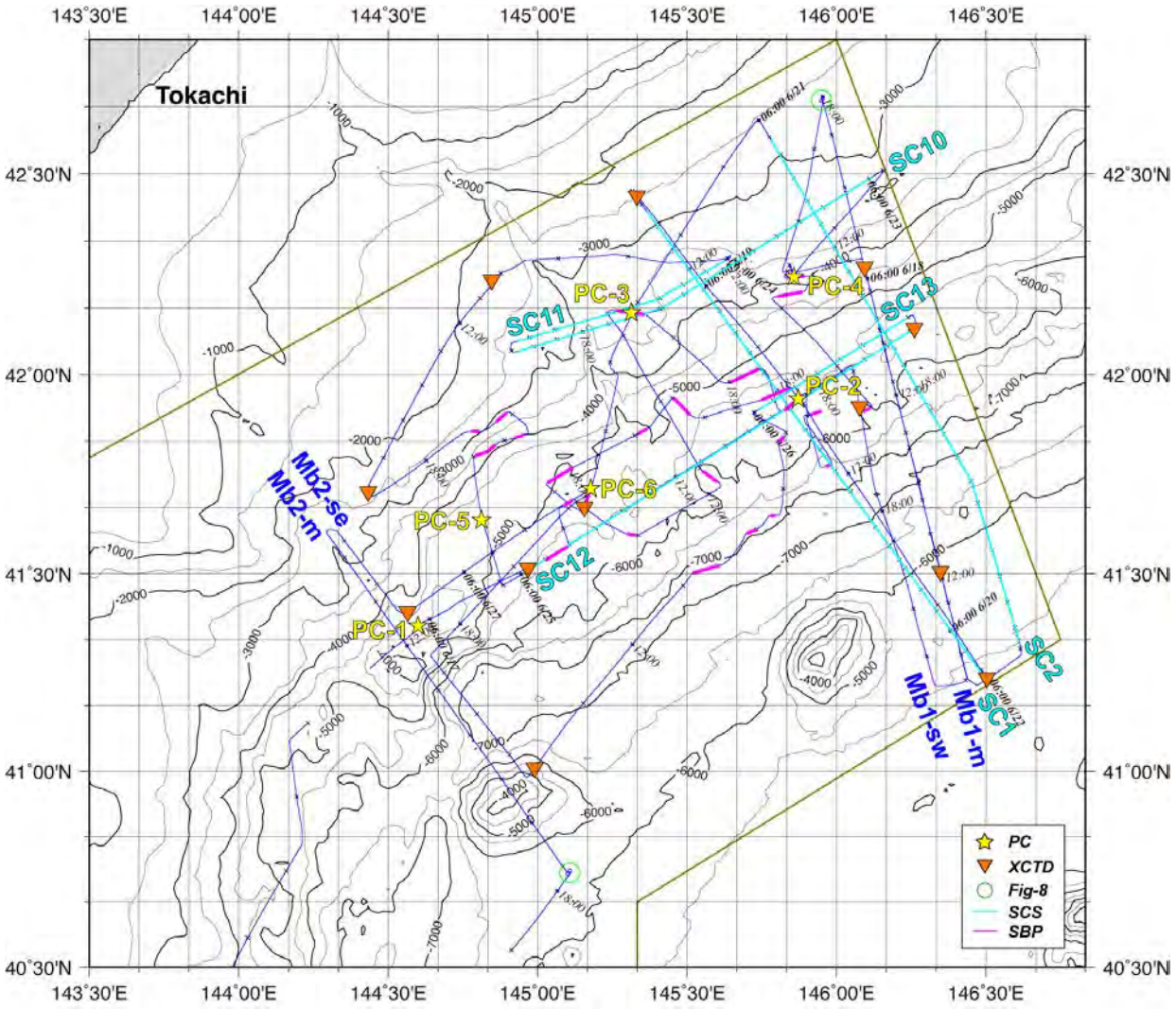


Figure 1-2: Survey lines and locations in the survey area. Blue lines show the R/V "Mirai" ship tracks. PC: piston core, Fig-8: "Figure-8" sailing, SCS: single-channel seismic reflection survey, SBP: sub-bottom profiling.

2. Participant List

Science Party

Toshiya Fujiwara	IMG, JAMSTEC
Toshiya Kanamatsu	IMG, JAMSTEC
Kan-Hsi Hsiung	IMG, JAMSTEC
Kaoru Kubota	IMG, JAMSTEC
Ken Ikehara	GSJ, AIST
Mai Kikui	GSSE, Chiba Univ.

IMG: Research Institute for Marine Geodynamics, GSJ: Geological Survey of Japan, AIST: National Institute of Advanced Industrial Science and Technology, GSSE: Graduate School of Science and Engineering

Underway Geophysics & Seismic Survey Operation Team

Kazuho Yoshida	NME
Soichiro Sueyoshi	NME
Ryo Kimura	NME
Toshimasa Nasu	NME
Michiyasu Katagiri	NME
Fumine Okada	NME
Yohei Sugimoto	NME
Kazuhiko Fujita	NME
Yu Kaneko	NME

NME: Nippon Marine Enterprises Ltd.

Piston Corer Operation & Core Measurement Team

Kazuma Takahashi	MWJ
Yoshiki Kido	MWJ
Yohei Katayama	MWJ
Yuta Shinomiya	MWJ
Htet Naing Lin	MWJ
Paing Zu	MWJ
Ryota Uchiyama	MWJ
Nahoko Adachi	MWJ

MWJ: Marine Works Japan Ltd.

R/V Mirai Crew

Haruhiko Inoue	Master
Takeshi Egashira	Chief Officer
Shozo Fujii	1st Officer
Tatsuo Adachi	Jr. 1st Officer
Shoma Abe	2nd Officer
Keiji Kanayama	3rd Officer
Yuri Hiasa	Jr. 3rd Officer
Koji Funae	Chief Engineer
Yoichi Yasue	1st Engineer
Yoshinobu Hiratsuka	2nd Engineer
Yuna Kaino	3rd Engineer
Yoichi Inoue	Chief Radio Operator

Kazuyoshi Kudo	Boatswain
Masanori Ohata	Quarter Master
Tsuyoshi Sato	Quarter Master
Yukito Ishii	Quarter Master
Shuji Komata	Quarter Master
Hideaki Tamotsu	Quarter Master
Hideyuki Okubo	Quarter Master
Keisuke Isobe	Sailor
Yuki Oishi	Sailor
Shin Ito	Sailor
Ryota Kume	Sailor
Kosei Hirai	Sailor
Iori Terasaki	Sailor
Daisuke Taniguchi	No.1 Oiler
Takuya Watanabe	Oiler
Daiki Sato	Oiler
Shion Narabe	Assistant Oiler
Fubuki Homma	Assistant Oiler
Yuta Wakugawa	Assistant Oiler
Eima Fujiura	Assistant Oiler
Ryuki Abe	Assistant Oiler
Kiyotaka Kosuji	Chief Steward
Yoshio Okada	Steward
Toshiyuki Asano	Steward
Kenichi Okumura	Steward
Kina Abe	Steward
Yuta Hangai	Steward

3. Cruise Summary

Research Objectives
To understand the history of paleo-earthquakes and tsunamis along the Chishima Trench from geological studies, sediment core samples including earthquake-induced turbidite will be collected on the landward trench slopes. And bathymetry, geology, and sub-surface structure of sedimentary layers around the sediment core sampling sites will be surveyed.

Activities (observation, sampling, methods, instruments)
Piston-coring, sub-bottom profiling, single-channel seismic reflection survey, multibeam bathymetric survey, XCTD measurement, shipboard gravity meter measurement, surface-towed magnetometer and shipboard three-component magnetometer measurement

Results

- Sediment core samples were collected at 6 sites. The water depths of the sampling sites were 3370-5684 m. Eight-meter length of piston core was used at 4 sites, and 6 m length was used at 2 sites.
- Single-channel seismic reflection surveys were conducted along 6 lines. The seismic source was a 355 cu in (G: 250, I: 105) GI gun.
- Sub-bottom profiler surveys were conducted at 25 locations. The piston-coring sites were selected from the results of this survey.
- Multibeam bathymetric surveys were conducted in the survey area.
- XCTD measurements were conducted at 13 sites to improve the accuracy of multibeam bathymetric data.
- Surface-towed geomagnetic measurements using a cesium magnetometer were conducted during the single-channel seismic reflection survey and the multibeam bathymetric line survey.
- Shipboard gravity data and shipboard three-component magnetic data were collected throughout the cruise. "Figure-8" sailings for data calibration of the shipboard magnetic data were conducted at three locations.

4. Acknowledgments

We are grateful to captain Haruhiko Inoue, the officers, and the crew of the R/V Mirai for the outstanding professionalism and dedication that made the cruise successful. We are also indebted to the marine technician team's invaluable help at sea. We thank Masanobu Yanagitani for the arrangements for the cruise. Support from the research fleet department of MarE3, JAMSTEC, Nippon Marine Enterprises Ltd., and Marine Works Japan Ltd. is greatly acknowledged.

5. Notice on Using

This cruise report is a preliminary documentation as of the end of cruise.
This report is not necessarily corrected even if there is any inaccurate description (i.e. taxonomic classifications). This report is subject to be revised without notice. Some data on this report may be raw or unprocessed. If you are going to use or refer the data on this report, it is recommended to ask the Chief Scientist for latest status.
Users of information on this report are requested to submit Publication Report to JAMSTEC.

http://www.godac.jamstec.go.jp/darwin/explain/1/e#report
E-mail: submit-rv-cruise@jamstec.go.jp

6. Cruise Log

R/V "MIRAI" MR22-04 Cruise Log (Time: JST (UT+9 hrs))

Date & Time	Description	Weather / Wind / Wave Height, Sea Swell
2022/06/15 Wed.	Noon Position: 34-33.6N,138-48.0E (Off Izu Peninsula)	c / NE-3 / 2,3
09:00	Let go all shore lines & Departed SHIMIZU port for research area	
13:15	Carried out practical fire abandon ship and damage control station drill	
15:00	Science meeting	
16:00	Start SSV & Sea surface water pump	
2022/06/16 Thu.	Noon Position: 37-34.1N, 142-28.5E (Off Tohoku)	c / SW-3 / 2,3
	Proceed to research area	
19:30-19:55	Carried out eight-figure trace calibration of magnetometer #1	
19:58	Launched XCTD #1	
20:27	Commenced MBES mapping survey	
2022/06/17 Fri.	Noon Position: 41-22.1N,144-36.0E (Off Hokkaido, Pacific Sea)	bc / WSW-4 / 2,2
02:25	Finished MBES mapping survey	
09:45	Arrived at PC-1	
10:20-14:38	Carried out sediment sampling by Piston Corer (PC-1)	
16:24	Launched XCTD #2	
16:55	Commenced SBP mapping survey (mrsbp01 - 12)	
2022/06/18 Sat.	Noon Position: 42-12.4N,145-53.1E (Off Hokkaido, Pacific Sea)	bc / SW-2 / 2,1
13:05	Finished SBP mapping survey	
14:41	Launched XCTD #3	
14:56	Commenced towing cesium magnetometer and MBES mapping survey (Mb1-m+Mb1-sw)	
20:46	Launched XCTD #4	
2022/06/19 Sun.	Noon Position: 41-56.4N,145-52.3E (Off Hokkaido, Pacific Sea)	r / SSW-4 / 2,1
05:05	Launched XCTD #5	
05:58	Finished towing cesium magnetometer and MBES mapping survey (Mb1-m+Mb1-sw)	
06:14	Recovered towing cesium magnetometer and proceeded to PC-2	
07:30	Arrived at PC-2	
08:29-13:03	Carried out sediment sampling by Piston Corer (PC-2)	
16:27	Launched XCTD #6	
16:30	Arrived at SC-1	
16:56	Deployed SCS air gun	
17:04	Deployed streamer cable	
17:14	Deployed towing cesium magnetometer	
17:50	Commenced SCS survey (SC-1)	
2022/06/20 Mon.	Noon Position: 41-31.0N,146-13.8E (Off Hokkaido, Pacific Sea)	c / West-6 / 4,4
17:06	Finished SCS survey (SC-1)	

17:08-17:17	Recovered towing cesium magnetometer	
17:19-17:25	Recovered SCS air gun	
17:29-17:32	Recovered streamer cable	
17:33	Launched XCTD #7	
22:11	Commenced SBP survey (sbpAdd-01, 02, 03 ,04, 05)	
2022/06/21 Tue.	Noon Position: 42-11.0N,145-20.4E (Off Hokkaido, Pacific Sea)	b / WNW-2 / 2,1
04:31	Release XCTD #8	
05:11	Finished MBES and SBP mapping survey	
07:48	Arrived at PC-3	
08:31-11:41	Carried out sediment sampling by Piston Corer (PC-3)	
14:48	Arrived at SC-2	
14:58	Deployed SCS air gun and streamer cable	
15:28	Commenced towing cesium magnetometer	
15:35	Commenced SCS survey (SC-2)	
2022/06/22 Wed.	Noon Position: 41-25.2N,146-34.5E (Off Hokkaido, Pacific Sea)	c / North-4 / 3,2
13:34	Finished SCS survey (SC-2)	
14:04	Recovered SCS air gun and streamer cable	
15:36	Commenced MBES mapping survey with towing cesium magnetometer (Mb1-m)	
2022/06/23 Thu.	Noon Position: 42-14.6N,145-51.4E (Off Hokkaido, Pacific Sea)	o / SE-2 / 2,1
02:34	Finished MBES mapping survey with towing cesium magnetometer (Mb1-m)	
02:40-03:15	Carried out eight-figure trace calibration of magnetometer #2	
06:18	Arrived at PC-4	
08:28-11:59	Carried out sediment sampling by Piston Corer (PC-4)	
14:29	Deployed SCS air gun and streamer cable	
14:40	Commenced towing cesium magnetometer	
14:54	Commenced SCS survey (SC-10)	
2022/06/24 Fri.	Noon Position: 42-11.5N,145-25.0E (Off Hokkaido, Pacific Sea)	o / South-6 / 4,4
14:51	Finished SCS survey (SC-10)	
05:49	Recovered SCS streamer cable	
06:19	Deployed SCS streamer cable	
06:28	Commenced SCS survey (SC-11)	
14:51	Finished SCS survey (SC-11)	
14:53-15:21	Recovered SCS air gun and streamer cable	
15:03-15:12	Recovered towing cesium magnetometer	
19:15	Launched XCTD #9 (PG-2)	
2022/06/25 Sat.	Noon Position: 41-38.1N,144-48.7E (Off Hokkaido, Pacific Sea)	bc / SW-5 / 3,3
01:53	Launched XCTD #10 (PG-1)	
03:51-06:57	Carried out SBP survey (sbp31, 32, 33, 34)	
08:00	Arrived at PC-5	
08:24-12:23	Carried out sediment sampling by Piston Corer (PC-5)	
13:30	Arrived at SC-12	
14:06-14:18	Deployed SCS air gun and streamer cable	
14:20-14:31	Deployed towing cesium magnetometer	

15:01	Commenced SCS survey (SC12)	
2022/06/26 Sun.	Noon Position: 42-00.1N,145-56.0E (Off Hokkaido, Pacific Sea)	bc / SW-6 / 3,3
07:07	Finished SCS survey (SC12)	
07:11-07:15	Recovered SCS streamer cable	
07:15	Launched XCTD #11	
07:46-07:54	Deployed SCS streamer cable	
07:57	Commenced SCS survey (SC13)	
14:45	Finished SCS survey (SC13)	
14:47-14:57	Recovered towing cesium magnetometer	
15:03-15:14	Recovered SCS air gun and streamer cable	
16:09-19:45	Carried out SBP survey (sbp37, 42, 42, 43)	
23:07	Launched XCTD #12	
23:34	Commenced MBES mapping survey (Mb2-se-1)	
2022/06/27 Mon.	Noon Position: 41-42.8N,145-10.6E (Off Hokkaido, Pacific Sea)	c / SW-4 / 2,2
02:22	Finished MBES mapping survey (Mb2-se-1)	
05:30	Arrived at PC-6	
08:29-12:52	Carried out sediment sampling by Piston Corer (PC-6)	
12:52	Proceeded to Mb2-m+se-2	
15:56	Launched XCTD #13	
16:09-16:20	Deployed towing cesium magnetometer	
16:28	Commenced MBES mapping survey (Mb2-m+se-2)	
2022/06/28 Tue.	Noon Position: 39-21.3N, 144-21.7E (Off Kane-ga-saki,)	c / South-3 / 2,2
02:06	Finished MBES mapping survey (Mb2-m+se-2)	
02:06-02:42	Carried out eight-figure trace calibration of magnetometer #3	
02:48	Commenced proceeded to Shimizu	
06:00-06:17	Recovered towing cesium magnetometer	
2022/06/29 Wed.	Noon Position: 35-26.4N,140-55.7E (Off Katsuura)	bc / SW-5/ 3,3
08:58	Start SSV & Sea surface water pump	
2022/06/30 Thu.	Noon Position: 35-01.9N,138-30.3E (SHIMIZU port)	
08:50	Took first shore line & arrived at SHIMIZU port Completed MR22-04 cruise	

Weather: **b**: Blue sky, **bc**: Fine but cloudy, **c**: Cloudy, **o**: Over cast, **r**: Rainy,

7. Instruments and Operations

7-1. Piston Coring

7-1-1. Overview

Piston core sampler system consists of 0.59 ton weight, 6 or 8 m long stainless steel barrels trigger which works as the balance and a pilot core sampler (**Figure 7-1-1**). In addition, the polyvinyl chloride (PVC) liner tube is inside the stainless steel barrel. The inner diameter (I.D.) of the liner tube is 75 mm. The total weight of the system is approximately 0.8 ton. The piston is composed of two O-rings (size: P63). For a pilot core sampler, we used a “74 mm diameter long-type pilot corer” which is 112 kg weight, 70 cm long of the stainless steel pipe and the Poly-carbonate liner tube. The transponder (KAIYO DENSHI Co., Ltd.) was attached to the winch wire above 50 m from the PC to monitor the PC position.

7-1-2. "K-value"

"*K value"* is the strength barometer of the sea bed sediment, which is expressed by the following formula: *K value = pure pull out load / (outer diameter of outer pipe* x *penetration length)*.

7-1-3. Winch operation

At the beginning of the operation of the PC, the speed of wire out was set to 0.3 m/sec, and then increased lowering the speed up to 1.0 m/sec gradually. Wire out was stopped at a depth about 100 m above the seafloor for about 3 minutes to stabilize some pendulum motion of the system. After the wire tension was stable, the wire out was restarted at a speed of 0.3 m/sec, and we carefully watched a tension meter to observe the reaching of the PC to the seafloor. When the corer reached the seafloor, wire tension abruptly decreased by the loss of the corer weight. Wire out was stopped immediately when the corer hit the seafloor. Winding of the wire was started at a speed of 0.3 m/sec until the tension gauge indicates that the corer was lifted off the seafloor. After leaving the PC from the seafloor, the winch wire was wound at the maximum speed.

The results of this cruise are summarized in **Table 7-1-1**. Graphical tension records of winch wire during the operations are attached to the APPENDIX. Coring positions were measured by the transponder.

Table 7-1-1: Summary of the piston coring during MR22-04

Date (UTC)	Core ID	Water Depth	Position (Transponder)		Recovery (m)		Tension MAX	K
		(m)	Latitude	Longitude	PC	PL	(kN)	value
20220617	PC01	4,890	41-22.1407N	144-36.0281E	7.11 / 8	0.60	6.2	0.15
20220619	PC02	5,712	41-56.3792N	145-52.3477E	7.25 / 8	0.33	6.9	0.14
20220621	PC03	3,352	42-09.2943N	145-18.7815E	6.30 / 6	0.06	6.5	0.79
20220623	PC04	3,917	42-14.6699N	145-51.4465E	4.90 / 6	0.22	5.7	0.26
20220625	PC05	4,845	41-38.1188N	144-48.7313E	4.93 / 6	0.50	5.9	0.25
20220627	PC06	5,237	41-42.8301N	145-10.7052E	7.35 / 8	0.31	6.8	0.18

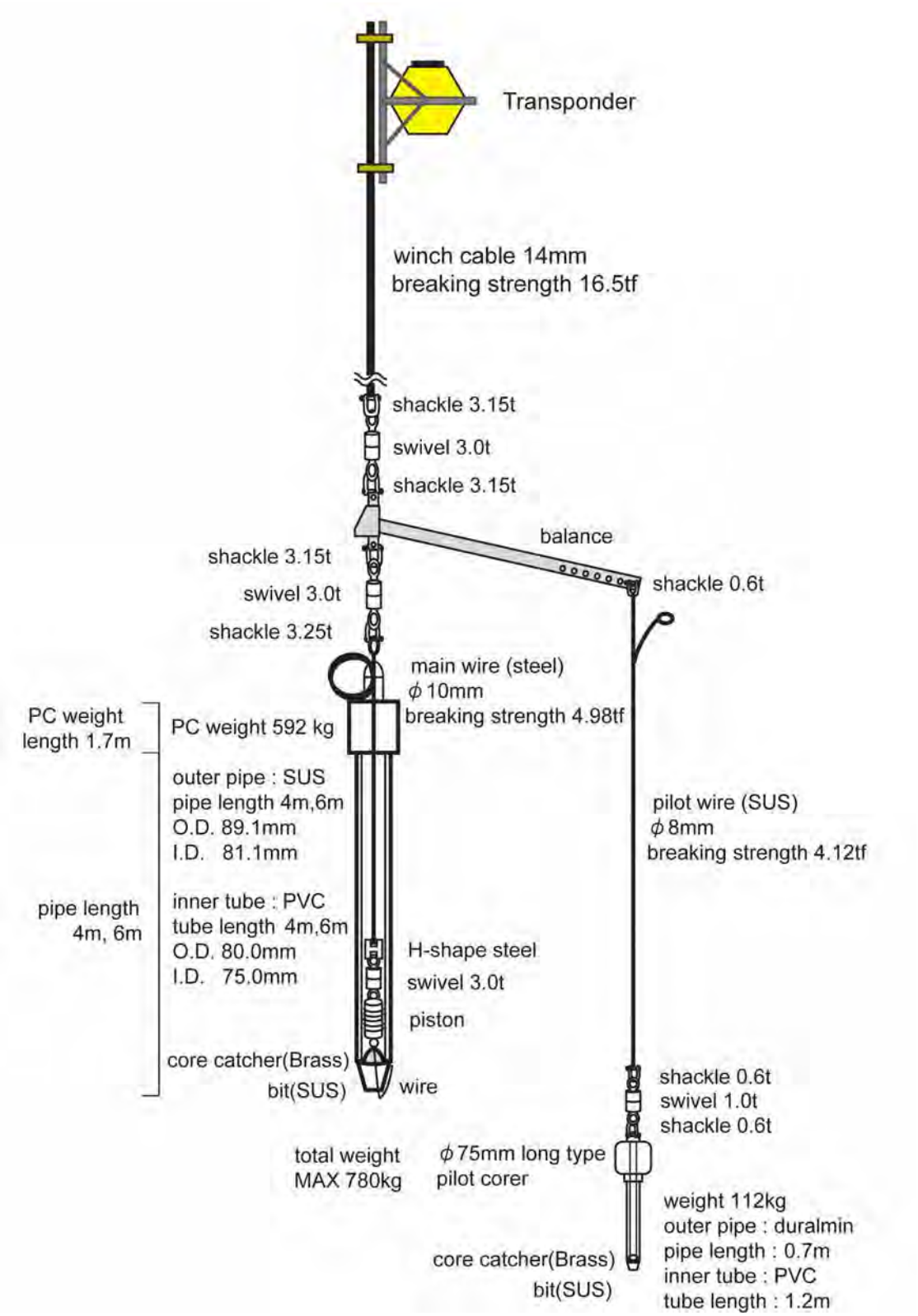


Figure 7-1-1: Piston-corer system used in this cruise.

7-1-4. Multi-Sensor Core Logger (MSCL)

Physical properties are measured with a GEOTEK multi-sensor core logger (MSCL). MSCL has sensors that the gamma-ray attenuation (GRA), the P-wave velocity (PWV) and the magnetic susceptibility (MS), the Non-Contact Resistivity (NCR) and the Natural Gamma Ray Radiation (NGR).

Whole-core samples were kept in the laboratory for the night to equalize the sediment temperature with the room temperature. The measurement interval was every 2 cm for cores (Only an NGR sensor interval was every 20 cm). **Table 7-1-2** is shown the sensor's settings.

After MSCL measurement, whole-core samples were longitudinally cut into working and archive halves by a splitting device and a nylon wire.

Table 7-1-2: Sensor's settings.

Sensor	Interval	Measurement time	Condition check	Calibration
GRA	2 cm	10 seconds	Before Measurement	6/21
PWV	2 cm	Variable	Before Measurement	6/21
MS	2 cm	1 second	Before Measurement	6/21
NCR	2 cm	5 seconds	Before Measurement	6/21
NGR	20 cm	120 seconds	Before Measurement	6/21

7-1-5. Digital imaging system

GEOTEK multi-sensor core logger (MSCL) has a Geoscan V system, which is a line scan camera system with automated focus, aperture, and illumination control that is designed to image split sediment core surfaces.

Split core samples were scanned after scraping the sample surface. Two LED lights were manually adjusted by checking the lightness of the core sample image. **Table 7-1-3** is shown the sensor's settings. After scanning, a ruler was added to the left-hand edge of the images.

Table 7-1-3: Sensor's settings.

Item	Setting	Condition check	Calibration
Focus	Auto	Before Measurement	Before Measurement
Color Balance	Auto	Before Measurement	Before Measurement
Aperture	Auto	Before Measurement	Before Measurement

7-2. Multibeam Bathymetric Survey

7-2-1. Data acquisition

R/V MIRAI is equipped with a Multi narrow Beam Echo Sounding system (MBES), SEABEAM 3012 (L3 Communications, ELAC Nautik, **Table 7-2-1**). The MBES collects continuous bathymetric data along the ship's track to make a contribution to geological and geophysical investigations and global datasets.

To get an accurate sound velocity of the water column for ray-path correction of acoustic multibeam, we used Surface Sound Velocimeter (SSV) data to get the sea surface sound velocity (at 6.62m). Sound velocity profiles in the deeper water column were calculated using measurements from XCTD measurements at 13 sites (See 7-3). The equation of Del Grosso (1974) was used for the calculation.

The bathymetric surveys were conducted at ship speeds of 4-6 knots along the tracks simultaneously single-channel seismic reflection (SCS) or sub-bottom profiler surveys were carried out. The bathymetric data in the off-Sanriku area were acquired with a speed of 8 knots.

Table 7-2-1: SEABEAM 3012 system configuration and performance.

Frequency:	12 kHz
Transmit beam width:	2.0 degree
Transmit power:	4 kW
Transmit pulse length:	2 to 20 msec.
Receive beam width:	1.6 degree
Depth range:	50 to 11,000 m
Number of beams:	301 beams
Beam spacing:	Equi-angle
Swath width:	60 to 150 degrees
Depth accuracy:	< 1 % of water depth (average across the swath)

7-2-2. Data processing

i) Sound velocity correction
Each bathymetry data were corrected with sound velocity profiles calculated from the nearest XCTD data in the distance. The equation of Del Grosso (1974) was used for calculating sound velocity. The data corrections were carried out using the HIPS software version 10.2 (Teledyne CARIS, Canada).

ii) Editing and gridding
Editing for the bathymetry data was carried out using the HIPS. Firstly, the bathymetry data during the ship's turning was basically deleted, and the spike noise of each swath data was removed. Then the bathymetry data were checked by "Regular Grid Surface (resolution: 50 m averaged grid)". Finally, all accepted data were exported as XYZ ASCII data (longitude [degree], latitude [degree], depth [m]), and converted to 150 m grid data using "nearneighbor" utility of GMT (Generic Mapping Tool) software.

7-3. XCTD Measurement

XCTD (eXpendable Conductivity, Temperature, and Depth) measurements to obtain vertical profiles of seawater temperature and salinity were conducted at 13 sites. We launched 12 XCTD-4N probes and 1 XCTD-1 probe by using the automatic launcher, MK-150N digital converter (Tsurumi-Seiki Co.), and AL-12B software (Ver.1.6.4; Tsurumi-Seiki Co.).

Specifications of XCTD probes (Tsurumi-Seiki Co.) are as follows;

Item	Range	Accuracy	Resolution
Conductivity	0 ~ 60 [mS/cm]	+/- 0.03 [mS/cm]	0.015 [mS/cm]
Temperature	-2 ~ 35 [deg-C]	+/- 0.02 [deg-C]	0.01 [deg-C]
(XCTD-4N) Depth	0 ~ 1850 [m]	5 [m] or 2 [%] (whichever is greater)	
(XCTD-1) Depth	0 ~ 1000 [m]	5 [m] or 2 [%] (whichever is greater)	

The summary of the XCTD measurements were shown in **Table 7-3-1**.

Table 7-3-1: Summary of XCTD measurement and launching log (Time: UT).

No.	Site ID	Date [YYYY/MM/DD]	Time [hh:mm]	Latitude [deg]	Longitude [deg]	Depth [m]	SST [deg-C]	SSS [PSU]	Probe S/N	Probe Type	Remarks
1	Sanriku	2022/06/16	10:58	38-55.6247N	143-29.4758E	2358	19.600	-	21129053	XCTD-4N	
2	PC1	2022/06/17	07:25	41-30.8588N	144-58.0755E	5429	12.300	-	21129051	XCTD-4N	
3	Mb1-m-a	2022/06/18	05:40	42-16.1415N	146-05.6573E	4428	17.600	-	21129052	XCTD-4N	
4	Mb1-m-b	2022/06/18	11:46	41-30.3476N	146-20.8786E	5700	18.500	-	21129056	XCTD-4N	
5	Mb1-sw	2022/06/18	20:05	41-55.2078N	146-04.6789E	6016	17.200	-	21129055	XCTD-4N	
6	SC1-a	2022/06/19	07:27	42-26.7729N	145-19.9457E	2492	14.800	-	21129054	XCTD-4N	
7	SC1-b	2022/06/20	08:33	41-14.2419N	146-30.1722E	5447	14.700	-	21129058	XCTD-4N	
8	sbpadd01	2022/06/20	19:31	41-40.0708N	145-09.4269E	5285	14.900	-	21129057	XCTD-4N	measured to 1663m
9	PG2	2022/06/24	10:15	42-14.2136N	144-50.7853E	2216	16.200	-	21129061	XCTD-4N	measured to 1372m
10	PG1	2022/06/24	16:53	41-42.4332N	144-25.9782E	2253	16.200	-	21129060	XCTD-4N	
11	SC12	2022/06/25	22:15	42-06.9943N	146-15.6570E	5691	14.300	-	18128451	XCTD-1	measured to 794m
12	Mb2-se-1	2022/06/26	14:07	41-00.5252N	144-59.3975E	5538	17.400	-	21129059	XCTD-4N	
13	Mb2_m_se_2_Start	2022/06/27	06:59	41-24.2317N	144-33.9200E	4504	17.800	-	21129062	XCTD-4N	

Depth: Water depth [m]
SST: Sea Surface Temperature [deg-C] measured by TSG (ThermoSalinoGraph).
SSS: Sea Surface Salinity [PSU] measured by TSG.

7-4. Sub-Bottom Profiling

Sub-bottom profiler (SBP) data were collected using a SyQwest Bathy 2010 sub-bottom profiler with a 3.5 kHz frequency and a 30° beam width (**Table 7-4-1**). Survey ship speeds were 5 knots. The survey was conducted to inspect piston coring sites for deposition in slope sedimentary basins on the landward slope of the Chishima Trench.

Table 7-4-1: Bathy2010 system configuration and performance

Frequency:	3.5 kHz (FM sweep)
Transmit beam width:	30 degree
Transmit pulse length:	0.5 to 50 msec
Strata resolution:	Up to 8 cm with 300 m of bottom penetration according to bottom type
Depth resolution:	0.1 feet, 0.1 m
Depth accuracy:	±10 cm to 100 m, ± 0.3% to 6,000 m
Sound velocity:	1,500 m/s (fix)

A total of 25 lines of the SBP surveys were conducted (**Table 7-4-2**).

Table 7-4-2: Summary of the SBP survey lines.

mrsbp01:	145° 5.217' E, 41° 40.276'N ~ 145° 7.111' E, 41° 41.151'N
mrsbp02:	145° 18.013' E, 41° 36.026'N ~ 145° 19.824' E, 41° 35.776'N
mrsbp03:	145° 33.106' E, 41° 45.525'N ~ 145° 36.058' E, 41° 43.876'N
mrsbp04:	145° 54.742' E, 41° 53.991'N ~ 145° 57.018' E, 41° 54.570'N
mrsbp05:	146° 5.429' E, 41° 54.478'N ~ 146° 6.867' E, 41° 55.048'N
mrsbp06:	145° 38.787' E, 41° 58.872'N ~ 145° 44.392' E, 42° 0.846'N
mrsbp07:	145° 49.565' E, 41° 54.631'N ~ 145° 53.228' E, 41° 56.962'N
mrsbp08:	145° 48.137' E, 42° 11.737'N ~ 145° 53.117' E, 42° 12.404'N
mrsbp09:	145° 49.969' E, 42° 14.580'N ~ 145° 53.626' E, 42° 14.758'N
mrsbp10:	145° 15.751' E, 42° 9.611'N ~ 145° 21.427' E, 42° 9.020'N
mrsbp11:	145° 57.865' E, 41° 46.199'N ~ 145° 58.745' E, 41° 46.325'N
mrsbp12:	145° 1.748' E, 41° 32.135'N ~ 145° 6.084' E, 41° 34.126'N
sbpAdd01:	145° 09.36'E, 41° 40.00'N ~ 145° 10.89'E, 41° 43.26'N
sbpAdd02:	145° 02.00'E, 41° 43.70'N ~ 145° 07.00'E, 41° 46.00'N
sbpAdd03:	145° 20.166'E, 41° 51.102'N ~ 145° 21.99'E, 41° 51.864'N
sbpAdd04:	145° 27.3606'E, 41° 56.472'N ~ 145° 30.60'E, 41° 54.00'N
sbpAdd05:	145° 45.00'E, 41° 56.200'N ~ 145° 50.52'E, 41° 58.000'N
sbp31:	144° 48.336'E, 41° 51.470'N ~ 144° 46.699'E, 41° 51.470'N
sbp32:	144° 51.659'E, 41° 52.914'N ~ 144°53.771'E, 41° 54.253'N
sbp33:	144° 47.549'E, 41° 47.815'N ~ 144° 50.034'E, 41° 48.469'N ~ 144° 51.495'E, 41° 49.429'N
sbp34:	144° 55.513'E, 41° 50.540'N ~ 144° 57.196'E, 41° 50.919'N
sbp37:	145° 49.491'E, 41° 50.730'N ~ 145° 48.437'E, 41° 49.847'N
sbp41:	145° 47.80'E, 41° 38.77'N ~ 145° 46.59'E, 41° 38.74'N
sbp42:	145° 43.96'E, 41° 36.72'N ~ 145° 41.98'E, 41° 36.07'N
sbp43:	145° 36.39'E, 41° 31.23'N ~ 145° 31.22'E, 41° 30.08'N

7-5. Single Channel Seismic Reflection Survey

7-5-1. Data acquisition

The single channel seismic reflection (SCS) survey was conducted along six survey lines (**Figures 7-5-1** to **7-5-4**). A GI gun (Sercel) was used for a seismic source. The chamber size was 355 cu in. (Generator: 250 cu in., Injector: 105 cu in.). The GI gun was towed 17.257 m behind the ship's center and towing depth was ~2 m. A hydrophone streamer was towed behind the ship from the port side. A 12-channel streamer (S.I.G.16) was used. The streamer lead-in-cable length was 135 m and the active section length was 60 m (**Figure 7-5-5**). Survey ship speed was ~4 knots, and shots were fired at a time spacing of 14 seconds (~29 m spacing) or 12 seconds (~25 m spacing). The detailed information on the SCS survey is described in **Tables 7-5-1** to **7-5-3**.

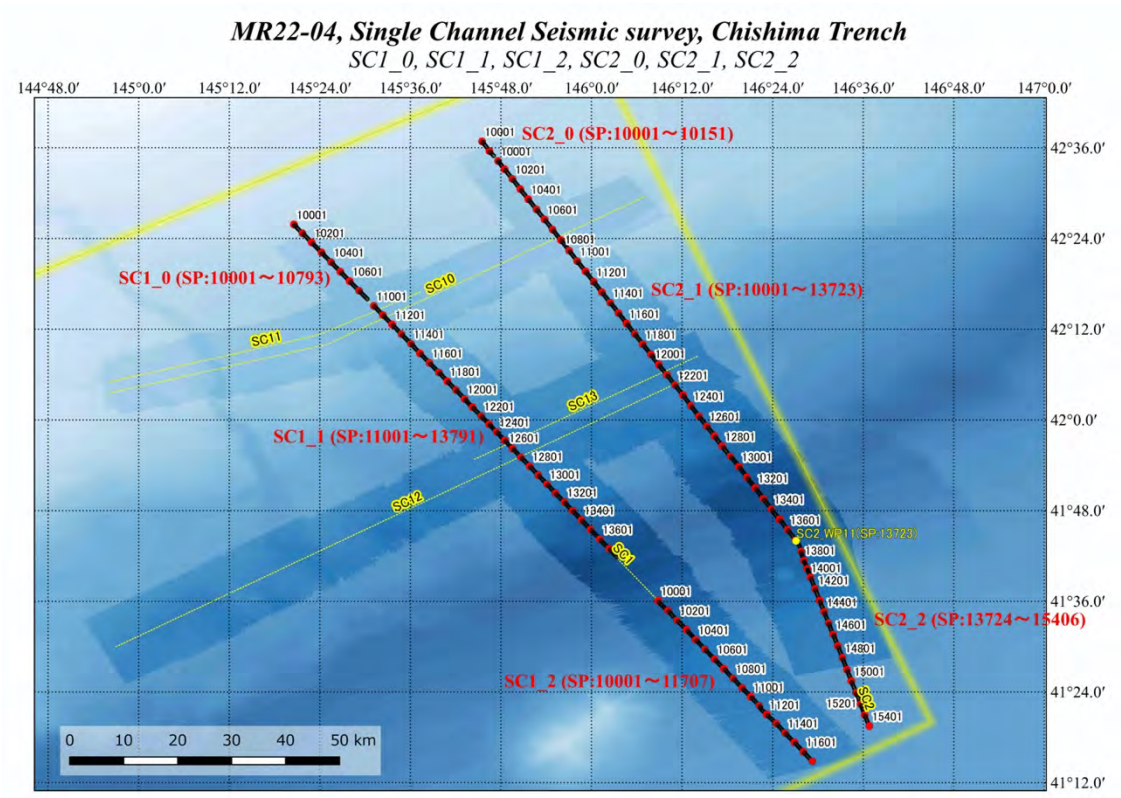


Figure 7-5-1: Location map of Line SC1 and SC2.

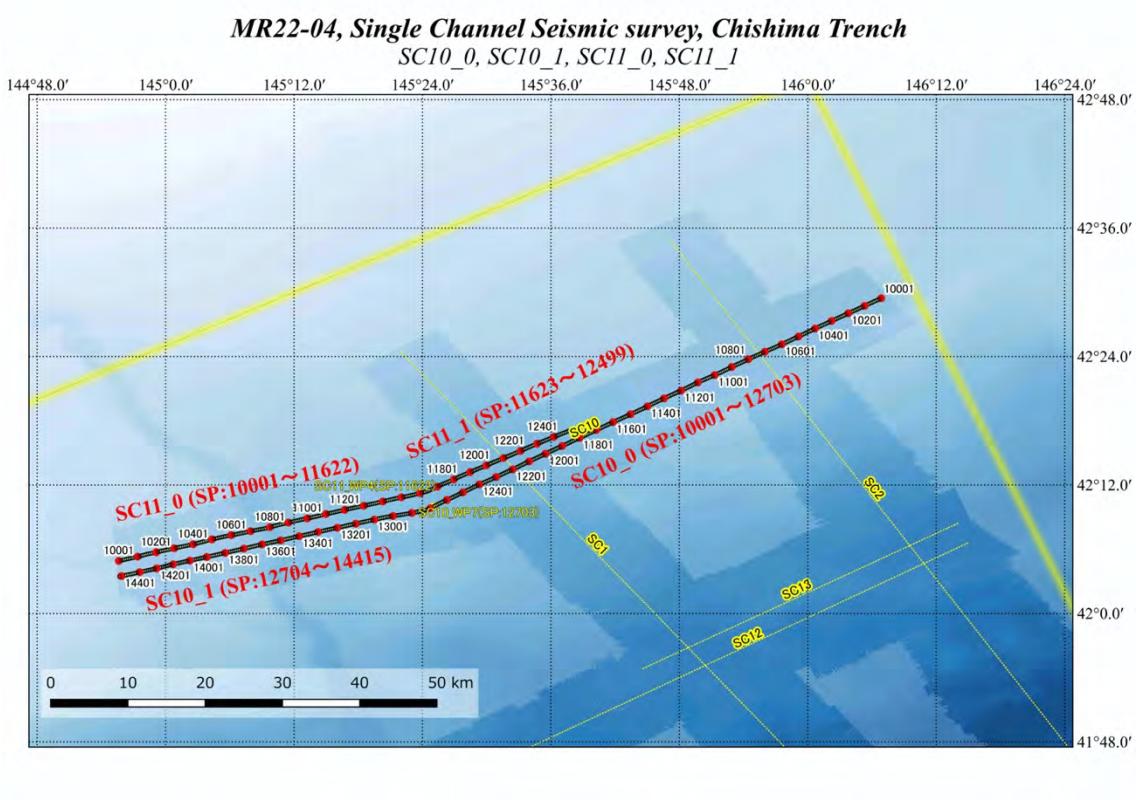


Figure 7-5-2: Location map of Line SC10 and SC11.

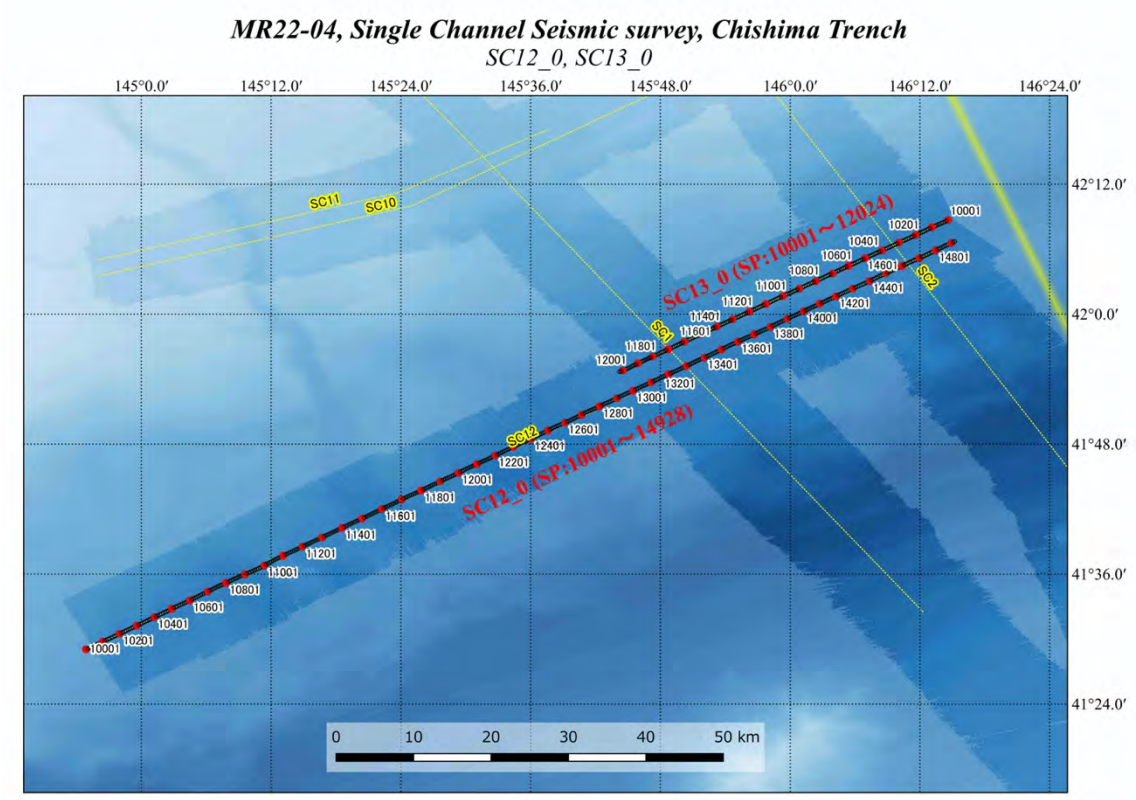


Figure 7-5-3: Location map of Line SC12 and SC13.

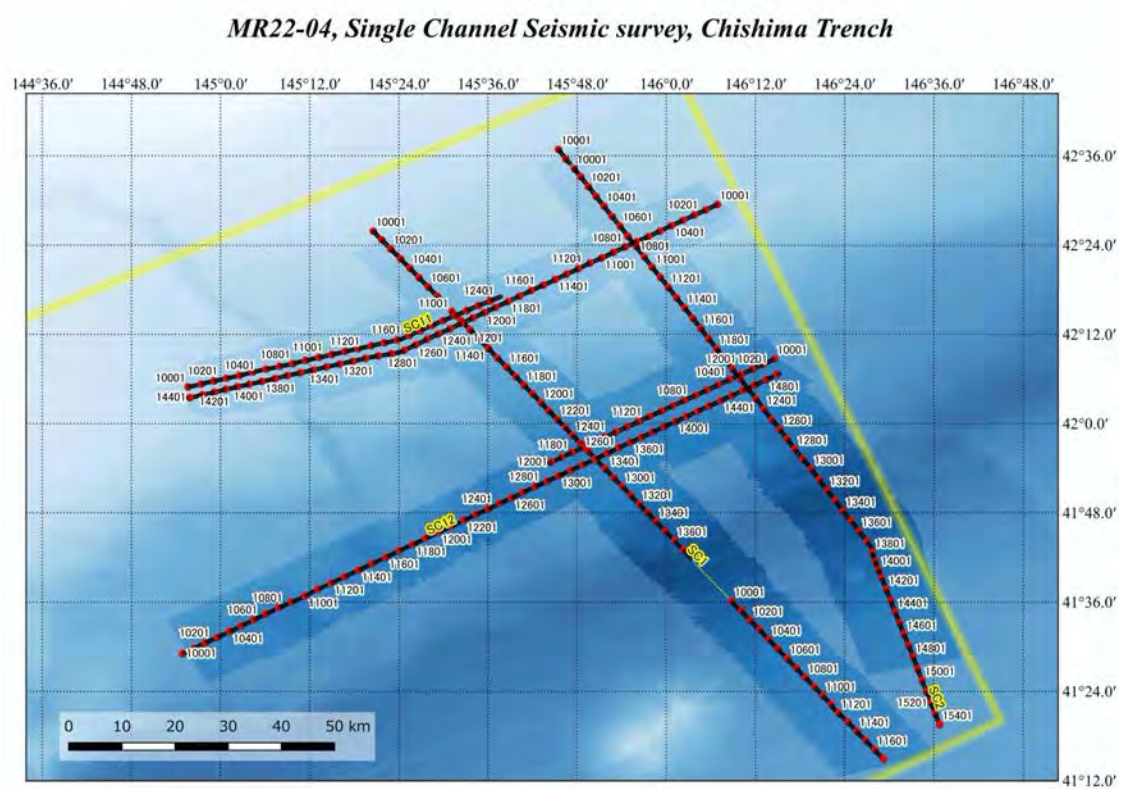


Figure 7-5-4: Location map of all Lines.

Table 7-5-1: Single channel seismic equipment and survey specification for MR22-04.

Streamer

Manufacturer	S.I.G Multi-Channel Streamer
Active section length	60 m (Hydrophone section 30m)
Hydrophone interval	0.41 m
Type of hydrophone	S.I.G.16
Hydrophone output	-183 dB, re 1V/μbar, ±1dB
Frequency	flat ±1 dB, over the frequency range 10 to 1000 Hz
Depth sensor	None
Preamp gain	26 dB (Unvariable)
Power supply unit gain	0 dB
Lead in cable length	135 m

Source

Manufacturer	Sercel
Type of airgun	GI Gun
Volume	355 cu.in (G:250 cu.in, I:105 cu.in), 1 array
Air pressure	13.8 MPa (2000 psi)
Source depth	2 m
Gun controller	Hotshot ver. 3.3000

Air Compressor

Manufacturer	National Compressed Air
Type of machine	NCA5-138×2(Used 1 unit)
Air supply capacity	5 m^3/min/Unit.

Recording System

Manufacturer	GEOMETRICS
Type of system	Geode ver. 11.1.69.0
Recording format	SEG-D 8058 Rev.1 Promax
Recording length	9,000 msec: SC10_0, SC10_1, SC11_0, SC11_1, SC12_0, SC13_0
	11,000 msec: SC1_0, SC1_1, SC1_2, SC2_0, SC2_1, SC2_2
Water delay	0 msec
Sample rate	1 msec
Analog gain (12dB or 24dB)	12 dB High cut filter
	None
Low cut filter	3 Hz
Recording media	Hard Disk

GPS System

Manufacturer	Fugro
Type of system	StarPack-D
DGPS reference station	Best Position Reference Station (OCSAT)

Navigation System

Manufacturer	MARIMEX JAPAN
Type of system	NAVLOG ver. 2.2.8

Air-Gun Shot

Time mode shooting	harmonic mode (355 cu.in)
Shot interval	*12 sec*: SC10_0, SC10_1, SC11_0, SC11_1, SC12_0, SC13_0
	14 sec: SC1_0, SC1_1, SC1_2, SC2_0, SC2_1, SC2_2

Geodetic Parameter

Spheroid	WGS84
Semi-major axis	6,378,137 m
Inverse flattening	298.26
Projection	U.T.M Zone55

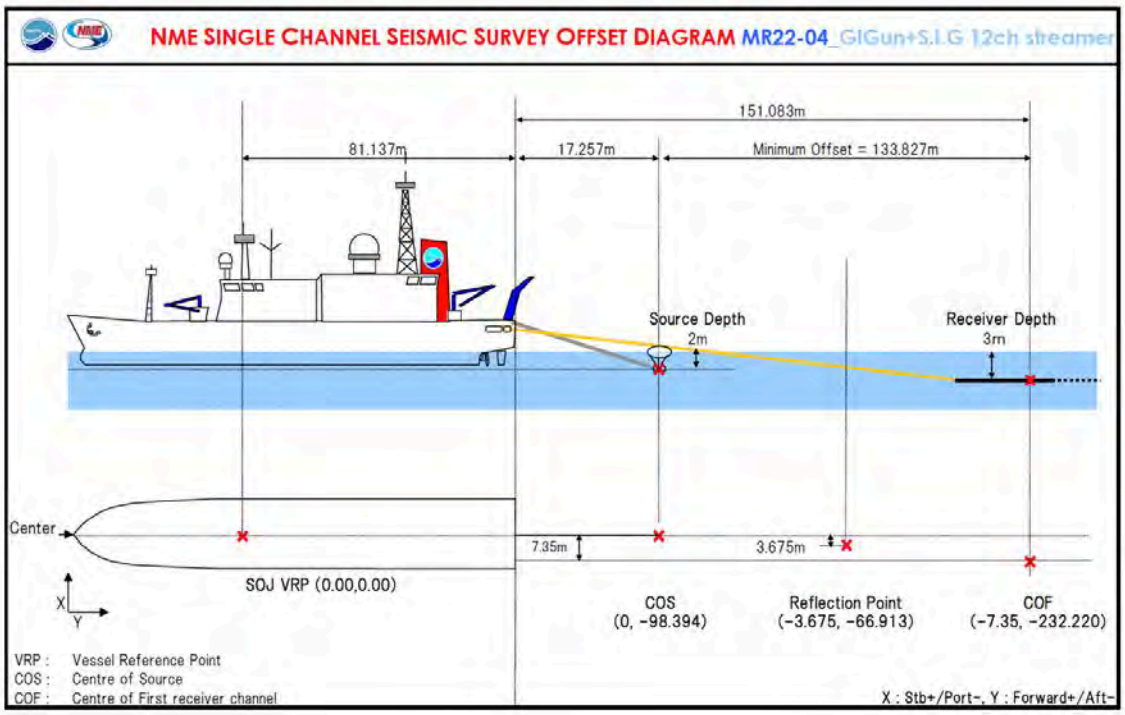


Figure 7-5-5: Offset diagram.

Table 7-5-2: Single channel seismic survey line list.

NME SCS SURVEY LINE LIST MR22-04

Line No.	Date (UTC)	Time (UTC)	Passing Point	Shot No.	Shot Position		Length [m]	Direction [deg]
					Lat.	Lon.		
SC1_0	2022/6/19	8:50:31	F.S.P = F.G.S.P	10001	42-25.85655	145-20.56458	22,683	Refer to General Information
	2022/6/19	11:56:20	L.S.P = L.G.S.P	10793	42-15.97458	145-30.31952		
SC1_1	2022/6/19	12:16:27	F.S.P = F.G.S.P	11001	42-15.07988	145-31.15906	75,943	Refer to General Information
	2022/6/19	23:10:44	L.S.P = L.G.S.P	13791	41-41.85516	146-03.36090		
SC1_2	2022/6/20	1:25:56	F.S.P = F.G.S.P	10001	41-36.06903	146-08.83575	48,788	Refer to General Information
	2022/6/20	8:06:08	L.S.P = L.G.S.P	11707	41-14.76173	146-29.32892		
SC2_0	2022/6/21	6:36:10	F.S.P = F.G.S.P	10001	42-36.84792	145-45.48248	4,140	150.3
	2022/6/21	7:11:08	L.S.P = L.G.S.P	10151	42-34.93652	145-47.04712		
SC2_1	2022/6/21	7:30:42	F.S.P = F.G.S.P	10001	42-34.25262	145-47.61841	108,271	Refer to General Information
	2022/6/21	22:04:04	L.S.P = L.G.S.P	13723	41-43.77983	146-27.27173		
SC2_2	2022/6/21	22:04:19	F.S.P = F.G.S.P	13724	41-43.76587	146-27.28180	46,985	163.8
	2022/6/22	4:38:57	L.S.P = L.G.S.P	15406	41-19.44122	146-36.82068		
SC10_0	2022/6/23	5:55:50	F.S.P = F.G.S.P	10001	42-29.43855	146-06.86005	68,393	Refer to General Information
	2022/6/23	15:00:08	L.S.P = L.G.S.P	12703	42-09.81216	145-24.69727		
SC10_1	2022/6/23	15:00:20	F.S.P = F.G.S.P	12704	42-09.80415	145-24.68170	41,769	Refer to General Information
	2022/6/23	20:44:55	L.S.P = L.G.S.P	14415	42-03.44124	144-55.63293		
SC11_0	2022/6/23	21:28:13	F.S.P = F.G.S.P	10001	42-04.91272	144-55.62653	41,094	Refer to General Information
	2022/6/24	2:54:46	L.S.P = L.G.S.P	11622	42-11.32851	145-24.16077		
SC11_1	2022/6/24	2:54:58	F.S.P = F.G.S.P	11623	42-11.33286	145-24.17816	21,644	68.0
	2022/6/24	5:51:20	L.S.P = L.G.S.P	12499	42-17.12814	145-37.82593		
SC12_0	2022/6/25	5:35:41	F.S.P = F.G.S.P	10001	41-29.04739	144-54.87854	131,538	Refer to General Information
	2022/6/25	22:07:48	L.S.P = L.G.S.P	14928	42-06.75522	146-15.30304		
SC13_0	2022/6/25	22:57:36	F.S.P = F.G.S.P	10001	42-08.68011	146-14.57611	49,356	Refer to General Information
	2022/6/26	5:45:31	L.S.P = L.G.S.P	12024	41-54.67140	145-44.17969		

Table 7-5-3: Information on each survey line.

NME Single Channel Seismic Survey General Information

MR22-04

General

CLIENT	JAMSTEC			
CRUISE	MR22-04			
AREA	Chishima Trench			
LINE	SC1_0			
DIRECTION (°)	144.93° *Refer to remarks			
DATE	2022/6/19			
WEATHER	Cloudy			
WIND	SSW-5(Fresh breeze)			
SEA CONDITION	Sea slight			
FIRST SHOT POINT	SP No.	10001	FF No.	10001
FIRST GOOD SHOT POINT	SP No.	10001	FF No.	10001
	N		42-25.85655	
	E		145-20.56458	
	Time (UTC)		8:50:31	
	Water Depth (m)		2573	
LAST SHOT POINT	SP No.	10793	FF No.	10793
LAST GOOD SHOT POINT	SP No.	10729	FF No.	10729
	N		42-15.97458	
	E		145-30.31952	
	Time (UTC)		11:56:20	
	Water Depth (m)		3653	

Source

GUN TYPE	GI Gun
SHOT TYPE	Harmonic Mode
SHOT MODE	Time
SHOT INTERVAL	14 sec
NUMBER OF STRINGS	1
TOTAL VOLUME	355 cu.in.
CONFIGURATION	(Generator:250 + Injector:105 cu.in) x 1
GUN DEPTH	2.0 m
AIR PRESSURE	13.8 MPa(2000 psi)
GUN CONTROLLER	Hotshot ver 3.300
GUN TOWING WIRE LENGTH	18.58 m

Receiver

RECEIVER TYPE	S.I.G Multi-Channel Streamer
HYDROPHONE	S.I.G.16
NUMBER OF CHANNEL	12
NO. OF HYD./GROUP	5
SENSITIVITY	-183 dB. re 1V/μbar. ±1dB
Active Section depth	7.382 m (avarage)
ACTIVE SECTION	30.0 m
LEAD-IN Towing Length	135.0 m

Recording

RECORDING SYSTEM	Geode ver 11.1.69.0
SAMPLE FREQUENCY	1 msec
RECORDING LENGTH	11,000 msec
WATER DELAY	0 msec
RECORDING FORMAT	SEG-D 8058 Rev.1 Promax
ANALOG / PREAMP	26 dB / 12 dB
HICUT FILTER	None
LOWCUT FILTER	None
SYSTEM DELAY	100ms (from start recording to gun firing)
GPS SYSTEM	Best Position Reference Station (OCSAT)
NAVIGATION SYSTEM	Navlog ver 2.2.8

Data

SEISMIC DATA	10001.sgd - 10793.sgd(793 Files)
	(Folder name : MR22-04_SC1_0)
NAVIGATION DATA	SC1_0_Shot.csv
	SC1_0_LOG.csv

Remarks

SHIP SPEED AGAINST GROUND : 3.966 knot
SHIP SPEED AGAINST WATER : 4.049 knot

The ship changed its direction at waypoints.
Start→WP1 : Direction 144.9378°(SP10001 - SP10466)
WP1→WP2 : Direction 144.9380° (SP10467 - SP10793)

Gun controler was many bubble error(Refer to HOTSHOT log file).

SP107230-SP10793
= HOTSHOT(Gun controler) and Geode(segD recording system) was disable.
due to compressor was machine trouble.

SPW prosessing used file = FF10001-FF10729

SPW prosessing image(BITMAP)
· MR22-04_SC1_0_stk_filt_2000mpi.bmp (Hi resolution image)
=1inch per 2,000m survey distance(≒70 shots)
· MR22-04_SC1_0_stk_filt_10000mpi.bmp (Low resolution image)
=1inch per 10,000m survey distance(≒350 shots)

Processing

Static Correction	93.746 msec
Time Variant Bandpass Filter	20-25-400-500 Hz
Spherical Divergence Correction	T^1.6
Normal Move Out / CMP Stack	1525m/s
Time Variant Bandpass Filter	20-25-240-250 Hz

Observer

Kazuho YOSHIDA, Toshimasa NASU, Ryo KIMURA, Soichiro SUEYOSHI, Fumine OKADA

NME SINGLE CHANNEL SEISMIC SURVEY GENERAL INFORMATION

MR22-04

GENERAL

CLIENT	JAMSTEC			
CRUISE	MR22-04			
AREA	Chishima Trench			
LINE	SC1_1			
DIRECTION (°)	144.93° *Refer to remarks			
DATE	2022/6/19			
WEATHER	Overcast			
WIND	SW-5(Fresh breeze)			
SEA CONDITION	Sea smooth			
FIRST SHOT POINT	SP No.	11001	FF No.	11001
FIRST GOOD SHOT POINT	SP No.	11001	FF No.	11001
	N		42-15.07988	
	E		145-31.15906	
	Time (UTC)		12:16:27	
	Water Depth (m)		3717	
LAST SHOT POINT	SP No.	13791	FF No.	13791
LAST GOOD SHOT POINT	SP No.	13791	FF No.	13791
	N		41-41.85516	
	E		146-03.36090	
	Time (UTC)		23:10:44	
	Water Depth (m)		7151	

SOURCE

GUN TYPE	GI Gun
SHOT TYPE	Harmonic Mode
SHOT MODE	Time
SHOT INTERVAL	14 sec
NUMBER OF STRINGS	1
TOTAL VOLUME	355 cu.in.
CONFIGURATION	(Generator:250 + Injector:105 cu.in) x 1
GUN DEPTH	2.0 m
AIR PRESSURE	13.8 MPa(2000 psi)
GUN CONTROLLER	Hotshot ver 3.300
GUN TOWING WIRE LENGTH	18.58 m

RECEIVER

RECEIVER TYPE	S.I.G Multi-Channel Streamer
HYDROPHONE	S.I.G.16
NUMBER OF CHANNEL	12
NO. OF HYD./GROUP	5
SENSITIVITY	-183 dB, re 1V/μbar, ±1dB
Active Section depth	6.884 m (avarage)
ACTIVE SECTION	30.0 m
LEAD-IN Towing Length	135.0 m

RECORDING

RECORDING SYSTEM	Geode ver 11.1.69.0
SAMPLE FREQUENCY	1 msec
RECORDING LENGTH	11,000 msec
WATER DELAY	0 msec
RECORDING FORMAT	SEG-D 8058 Rev.1 Promax
ANALOG / PREAMP	26 dB / 12 dB
HICUT FILTER	None
LOWCUT FILTER	None
SYSTEM DELAY	100ms (from start recording to gun firing)
GPS SYSTEM	Best Position Reference Station (OCSAT)
NAVIGATION SYSTEM	Navlog ver 2.2.8

DATA

SEISMIC DATA	11001.sgd - 13791.sgd(2791 Files)
	(Folder name : MR22-04_SC1_1)
NAVIGATION DATA	SC1_1_Shot.csv
	SC1_1_LOG.csv

REMARKS

SHIP SPEED AGAINST GROUND : 3.76 knot

SHIP SPEED AGAINST WATER : 4.26 knot

SC1_0 last SP - SC1_1 first SP distance = 2,019m

The ship changed its direction at waypoints.
Start→WP3 : Direction 144.9380° (SP11000 - SP11303)
WP3→WP4 : Direction 144.9379° (SP11304 - SP11648)
WP4→WP5 : Direction 144.9381° (SP11649 - SP12019)
WP5→WP6 : Direction 144.9381° (SP12020 - SP12420)
WP6→WP7 : Direction 144.9385° (SP12021 - SP12807)
WP7→WP8 : Direction 144.9374° (SP12808 - SP13174)
WP8→WP9 : Direction 144.9386° (SP13175 - SP13536)
WP9→End : Direction 144.9377° (SP13537 - SP13791)

SP11731-SP13791(last shot)
= HOTSHOT(Gun controler) was NO FIRE error,
but air gun was nomal shots.
Due to air gun monitor hydrophone was damaged.

SPW prosessing image(BITMAP)
・MR22-04_SC1_1_stk_filt_2000mpi.bmp (Hi resolution image)
=1inch per 2,000m survey distance(≒74 shots)
・MR22-04_SC1_1_stk_filt_10000mpi.bmp (Low resolution image)
=1inch per 10,000m survey distance(≒369 shots)

PROCESSING

Static Correction	94.080 msec
Time Variant Bandpass Filter	20-25-400-500 Hz
Spherical Divergence Correction	T^1.6
Normal Move Out / CMP Stack	1525m/s
Time Variant Bandpass Filter	20-25-240-250 Hz

OBSERVER

Kazuho YOSHIDA, Toshimasa NASU, Ryo KIMURA, Soichiro SUEYOSHI, Fumine OKADA

NME SINGLE CHANNEL SEISMIC SURVEY GENERAL INFORMATION

MR22-04

GENERAL

CLIENT	JAMSTEC			
CRUISE	MR22-04			
AREA	Chishima Trench			
LINE	SC1_2			
DIRECTION (°)	145° *Refer to remarks			
DATE	2022/6/20			
WEATHER	Cloudy			
WIND	West-6(Strong breeze)			
SEA CONDITION	Sea moderate			
FIRST SHOT POINT	SP No.	10001	FF No.	10001
FIRST GOOD SHOT POINT	SP No.	10001	FF No.	10001
	N		41-36.06903	
	E		146-08.83575	
	Time (UTC)		1:25:56	
	Water Depth (m)		6560	
LAST SHOT POINT	SP No.	11707	FF No.	11707
LAST GOOD SHOT POINT	SP No.	11707	FF No.	11707
	N		41-14.76173	
	E		146-29.32892	
	Time (UTC)		8:06.08	
	Water Depth (m)		5476	

SOURCE

GUN TYPE	GI Gun
SHOT TYPE	Harmonic Mode
SHOT MODE	Time
SHOT INTERVAL	14 sec
NUMBER OF STRINGS	1
TOTAL VOLUME	355 cu.in.
CONFIGURATION	(Generator:250 + Injector:105 cu.in) x 1
GUN DEPTH	2.0 m
AIR PRESSURE	13.8 MPa(2000 psi)
GUN CONTROLLER	Hotshot ver 3.300
GUN TOWING WIRE LENGTH	18.58 m

RECEIVER

RECEIVER TYPE	S.I.G Multi-Channel Streamer
HYDROPHONE	S.I.G.16
NUMBER OF CHANNEL	12
NO. OF HYD./GROUP	5
SENSITIVITY	-183 dB, re 1V/μbar, ±1dB
Active Section depth	8.428 m (avarage)
ACTIVE SECTION	30.0 m
LEAD-IN Towing Length	135.0 m

RECORDING

RECORDING SYSTEM	Geode ver 11.1.69.0
SAMPLE FREQUENCY	1 msec
RECORDING LENGTH	11,000 msec
WATER DELAY	0 msec
RECORDING FORMAT	SEG-D 8058 Rev.1 Promax
ANALOG / PREAMP	26 dB / 12 dB
HICUT FILTER	None
LOWCUT FILTER	None
SYSTEM DELAY	100ms (from start recording to gun firing)
GPS SYSTEM	Best Position Reference Station (OCSAT)
NAVIGATION SYSTEM	Navlog ver 2.2.8

DATA

SEISMIC DATA	10001.sgd - 11707.sgd(1705 Files)
	(Folder name : MR22-04_SC1_2)
NAVIGATION DATA	SC1_2_Shot.csv
	SC1_2_LOG.csv

REMARKS

SHIP SPEED AGAINST GROUND : 3.96 knot

SHIP SPEED AGAINST WATER : 4.32 knot

SC1_1 last SP - SC1_2 first SP distance = 13,133m

The ship changed its direction at waypoints.
Start→WP_end : Direction 144.9379° (SP10001 - SP10278)
WP_end→WP12 : Direction 144.5725° (SP10279 - SP10617)
WP12→WP13 : Direction 144.5732° (SP10618 - SP10969)
WP13→WP14 : Direction 144.5731° (SP10970- SP11336)
WP14→End : Direction 144.5727° (SP11337- SP11707)

Go away from survey line, due to avoiding to floating debris.
(SP11117-SP11295, MAX DC Offset =221.2m;SP11142)

FF11472 was recording time 42sec,
due to Geode(segD recording system) recording time delay.
SP11472-SP11473 was no record (SP11474=FF11472).

SPW prosessing image(BITMAP)
・MR22-04_SC1_2_stk_filt_2000mpi.bmp (Hi resolution image)
=1inch per 2,000m survey distance(≒70 shots)
・MR22-04_SC1_2_stk_filt_10000mpi.bmp (Low resolution image)
=1inch per 10,000m survey distance(≒355 shots)

PROCESSING

Static Correction	93.047 msec
Time Variant Bandpass Filter	20-25-400-500 Hz
Spherical Divergence Correction	T^1.6
Normal Move Out / CMP Stack	1525m/s
Time Variant Bandpass Filter	20-25-240-250 Hz

OBSERVER

Kazuho YOSHIDA, Toshimasa NASU, Ryo KIMURA, Soichiro SUEYOSHI, Fumine OKADA

NME SINGLE CHANNEL SEISMIC SURVEY GENERAL INFORMATION

MR22-04

GENERAL

CLIENT	JAMSTEC			
CRUISE	MR22-04			
AREA	Chishima Trench			
LINE	SC2_0			
DIRECTION (°)	150.3°			
DATE	2022/6/21			
WEATHER	Fog			
WIND	SW-4(Moderate breeze)			
SEA CONDITION	Sea smooth			
FIRST SHOT POINT	SP No.	10001	FF No.	10001
FIRST GOOD SHOT POINT	SP No.	10001	FF No.	10001
	N		42-36.84792	
	E		145-45.48248	
	Time (UTC)		6:36:10	
	Water Depth (m)		2631	
LAST SHOT POINT	SP No.	10151	FF No.	10151
LAST GOOD SHOT POINT	SP No.	10150	FF No.	10150
	N		42-34.93652	
	E		145-47.04712	
	Time (UTC)		7:11:08	
	Water Depth (m)		2796	

SOURCE

GUN TYPE	GI Gun
SHOT TYPE	Harmonic Mode
SHOT MODE	Time
SHOT INTERVAL	14 sec
NUMBER OF STRINGS	1
TOTAL VOLUME	355 cu.in.
CONFIGURATION	(Generator:250 + Injector:105 cu.in) x 1
GUN DEPTH	2.0 m
AIR PRESSURE	13.8 MPa(2000 psi)
GUN CONTROLLER	Hotshot ver 3.300
GUN TOWING WIRE LENGTH	18.58 m

RECEIVER

RECEIVER TYPE	S.I.G Multi-Channel Streamer
HYDROPHONE	S.I.G.16
NUMBER OF CHANNEL	12
NO. OF HYD./GROUP	5
SENSITIVITY	-183 dB, re 1V/μbar, ±1dB
CABLE DEPTH	4.152 m (avarage)
ACTIVE SECTION	30.0 m
LEAD-IN Towing Length	135.0 m

RECORDING

RECORDING SYSTEM	Geode ver 11.1.69.0
SAMPLE FREQUENCY	1 msec
RECORDING LENGTH	11,000 msec
WATER DELAY	0 msec
RECORDING FORMAT	SEG-D 8058 Rev.1 Promax
ANALOG / PREAMP	26 dB / 12 dB
HICUT FILTER	None
LOWCUT FILTER	None
SYSTEM DELAY	100ms (from start recording to gun firing)
GPS SYSTEM	Best Position Reference Station (OCSAT)
NAVIGATION SYSTEM	Navlog ver 2.2.8

DATA

SEISMIC DATA	10001.sgd - 10151.sgd(150 Files)
	(Folder name : MR22-04_SC2_0)
NAVIGATION DATA	SC2_0_Shot.csv
	SC2_0_LOG.csv

REMARKS

SHIP SPEED AGAINST GROUND : 3.84 knot

SHIP SPEED AGAINST WATER : 4.19 knot

SP10003 shot interval 2sec ,due to ubnormal trigger timing.

SP10003 was no record.

SP10001-SP10002 : SP=FF, after SP10004 : SP=FF-1

SP10151

= Finished survey, due to compressor was machine trouble.

HOTSHOT(Gun controler) and Geode(segD recording system) was disable.

SPW prosessing image(BITMAP)
- MR22-04_SC2_0_stk_filt_2000mpi.bmp (Hi resolution image) =1inch per 2,000m survey distance(≒72 shots)
- MR22-04_SC2_0_stk_filt_10000mpi.bmp (Low resolution image) =1inch per 10,000m survey distance(≒361 shots)

PROCESSING

Static Correction	95.899 msec
Time Variant Bandpass Filter	20-25-400-500 Hz
Spherical Divergence Correction	T^1.6
Normal Move Out / CMP Stack	1525m/s
Time Variant Bandpass Filter	20-25-240-250 Hz

OBSERVER

Kazuho YOSHIDA, Toshimasa NASU, Ryo KIMURA, Soichiro SUEYOSHI, Fumine OKADA

NME SINGLE CHANNEL SEISMIC SURVEY GENERAL INFORMATION

MR22-04

GENERAL

CLIENT	JAMSTEC			
CRUISE	MR22-04			
AREA	Chishima Trench			
LINE	SC2_1			
DIRECTION (°)	150.3°			
DATE	2022/6/21			
WEATHER	Cloudy			
WIND	North-3(Gentle breeze)			
SEA CONDITION	Sea slight			
FIRST SHOT POINT	SP No.	10001	FF No.	10001
FIRST GOOD SHOT POINT	SP No.	10001	FF No.	10001
	N		42-34.25262	
	E		145-47.61841	
	Time (UTC)		7:30:42	
	Water Depth (m)		2854	
LAST SHOT POINT	SP No.	13723	FF No.	13723
LAST GOOD SHOT POINT	SP No.	13723	FF No.	13723
	N		41-43.77983	
	E		146-27.27173	
	Time (UTC)		22:04:04	
	Water Depth (m)		6589	

SOURCE

GUN TYPE	GI Gun
SHOT TYPE	Harmonic Mode
SHOT MODE	Time
SHOT INTERVAL	14 sec
NUMBER OF STRINGS	1
TOTAL VOLUME	355 cu.in.
CONFIGURATION	(Generator:250 + Injector:105 cu.in) x 1
GUN DEPTH	2.0 m
AIR PRESSURE	13.8 MPa(2000 psi)
GUN CONTROLLER	Hotshot ver 3.300
GUN TOWING WIRE LENGTH	18.58 m

RECEIVER

RECEIVER TYPE	S.I.G Multi-Channel Streamer
HYDROPHONE	S.I.G.16
NUMBER OF CHANNEL	12
NO. OF HYD./GROUP	5
SENSITIVITY	-183 dB, re 1V/μbar, ±1dB
CABLE DEPTH	3.797 m (avarage)
ACTIVE SECTION	30.0 m
LEAD-IN Towing Length	135.0 m

RECORDING

RECORDING SYSTEM	Geode ver 11.1.69.0
SAMPLE FREQUENCY	1 msec
RECORDING LENGTH	11,000 msec
WATER DELAY	0 msec
RECORDING FORMAT	SEG-D 8058 Rev.1 Promax
ANALOG / PREAMP	26 dB / 12 dB
HICUT FILTER	None
LOWCUT FILTER	None
SYSTEM DELAY	100ms (from start recording to gun firing)
GPS SYSTEM	Best Position Reference Station (OCSAT)
NAVIGATION SYSTEM	Navlog ver 2.2.8

DATA

SEISMIC DATA	10001.sgd - 13723.sgd(3723 Files)
	(Folder name : MR22-04_SC2_1)
NAVIGATION DATA	SC2_1_Shot.csv
	SC2_1_LOG.csv

REMARKS

SHIP SPEED AGAINST GROUND : 4.02 knot

SHIP SPEED AGAINST WATER : 4.31 knot

The ship changed its direction at waypoints.
Start→WP1 : Direction 150.2645° (SP10001 - SP10315)
WP1→WP2 : Direction 150.2645° (SP10316 - SP10662)
WP2→WP3 : Direction 150.2647° (SP10663 - SP11000)
WP3→WP4 : Direction 150.2646° (SP11001 - SP11337)
WP4→WP5 : Direction 150.2651° (SP11338 - SP11676)
WP5→WP6 : Direction 150.2641° (SP11677 - SP12020)
WP6→WP7 : Direction 150.2652° (SP12021 - SP12364)
WP7→WP8 : Direction 150.2643° (SP12365 - SP12712)
WP8→WP9 : Direction 150.2649° (SP12713 - SP13055)
WP9→WP10 : Direction 150.2643° (SP13056 - SP13388)
WP10→End : Direction 150.2645° (SP13389 - SP13723)

SPW prosessing image(BITMAP)
· MR22-04_SC2_1_stk_filt_2000mpi.bmp (Hi resolution image)
=1inch per 4,000m survey distance(≒138 shots)
· MR22-04_SC2_1_stk_filt_10000mpi.bmp (Low resolution image)
=1inch per 10,000m survey distance(≒345 shots)

PROCESSING

Static Correction	96.135 msec
Time Variant Bandpass Filter	20-25-400-500 Hz
Spherical Divergence Correction	T^1.6
Normal Move Out / CMP Stack	1525m/s
Time Variant Bandpass Filter	20-25-240-250 Hz

OBSERVER

Kazuho YOSHIDA, Toshimasa NASU, Ryo KIMURA, Soichiro SUEYOSHI, Fumine OKADA

NME SINGLE CHANNEL SEISMIC SURVEY GENERAL INFORMATION

MR22-04

GENERAL

CLIENT	JAMSTEC			
CRUISE	MR22-04			
AREA	Chishima Trench			
LINE	SC2_2			
DIRECTION (°)	163.8°			
DATE	2022/6/21-2022/6/22			
WEATHER	Overcast			
WIND	NNE-3(Gentle breeze)			
SEA CONDITION	Sea moderate			
FIRST SHOT POINT	SP No.	13724	FF No.	13724
FIRST GOOD SHOT POINT	SP No.	13724	FF No.	13724
	N		41-43.76587	
	E		146-27.28180	
	Time (UTC)		22:04:19	
	Water Depth (m)		6589	
LAST SHOT POINT	SP No.	15406	FF No.	15406
LAST GOOD SHOT POINT	SP No.	15406	FF No.	15406
	N		41-19.44122	
	E		146-36.82068	
	Time (UTC)		4:38:57	
	Water Depth (m)		5486	

SOURCE

GUN TYPE	GI Gun
SHOT TYPE	Harmonic Mode
SHOT MODE	Time
SHOT INTERVAL	14 sec
NUMBER OF STRINGS	1
TOTAL VOLUME	355 cu.in.
CONFIGURATION	(Generator:250 + Injector:105 cu.in) x 1
GUN DEPTH	2.0 m
AIR PRESSURE	13.8 MPa(2000 psi)
GUN CONTROLLER	Hotshot ver 3.300
GUN TOWING WIRE LENGTH	18.58 m

RECEIVER

RECEIVER TYPE	S.I.G Multi-Channel Streamer
HYDROPHONE	S.I.G.16
NUMBER OF CHANNEL	12
NO. OF HYD./GROUP	5
SENSITIVITY	-183 dB, re 1V/μbar, ±1dB
CABLE DEPTH	4.098 m (avarage)
ACTIVE SECTION	30.0 m
LEAD-IN Towing Length	135.0 m

RECORDING

RECORDING SYSTEM	Geode ver 11.1.69.0
SAMPLE FREQUENCY	1 msec
RECORDING LENGTH	11,000 msec
WATER DELAY	0 msec
RECORDING FORMAT	SEG-D 8058 Rev.1 Promax
ANALOG / PREAMP	26 dB / 12 dB
HICUT FILTER	None
LOWCUT FILTER	None
SYSTEM DELAY	100ms (from start recording to gun firing)
GPS SYSTEM	Best Position Reference Station (OCSAT)
NAVIGATION SYSTEM	Navlog ver 2.2.8

DATA

SEISMIC DATA	13724.sgd - 15406.sgd(1683 Files)
	(Folder name : MR22-04_SC2_2)
NAVIGATION DATA	SC2_1_Shot.csv
	SC2_1_LOG.csv

REMARKS

SHIP SPEED AGAINST GROUND : 3.86 knot

SHIP SPEED AGAINST WATER : 4.27 knot

SP13845-SP14076 was ship ground speed slow.

due to avoiding to fishing boat(Ship speed against ground 3~3.5 knot).

SPW prosessing image(BITMAP)
- MR22-04_SC2_2_stk_filt_2000mpi.bmp (Hi resolution image) =1inch per 2,000m survey distance(≒72 shots)
- MR22-04_SC2_2_stk_filt_10000mpi.bmp (Low resolution image) =1inch per 10,000m survey distance(≒360 shots)

PROCESSING

Static Correction	95.935 msec
Time Variant Bandpass Filter	20-25-400-500 Hz
Spherical Divergence Correction	T^1.6
Normal Move Out / CMP Stack	1525m/s
Time Variant Bandpass Filter	20-25-240-250 Hz

OBSERVER

Kazuho YOSHIDA, Toshimasa NASU, Ryo KIMURA, Soichiro SUEYOSHI, Fumine OKADA

NME SINGLE CHANNEL SEISMIC SURVEY GENERAL INFORMATION

MR22-04

GENERAL

CLIENT	JAMSTEC			
CRUISE	MR22-04			
AREA	Chishima Trench			
LINE	SC10_0			
DIRECTION (°)	238.79° *Refer to remarks			
DATE	2022/6/23			
WEATHER	Cloudy			
WIND	SSE-5(Fresh breeze)			
SEA CONDITION	Sea slight			
FIRST SHOT POINT	SP No.	10001	FF No.	10001
FIRST GOOD SHOT POINT	SP No.	10001	FF No.	10001
	N		42-29.43855	
	E		146-06.86005	
	Time (UTC)		5:55:50	
	Water Depth (m)		3235	
LAST SHOT POINT	SP No.	12703	FF No.	12703
LAST GOOD SHOT POINT	SP No.	12703	FF No.	12703
	N		42-09.81216	
	E		145-24.69727	
	Time (UTC)		15:00:08	
	Water Depth (m)		3441	

SOURCE

GUN TYPE	GI Gun
SHOT TYPE	Harmonic Mode
SHOT MODE	Time
SHOT INTERVAL	12 sec
NUMBER OF STRINGS	1
TOTAL VOLUME	355 cu.in.
CONFIGURATION	(Generator:250 + Injector:105 cu.in) x 1
GUN DEPTH	2.0 m
AIR PRESSURE	13.8 MPa(2000 psi)
GUN CONTROLLER	Hotshot ver 3.300
GUN TOWING WIRE LENGTH	18.58 m

RECEIVER

RECEIVER TYPE	S.I.G Multi-Channel Streamer
HYDROPHONE	S.I.G.16
NUMBER OF CHANNEL	12
NO. OF HYD./GROUP	5
SENSITIVITY	-183 dB, re 1V/μbar, ±1dB
Active Section depth	6.689 m (avarage)
ACTIVE SECTION	30.0 m
LEAD-IN Towing Length	135.0 m

RECORDING

RECORDING SYSTEM	Geode ver 11.1.69.0
SAMPLE FREQUENCY	1 msec
RECORDING LENGTH	9,000 msec
WATER DELAY	0 msec
RECORDING FORMAT	SEG-D 8058 Rev.1 Promax
ANALOG / PREAMP	26 dB / 12 dB
HICUT FILTER	None
LOWCUT FILTER	None
SYSTEM DELAY	100ms (from start recording to gun firing)
GPS SYSTEM	Best Position Reference Station (OCSAT)
NAVIGATION SYSTEM	Navlog ver 2.2.8

DATA

SEISMIC DATA	10001.sgd - 12703.sgd(2703 Files)
	(Folder name : MR22-04_SC10_0)
NAVIGATION DATA	SC10_0_Shot.csv
	SC10_0_LOG.csv

REMARKS

SHIP SPEED AGAINST GROUND : 4.07 knot

SHIP SPEED AGAINST WATER : 3.95 knot

The ship changed its direction at waypoints.
Start→WP1 : Direction 238.7949° (SP10001 - SP10393)
WP1→WP2 : Direction 238.7964° (SP10393 - SP10790)
WP2→WP3 : Direction 238.7960° (SP10791 - SP11184)
WP3→WP4 : Direction 238.7952° (SP11185 - SP11571)
WP4→WP5 : Direction 238.7960° (SP11572 - SP11961)
WP5→WP6 : Direction 238.7951° (SP11962 - SP12360)
WP6→WP7(End) : Direction 238.7951° (SP12361-SP12703)

SPW prosessing image(BITMAP)
・MR22-04_SC10_0_stk_filt_2000mpi.bmp (Hi resolution image)
=1inch per 2,000m survey distance(≒80 shots)
・MR22-04_SC10_0_stk_filt_10000mpi.bmp(Low resolution image)
=1inch per 10,000m survey distance(≒398 shots)

PROCESSING

Static Correction	94.207 msec
Time Variant Bandpass Filter	20-25-400-500 Hz
Spherical Divergence Correction	T^1.6
Normal Move Out / CMP Stack	1525m/s
Time Variant Bandpass Filter	20-25-240-250 Hz

OBSERVER

Kazuho YOSHIDA, Toshimasa NASU, Ryo KIMURA, Soichiro SUEYOSHI, Fumine OKADA

NME SINGLE CHANNEL SEISMIC SURVEY GENERAL INFORMATION

MR22-04

GENERAL

CLIENT	JAMSTEC			
CRUISE	MR22-04			
AREA	Chishima Trench			
LINE	SC10_1			
DIRECTION (°)	254.47° *Refer to remarks			
DATE	2022/6/23			
WEATHER	Overcast			
WIND	SE-5(Fresh breeze)			
SEA CONDITION	Sea smooth			
FIRST SHOT POINT	SP No.	12704	FF No.	12704
FIRST GOOD SHOT POINT	SP No.	12704	FF No.	12704
	N		42-09.80415	
	E		145-24.68170	
	Time (UTC)		15:00:20	
	Water Depth (m)		3435	
LAST SHOT POINT	SP No.	14415	FF No.	14415
LAST GOOD SHOT POINT	SP No.	14415	FF No.	14415
	N		42-03.44124	
	E		144-55.63293	
	Time (UTC)		20:44:55	
	Water Depth (m)		2723	

SOURCE

GUN TYPE	GI Gun
SHOT TYPE	Harmonic Mode
SHOT MODE	Time
SHOT INTERVAL	12 sec
NUMBER OF STRINGS	1
TOTAL VOLUME	355 cu.in.
CONFIGURATION	(Generator:250 + Injector:105 cu.in) x 1
GUN DEPTH	2.0 m
AIR PRESSURE	13.8 MPa(2000 psi)
GUN CONTROLLER	Hotshot ver 3.300
GUN TOWING WIRE LENGTH	18.58 m

RECEIVER

RECEIVER TYPE	S.I.G Multi-Channel Streamer
HYDROPHONE	S.I.G.16
NUMBER OF CHANNEL	12
NO. OF HYD./GROUP	5
SENSITIVITY	-183 dB, re 1V/μbar, ±1dB
Active Section depth	6,555 m (avarage)
ACTIVE SECTION	30.0 m
LEAD-IN Towing Length	135.0 m

RECORDING

RECORDING SYSTEM	Geode ver 11.1.69.0
SAMPLE FREQUENCY	1 msec
RECORDING LENGTH	9,000 msec
WATER DELAY	0 msec
RECORDING FORMAT	SEG-D 8058 Rev.1 Promax
ANALOG / PREAMP	26 dB / 12 dB
HICUT FILTER	None
LOWCUT FILTER	None
SYSTEM DELAY	100ms (from start recording to gun firing)
GPS SYSTEM	Best Position Reference Station (OCSAT)
NAVIGATION SYSTEM	Navlog ver 2.2.8

DATA

SEISMIC DATA	12704.sgd - 14415.sgd(1712 Files)
	(Folder name : MR22-04_SC10_1)
NAVIGATION DATA	SC10_0_Shot.csv
	SC10_0_LOG.csv

REMARKS

SHIP SPEED AGAINST GROUND : 3.93 knot

SHIP SPEED AGAINST WATER : 3.96 knot

The ship changed its direction at waypoints.
Start(WP7)→WP8 : Direction 254.4704° (SP12704 - SP13084)
WP8→WP9 : Direction 254.4717° (SP13085 - SP13481)
WP9→WP10 : Direction 254.4708° (SP13482 - SP13882)
WP10→WP11 : Direction 254.4707° (SP13883 - SP14322)
WP11→End : Direction 254.4701° (SP14323 - SP14415)

SPW prosessing image(BITMAP)
・MR22-04_SC10_1_stk_filt_2000mpi.bmp (Hi resolution image)
=1inch per 2,000m survey distance(≒82 shots)
・MR22-04_SC10_1_stk_filt_10000mpi.bmp(Low resolution image)
=1inch per 10,000m survey distance(≒412 shots)

PROCESSING

Static Correction	94.297 msec
Time Variant Bandpass Filter	20-25-400-500 Hz
Spherical Divergence Correction	T^1.6
Normal Move Out / CMP Stack	1525m/s
Time Variant Bandpass Filter	20-25-240-250 Hz

OBSERVER

Kazuho YOSHIDA, Toshimasa NASU, Ryo KIMURA, Soichiro SUEYOSHI, Fumine OKADA

NME SINGLE CHANNEL SEISMIC SURVEY GENERAL INFORMATION

MR22-04

GENERAL

CLIENT	JAMSTEC			
CRUISE	MR22-04			
AREA	Chishima Trench			
LINE	SC11_0			
DIRECTION (°)	74.46° *Refer to remarks			
DATE	2022/6/23-6/24			
WEATHER	Overcast			
WIND	SSE-5(Fresh breeze)			
SEA CONDITION	Sea slight			
FIRST SHOT POINT	SP No.	10001	FF No.	10001
FIRST GOOD SHOT POINT	SP No.	10001	FF No.	10001
	N		42-04.91272	
	E		144-55.62653	
	Time (UTC)		21:28:13	
	Water Depth (m)		2829	
LAST SHOT POINT	SP No.	11622	FF No.	11622
LAST GOOD SHOT POINT	SP No.	11622	FF No.	11622
	N		42-11.32851	
	E		145-24.16077	
	Time (UTC)		2:54:46	
	Water Depth (m)		3503	

SOURCE

GUN TYPE	GI Gun
SHOT TYPE	Harmonic Mode
SHOT MODE	Time
SHOT INTERVAL	12 sec
NUMBER OF STRINGS	1
TOTAL VOLUME	355 cu.in.
CONFIGURATION	(Generator:250 + Injector:105 cu.in) x 1
GUN DEPTH	2.0 m
AIR PRESSURE	13.8 MPa(2000 psi)
GUN CONTROLLER	Hotshot ver 3.300
GUN TOWING WIRE LENGTH	18.58 m

RECEIVER

RECEIVER TYPE	S.I.G Multi-Channel Streamer
HYDROPHONE	S.I.G.16
NUMBER OF CHANNEL	12
NO. OF HYD./GROUP	5
SENSITIVITY	-183 dB, re 1V/μbar, ±1dB
Active Section depth	9.015 m (avarage)
ACTIVE SECTION	30.0 m
LEAD-IN Towing Length	135.0 m

RECORDING

RECORDING SYSTEM	Geode ver 11.1.69.0
SAMPLE FREQUENCY	1 msec
RECORDING LENGTH	9,000 msec
WATER DELAY	0 msec
RECORDING FORMAT	SEG-D 8058 Rev.1 Promax
ANALOG / PREAMP	26 dB / 12 dB
HICUT FILTER	None
LOWCUT FILTER	None
SYSTEM DELAY	100ms (from start recording to gun firing)
GPS SYSTEM	Best Position Reference Station (OCSAT)
NAVIGATION SYSTEM	Navlog ver 2.2.8

DATA

SEISMIC DATA	10001.sgd - 11622.sgd(1622 Files)
	(Folder name : KM22-05_SC11_0)
NAVIGATION DATA	SC11_0_Shot.csv
	SC11_0_LOG.csv

REMARKS

SHIP SPEED AGAINST GROUND : 4.08 knot

SHIP SPEED AGAINST WATER : 4.06 knot

The ship changed its direction at waypoints.
Start→WP1 : Direction 74.46480° (SP10001 - SP10421)
WP1→WP2 : Direction 74.46555° (SP10421 - SP10809)
WP2→WP3 : Direction 74.46584° (SP10810 - SP11206)
WP3→WP4(End) : Direction 74.46407° (SP11207 - SP11622)

SPW prosessing image(BITMAP)
・MR22-04_SC11_0_stk_filt_2000mpi.bmp (Hi resolution image)
=1inch per 2,000m survey distance(≒80 shots)
・MR22-04_SC11_0_stk_filt_10000mpi.bmp(Low resolution image)
=1inch per 10,000m survey distance(≒402 shots)

PROCESSING

Static Correction	92.657 msec
Time Variant Bandpass Filter	20-25-400-500 Hz
Spherical Divergence Correction	T^1.6
Normal Move Out / CMP Stack	1525m/s
Time Variant Bandpass Filter	20-25-240-250 Hz

OBSERVER

Kazuho YOSHIDA, Toshimasa NASU, Ryo KIMURA, Soichiro SUEYOSHI, Fumine OKADA

NME SINGLE CHANNEL SEISMIC SURVEY GENERAL INFORMATION

MR22-04

GENERAL

CLIENT	JAMSTEC			
CRUISE	MR22-04			
AREA	Chishima Trench			
LINE	SC11_1			
DIRECTION (°)	68.0°			
DATE	2022/6/23			
WEATHER	Overcast			
WIND	South-6(Strong breeze)			
SEA CONDITION	Sea moderate			
FIRST SHOT POINT	SP No.	11623	FF No.	11623
FIRST GOOD SHOT POINT	SP No.	11623	FF No.	11623
	N		42-11.33286	
	E		145-24.17816	
	Time (UTC)		2:54:58	
	Water Depth (m)		3503	
LAST SHOT POINT	SP No.	12499	FF No.	12499
LAST GOOD SHOT POINT	SP No.	12499	FF No.	12499
	N		42-17.12814	
	E		145-37.82593	
	Time (UTC)		5:51:20	
	Water Depth (m)		3540	

SOURCE

GUN TYPE	GI Gun
SHOT TYPE	Harmonic Mode
SHOT MODE	Time
SHOT INTERVAL	12 sec
NUMBER OF STRINGS	1
TOTAL VOLUME	355 cu.in.
CONFIGURATION	(Generator:250 + Injector:105 cu.in) x 1
GUN DEPTH	2.0 m
AIR PRESSURE	13.8 MPa(2000 psi)
GUN CONTROLLER	Hotshot ver 3.300
GUN TOWING WIRE LENGTH	18.58 m

RECEIVER

RECEIVER TYPE	S.I.G Multi-Channel Streamer
HYDROPHONE	S.I.G.16
NUMBER OF CHANNEL	12
NO. OF HYD./GROUP	5
SENSITIVITY	-183 dB, re 1V/μbar, ±1dB
CABLE DEPTH	8.398 m (avarage)
ACTIVE SECTION	30.0 m
LEAD-IN Towing Length	135.0 m

RECORDING

RECORDING SYSTEM	Geode ver 11.1.69.0
SAMPLE FREQUENCY	1 msec
RECORDING LENGTH	9,000 msec
WATER DELAY	0 msec
RECORDING FORMAT	SEG-D 8058 Rev.1 Promax
ANALOG / PREAMP	26 dB / 12 dB
HICUT FILTER	None
LOWCUT FILTER	None
SYSTEM DELAY	100ms (from start recording to gun firing)
GPS SYSTEM	Best Position Reference Station (OCSAT)
NAVIGATION SYSTEM	Navlog ver 2.2.8

DATA

SEISMIC DATA	11623.sgd - 12499.sgd(877 Files)
	(Folder name : KM22-05_SC11_1)
NAVIGATION DATA	SC11_0_Shot.csv
	SC11_0_LOG.csv

REMARKS

SHIP SPEED AGAINST GROUND : 3.99 knot

SHIP SPEED AGAINST WATER : 4.25 knot

SPW prosessing image(BITMAP)
- MR22-04_SC11_1_stk_filt_2000mpi.bmp (Hi resolution image) =1inch per 2,000m survey distance(≒81 shots)
- MR22-04_SC11_1_stk_filt_10000mpi.bmp(Low resolution image) =1inch per 10,000m survey distance(≒406 shots)

PROCESSING

Static Correction	93.068 msec
Time Variant Bandpass Filter	20-25-400-500 Hz
Spherical Divergence Correction	T^1.6
Normal Move Out / CMP Stack	1525m/s
Time Variant Bandpass Filter	20-25-240-250 Hz

OBSERVER

Kazuho YOSHIDA, Toshimasa NASU, Ryo KIMURA, Soichiro SUEYOSHI, Fumine OKADA

NME SINGLE CHANNEL SEISMIC SURVEY GENERAL INFORMATION

MR22-04

GENERAL

CLIENT	JAMSTEC			
CRUISE	MR22-04			
AREA	Chishima Trench			
LINE	SC12_0			
DIRECTION (°)	58.84° *Refer to remarks			
DATE	2022/6/25			
WEATHER	Fine but cloudy			
WIND	SW-5(Fresh breeze)			
SEA CONDITION	Sea moderate			
FIRST SHOT POINT	SP No.	10001	FF No.	10001
FIRST GOOD SHOT POINT	SP No.	10001	FF No.	10001
	N		41-29.04739	
	E		144-54.87854	
	Time (UTC)		5:35:41	
	Water Depth (m)		5288	
LAST SHOT POINT	SP No.	14928	FF No.	14928
LAST GOOD SHOT POINT	SP No.	14928	FF No.	14928
	N		42-06.75522	
	E		146-15.30304	
	Time (UTC)		22:07:48	
	Water Depth (m)		5696	

SOURCE

GUN TYPE	GI Gun
SHOT TYPE	Harmonic Mode
SHOT MODE	Time
SHOT INTERVAL	12 sec
NUMBER OF STRINGS	1
TOTAL VOLUME	355 cu.in.
CONFIGURATION	(Generator:250 + Injector:105 cu.in) x 1
GUN DEPTH	2.0 m
AIR PRESSURE	13.8 MPa(2000 psi)
GUN CONTROLLER	Hotshot ver 3.300
GUN TOWING WIRE LENGTH	18.58 m

RECEIVER

RECEIVER TYPE	S.I.G Multi-Channel Streamer
HYDROPHONE	S.I.G.16
NUMBER OF CHANNEL	12
NO. OF HYD./GROUP	5
SENSITIVITY	-183 dB, re 1V/μbar, ±1dB
CABLE DEPTH	7.629 m (avarage)
ACTIVE SECTION	30.0 m
LEAD-IN Towing Length	135.0 m

RECORDING

RECORDING SYSTEM	Geode ver 11.1.69.0
SAMPLE FREQUENCY	1 msec
RECORDING LENGTH	9,000 msec
WATER DELAY	0 msec
RECORDING FORMAT	SEG-D 8058 Rev.1 Promax
ANALOG / PREAMP	26 dB / 12 dB
HICUT FILTER	None
LOWCUT FILTER	None
SYSTEM DELAY	100ms (from start recording to gun firing)
GPS SYSTEM	Best Position Reference Station (OCSAT)
NAVIGATION SYSTEM	Navlog ver 2.2.8

DATA

SEISMIC DATA	10001.sgd - 14927.sgd(4927 Files)
	(Folder name : KM22-05_SC12_0)
NAVIGATION DATA	SC12_0_Shot.csv
	SC12_0_LOG.csv

REMARKS

SHIP SPEED AGAINST GROUND : 4.23 knot

SHIP SPEED AGAINST WATER : 3.52 knot

The ship changed its direction at waypoints.
Start→WP1 : Direction 58.83972° (SP10001 - SP10515)
WP1→WP2 : Direction 58.83925° (SP10516 - SP10877)
WP2→WP3 : Direction 58.83988° (SP10878 - SP11219)
WP3→WP4 : Direction 58.83887° (SP11220 - SP11550)
WP4→WP5 : Direction 58.83938° (SP11551 - SP11889)
WP5→WP6 : Direction 58.83961° (SP11890 - SP12247)
WP6→WP7 : Direction 58.93958° (SP12248 - SP12630)
WP7→WP8 : Direction 58.93927° (SP12631 - SP13019)
WP8→WP9 : Direction 58.93960° (SP13020 - SP13392)
WP9→WP10 : Direction 58.93965° (SP13393 - SP13792)
WP10→WP11 : Direction 58.93944° (SP13793 - SP14198)
WP11→WP12 : Direction 58.93938° (SP14199 - SP14602)
WP12→End : Direction 58.93964° (SP14603 - SP14928)

FF14054 was recording time 24sec,
due to Geode(segD recording system) recording time delay.
SP14054 was no record (SP14055=FF14054).

SP10726 and SP10727 were SOJ depth data missing.

SPW prosessing image(BITMAP)
・MR22-04_SC12_0_stk_filt_4000mpi.bmp (Hi resolution image)
=1inch per 4,000m survey distance(≒153 shots)
・MR22-04_SC12_0_stk_filt_10000mpi.bmp(Low resolution image)
=1inch per 10,000m survey distance(≒383 shots)

PROCESSING

Static Correction	93.581 msec
Time Variant Bandpass Filter	20-25-400-500 Hz
Spherical Divergence Correction	T^1.6
Normal Move Out / CMP Stack	1525m/s
Time Variant Bandpass Filter	20-25-240-250 Hz

OBSERVER

Kazuho YOSHIDA, Toshimasa NASU, Ryo KIMURA, Soichiro SUEYOSHI, Fumine OKADA

NME SINGLE CHANNEL SEISMIC SURVEY GENERAL INFORMATION

MR22-04

GENERAL

CLIENT	JAMSTEC			
CRUISE	MR22-04			
AREA	Chishima Trench			
LINE	SC13_0			
DIRECTION (°)	238.94° *Refer to remarks			
DATE	2022/6/25-2022/6/26			
WEATHER	Fine but cloudy			
WIND	SW-6(Strong breeze)			
SEA CONDITION	Sea moderate			
FIRST SHOT POINT	SP No.	10001	FF No.	10001
FIRST GOOD SHOT POINT	SP No.	10001	FF No.	10001
	N		42-08.68011	
	E		146-14.57611	
	Time (UTC)		22:57:36	
	Water Depth (m)		5703	
LAST SHOT POINT	SP No.	12024	FF No.	12024
LAST GOOD SHOT POINT	SP No.	12024	FF No.	12024
	N		41-54.67140	
	E		145-44.17969	
	Time (UTC)		5:45:31	
	Water Depth (m)		5552	

SOURCE

GUN TYPE	GI Gun
SHOT TYPE	Harmonic Mode
SHOT MODE	Time
SHOT INTERVAL	12 sec
NUMBER OF STRINGS	1
TOTAL VOLUME	355 cu.in.
CONFIGURATION	(Generator:250 + Injector:105 cu.in) x 1
GUN DEPTH	2.0 m
AIR PRESSURE	13.8 MPa(2000 psi)
GUN CONTROLLER	Hotshot ver 3.300
GUN TOWING WIRE LENGTH	18.58 m

RECEIVER

RECEIVER TYPE	S.I.G Multi-Channel Streamer
HYDROPHONE	S.I.G.16
NUMBER OF CHANNEL	12
NO. OF HYD./GROUP	5
SENSITIVITY	-183 dB, re 1V/μbar, ±1dB
CABLE DEPTH	2.950 m (avarage)
ACTIVE SECTION	30.0 m
LEAD-IN Towing Length	135.0 m

RECORDING

RECORDING SYSTEM	Geode ver 11.1.69.0
SAMPLE FREQUENCY	1 msec
RECORDING LENGTH	9,000 msec
WATER DELAY	0 msec
RECORDING FORMAT	SEG-D 8058 Rev.1 Promax
ANALOG / PREAMP	26 dB / 12 dB
HICUT FILTER	None
LOWCUT FILTER	None
SYSTEM DELAY	100ms (from start recording to gun firing)
GPS SYSTEM	Best Position Reference Station (OCSAT)
NAVIGATION SYSTEM	Navlog ver 2.2.8

DATA

SEISMIC DATA	10001.sgd - 12024.sgd(2024 Files)
	(Folder name : KM22-05_SC13_0)
NAVIGATION DATA	SC13_0_Shot.csv
	SC13_0_LOG.csv

REMARKS

SHIP SPEED AGAINST GROUND : 3.92 knot

SHIP SPEED AGAINST WATER : 4.22 knot

The ship changed its direction at waypoints.
Start→WP1 : Direction 238.9485° (SP10001 - SP10443)
WP1→WP2 : Direction 238.9488° (SP10444 - SP10848)
WP2→WP3 : Direction 238.9476° (SP10849 - SP11247)
WP3→WP4 : Direction 238.9483° (SP11248 - SP11658)
WP4→End : Direction 238.9490° (SP11659 - SP12024)

SPW prosessing image(BITMAP)
・MR22-04_SC13_0_stk_filt_2000mpi.bmp (Hi resolution image)
=1inch per 2,000m survey distance(≒82 shots)
・MR22-04_SC13_0_stk_filt_10000mpi.bmp(Low resolution image)
=1inch per 10,000m survey distance(≒413 shots)

PROCESSING

Static Correction	96.700 msec
Time Variant Bandpass Filter	20-25-400-500 Hz
Spherical Divergence Correction	T^1.6
Normal Move Out / CMP Stack	1525m/s
Time Variant Bandpass Filter	20-25-240-250 Hz

OBSERVER

Kazuho YOSHIDA, Toshimasa NASU, Ryo KIMURA, Soichiro SUEYOSHI, Fumine OKADA

7-5-2. Data processing

The onboard data processing flow is summarized in **Figure 7-5-6**.

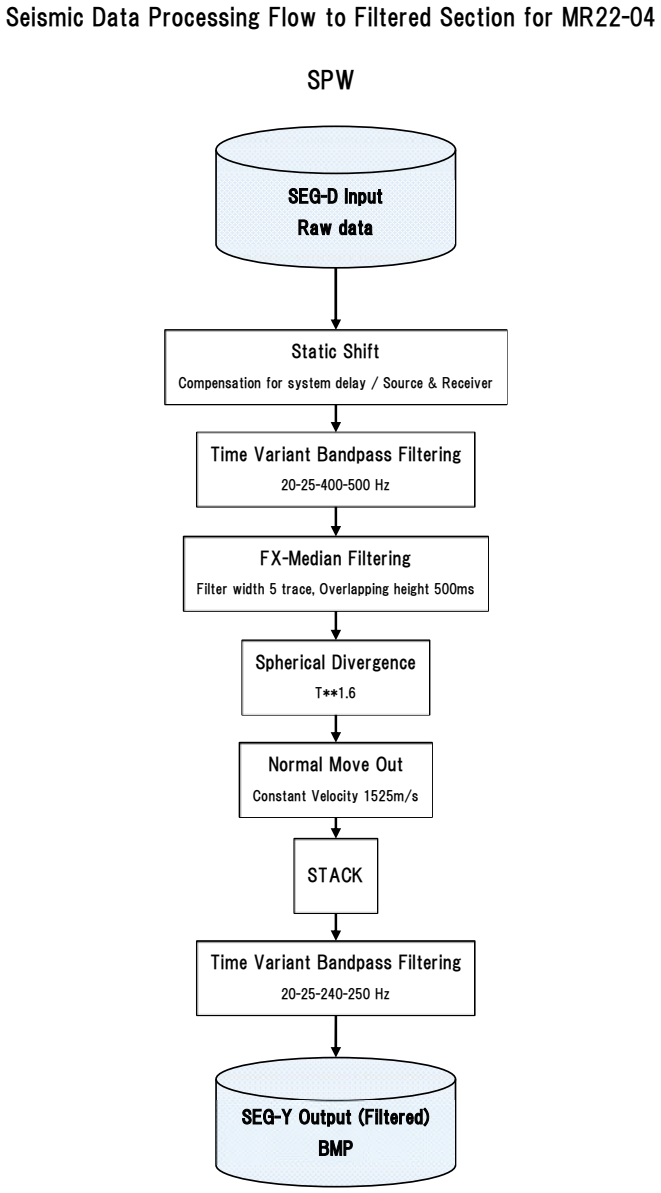


Figure 7-5-6: Onboard data processing flow.

7-6. Magnetic Survey

7-6-1. Measurement of three-component of the geomagnetic field

A shipboard three-component magnetometer system (Tierra Tecnica SFG-2018) is equipped on-board R/V MIRAI. Three-axis flux-gate sensors with ring-cored coils are fixed on the foremast. Outputs from the sensors are digitized by a 20-bit A/D converter (1 nT/LSB) and sampled 8 times per second. The ship's heading, pitch, and roll are measured by the Inertial Navigation System (INS) for controlling the attitude of a Doppler radar. The ship's position and speed data are taken from LAN every second.

The three-component of geomagnetic field data were collected throughout the cruise. "Figure-8" sailings (clockwise and counterclockwise 360° turns) for data calibration of the shipboard magnetic data were conducted at three locations (**Table 7-6-1**).

Table 7-6-1: Summary of "Figure-8" sailings (Time: UT).

1: 143° 29.0'E, 38° 55.5'N, 2022/06/16/10:30 - 10:55
2: 145° 57.0'E, 42° 41.0'N, 2022/06/22/17:41 - 18:08
3: 145° 06.5'E, 40° 44.5'N, 2022/06/27/17:08 - 17:42

7-6-2. Measurement of the geomagnetic total force

Geomagnetic total force data were obtained by using a surface-towed cesium marine magnetometer (Geometrics Inc., G-882) and recorded by a G-882 data logger (Clovertech Co., Ver.1.0.3b). The G-882 magnetometer uses an optically pumped Cesium-vapor atomic resonance system. The sensor fish is towed 500 m behind the ship to minimize the effects of the ship's magnetic field. The distance from the system position to the stern is 80 m. **Table 7-6-2** shows system configurations of the R/V MIRAI cesium magnetometer system.

Table 7-6-2: System configurations of R/V MIRAI cesium magnetometer.

Property	Description
Dynamic operating range:	20,000 to 100,000 nT
Absolute accuracy	<±2 nT throughout range
Cycle rate	1 second
Sensitivity	0.001265 nT at a 0.1 second cycle rate
Sampling rate	1 second

The geomagnetic total force data were collected during the following periods. The magnetic survey was conducted during the single-channel seismic reflection survey and the multibeam bathymetric line survey.

05:33UTC 18 Jun. 2022 - 20:58UTC 18 Jun. 2022
08:25UTC 19 Jun. 2022 - 08:08UTC 20 Jun. 2022
06:24UTC 21 Jun. 2022 - 20:59UTC 22 Jun. 2022
05:37UTC 23 Jun. 2022 - 06:03UTC 24 Jun. 2022
05:26UTC 25 Jun. 2022 - 21:00UTC 26 Jun. 2022

Remarks:
1) In the following periods, data acquisition was suspended due to the power supply trouble.

21:38UTC 21 Jun. 2022 - 21:52UTC 21 Jun. 2022
19:59UTC 23 Jun. 2022 - 20:44UTC 23 Jun. 2022

2) In the following periods, data was invalid due to an internal heater preheating after the power supply trouble.

20:44UTC 23 Jun. 2022 - 20:59UTC

3) In the following periods, data was invalid due to making towing distance shorter to 100m for maintenance of an air gun of the single channel seismic system.

23:17UTC 19 Jun. 2022 - 23:48UTC 19 Jun. 2022
00:51UTC 20 Jun. 2022 - 01:20UTC 20 Jun. 2022

7-7. Gravity Survey

Shipboard gravity data were collected throughout the cruise. The gravity measurement was carried out using a LaCoste & Romberg S-116. The sampling rate is 1 second.

The recording gravity unit is [CU: Counter Unit]. To convert from CU to relative gravity [mGal], multiply by the coefficient: (0.9946).

[mGal] = 0.9946 * [CU]

The shipboard gravity data are tied to absolute gravity values at the calibration station. The calibration station was a first-order benchmark in the Kiyomigata park, in Shimizu. A portable gravity meter (CG-5, Scintrex) was used for the gravity tie.

Table 7-7-1: Absolute gravity table of the MR22-04 cruise.

No.	Date mm/dd	UTC	Port	Absolute Gravity [mGal]	Sea Level [cm]	Ship Draft [cm]	Gravity at Sensor * [mGal]	S-116 Gravity [mGal]
#1	06/14	22:21	Shimizu	979,728.95	183	625	979,729.73	12002.00
#2	07/01	07:01	Shimizu	979,728.95	225	615	979,729.83	12002.30

*: Gravity at Sensor = Absolute Gravity + Sea Level*0.3086/100 + (Draft-530)/100*0.2222

Calibration stations
Sodeshi pier#1 berth#11 bit#35: 138°30'35.2"E, 35°01'56.0"N, 979728.95 mGal
Kiyomigata park: 138°30'20.6"E, 35°02'39.7"N, 979730.57 mGal

As the result, the drift rate of the shipboard gravitymeter during this cruise period is estimated to be 0.350 mGal/month (0.012 mGal/day).

8. Preliminary Results

8-1. Sediment Core

Six piston cores were obtained in this cruise. Information for their locations, water depth and recovery rate, and tension for pulling out are summarized in **Table 8-1-1**. Operation inventory records are attached to APPENDIX. Section length of the obtained cores are summarized in **Table 8-1-2**. Lithology of cores are shown in Figure 5-7-1. Physical properties measured by MSCL (**Figures 8-1-2** and **8-1-3**), and color of split surface were presented in **Figures 8-1-4** and **8-1-5**. Core photos for all the cores and scanned images for PC03-PC06 are shown in **Figures 8-1-4** and **8-1-5**.

Table 8-1-1: Summary of the piston coring operation

Date (UTC)	**Core ID**	**Water Depth**	**Position (Transponder)**		**Recovery (m)**		**Tension MAX**	**K**
		(m)	Latitude	Longitude	PC	PL	(kN)	value
20220617	PC01	4,890	41-22.1407N	144-36.0281E	7.11 / 8	0.60	6.2	0.15
20220619	PC02	5,712	41-56.3792N	145-52.3477E	7.25 / 8	0.33	6.9	0.14
20220621	PC03	3,352	42-09.2943N	145-18.7815E	6.30 / 8	0.06	6.5	0.79
20220623	PC04	3,917	42-14.6699N	145-51.4465E	4.90 / 6	0.22	5.7	0.26
20220625	PC05	4,845	41-38.1188N	144-48.7313E	4.93 / 6	0.50	5.9	0.25
20220627	PC06	5,237	41-42.8301N	145-10.7052E	7.35 / 8	0.31	6.8	0.18

*K value is the strength barometer of the sea bed sediment, which is expressed by the following formula: K value = pure pull out load / (outer diameter of outer pipe x penetration length)

Table 8-1-2: Core Length.

Core	Date	Corer	Sec. 1	Sec. 2	Sec. 3	Sec. 4	Sec. 5	Sec. 6	Sec. 7	Sec. 8	Sec. CC	Total Length	Remarks
PC01	17-Jun-22	8m PC	5.2	101.0	99.7	99.7	99.1	103.0	101.8	96.5	-	706.0	Sec. 6&7 patched
PL01	17-Jun-22	0.7m PL	53.4	-	-	-	-	-	-	-	5.3	58.7	Sec. CC A&W
PC02	19-Jun-22	8m PC	16.2	101.4	98.7	100.8	100.5	99.8	99.9	96.5	4.3	718.1	
PL02	19-Jun-22	0.7m PL	33.1								-	33.1	
PC03	21-Jun-22	8m PC	-	44.6	100.6	99.5	87.1	0.0	98.0	72.2	-	502.0	Sec. 5 87.1-99.8, Sec. 6 0.0-100.0, Sec. 7 0-5.2 void; Flow-in below 378.4 cm
PL03	21-Jun-22	0.7m PL	5.5	-	-	-	-	-	-	-	bag	5.5	Sec. CC in bag
PC04	23-Jun-22	6m PC	5.1	87.7	100.8	99.0	99.8	74.3	-	-	-	466.7	Sec. 1 A&W; Sec. 6 59.0-79.0 void
PL04	22-Jun-22	0.7m PL	17.0	-	-	-	-	-	-	-	4.4	21.4	
PC05	25-Jun-22	6m PC	-	88.0	104.0	99.6	100.6	97.6	-	-	-	489.8	Sec. 3 patched
PL05	25-Jun-22	0.7m PL	49.6	-	-	-	-	-	-	-	-	49.6	
PC06	27-Jun-22	8m PC	29.8	99.5	99.7	99.7	99.3	100.0	79.7	23.3	-	631.0	Sec. 7 patched; Sec. 7 62.5-83.0 void, Sec. 8 17-91.5 void
PL06	27-Jun-22	0.7m PL	30.2	-	-	-	-	-	-	-	-	30.2	

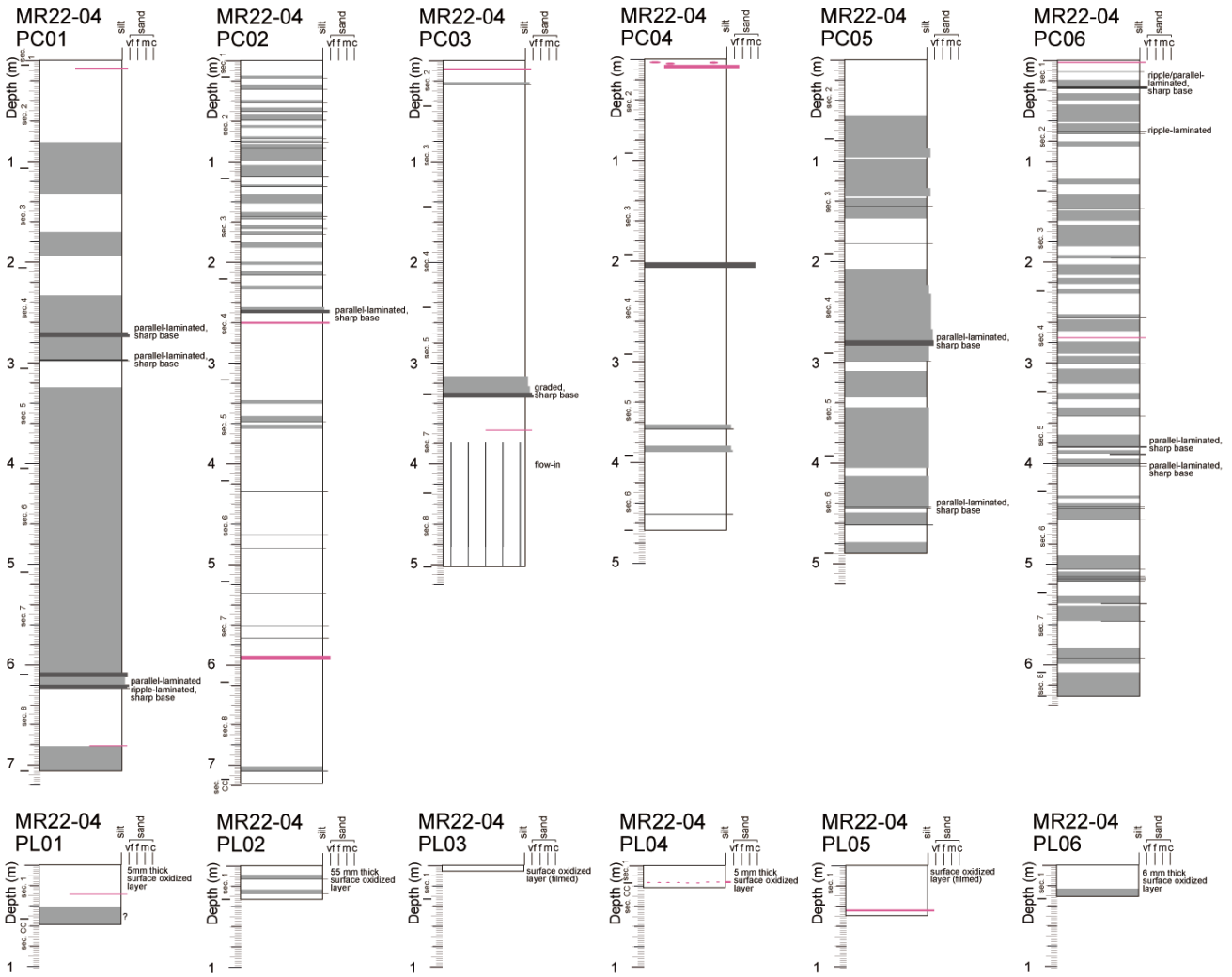


Figure 8-1-1: Lithology of PC01－PC06, and PL01-PL06. White: bioturbated mud interval, gray: massive mud interval, black: coarse grained interval, tephra layer.

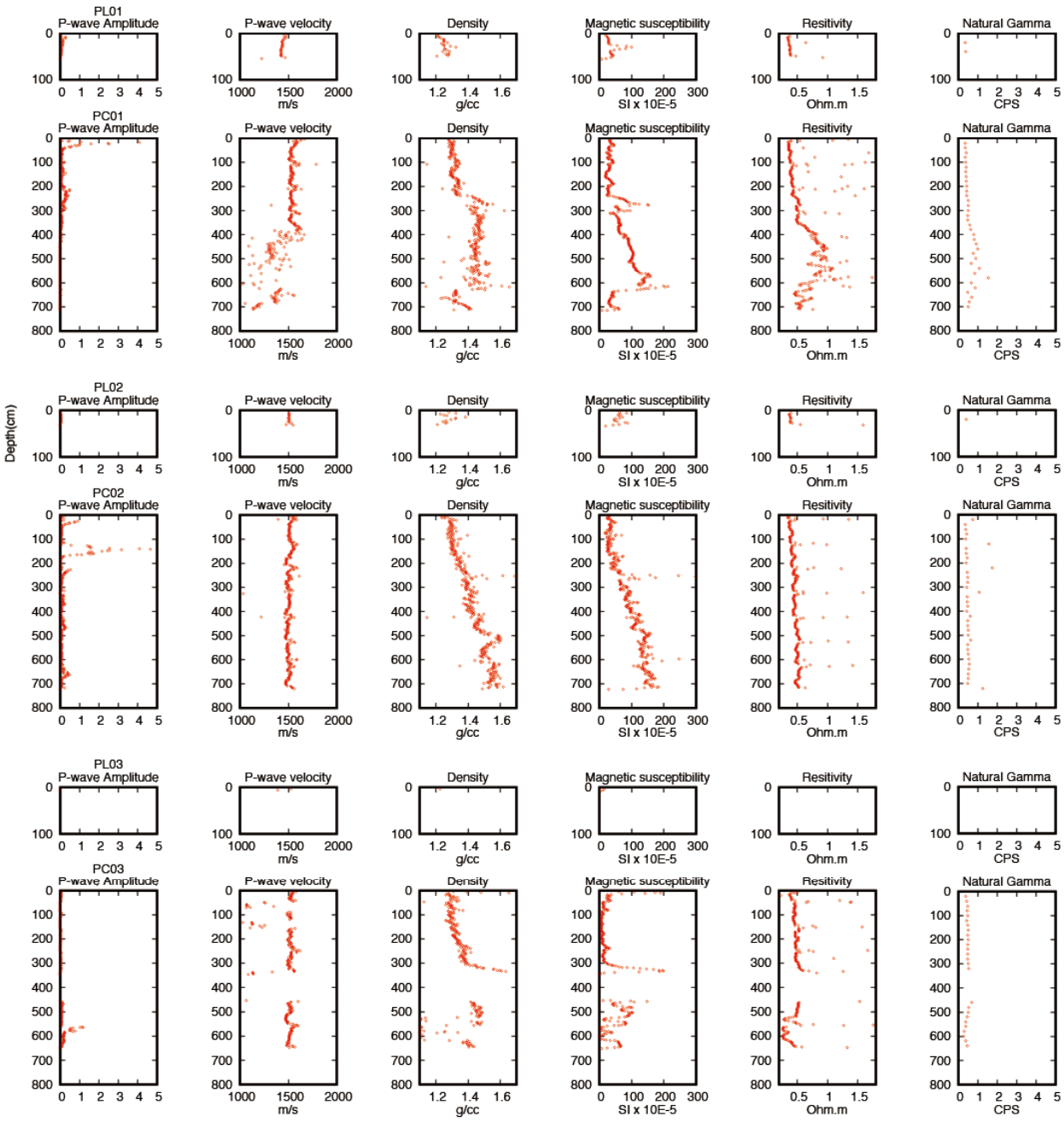


Figure 8-1-2: PW Amplitude, PW-Velocity, Density, Magnetic susceptibility, impedance, fluctuation porosity, natural gamma ray, resistivity of PL01, PC01, PL02, PC02, PL03, and PC03.

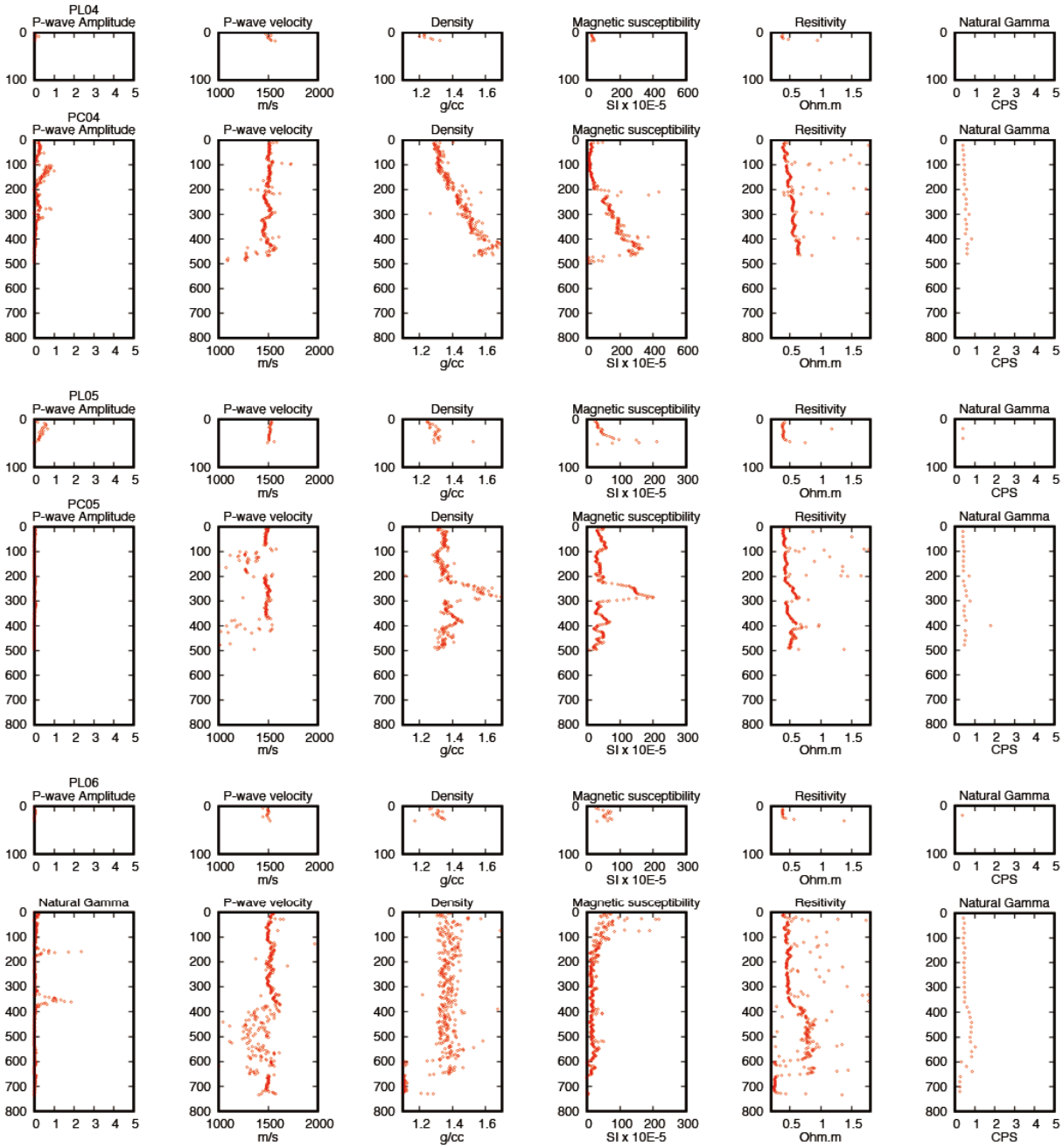


Figure 8-1-3: PW Amplitude, PW-Velocity, Density, Magnetic susceptibility, impedance, fluctuation porosity, natural gamma ray, resistivity of PL04, PC04, PL05, PC05, PL06, and PC06.

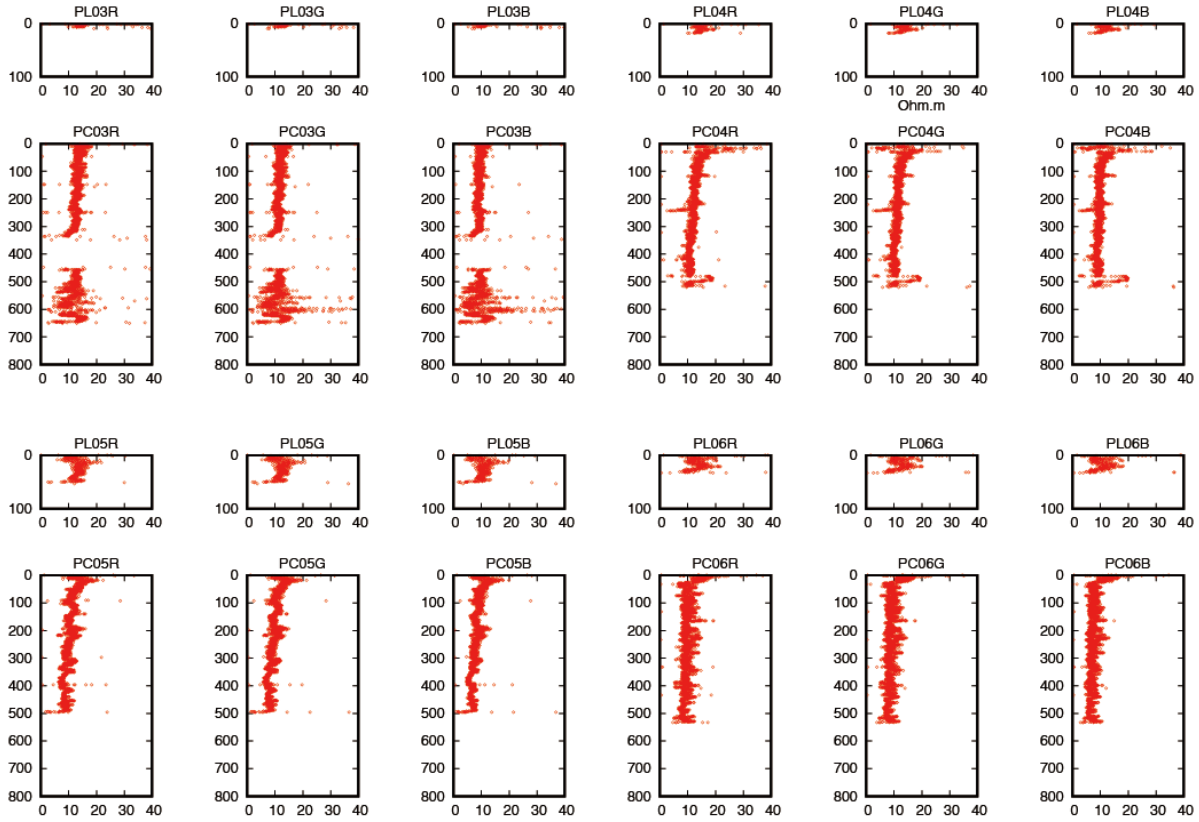


Figure 8-1-4: RGB values for PL03, PC03, PL04, PC04, PL05, PC05, PL06 and PC06 are extracted their scanned images. For PL01, PC01, PL02 and PC02, no data due to the mechanical problem of image scanner.

Core Photo and Core image

Core Photo of PL01 and PC01, PL02 and PC02, PL03 and PC03, PL04 and PC04, PL05 and PC05, and PL06 and PC06 are presented in the following pages (**Figures 8-1-5** to **8-1-10**). Digital images of split core surface of working-half section were taken with the image logger (MSCL-I). Due to mechanical troubles of MSCL-I system, no data for PL01, PC01, PL02 and PC02 (**Figures 8-1-11~ 8-1-14**).

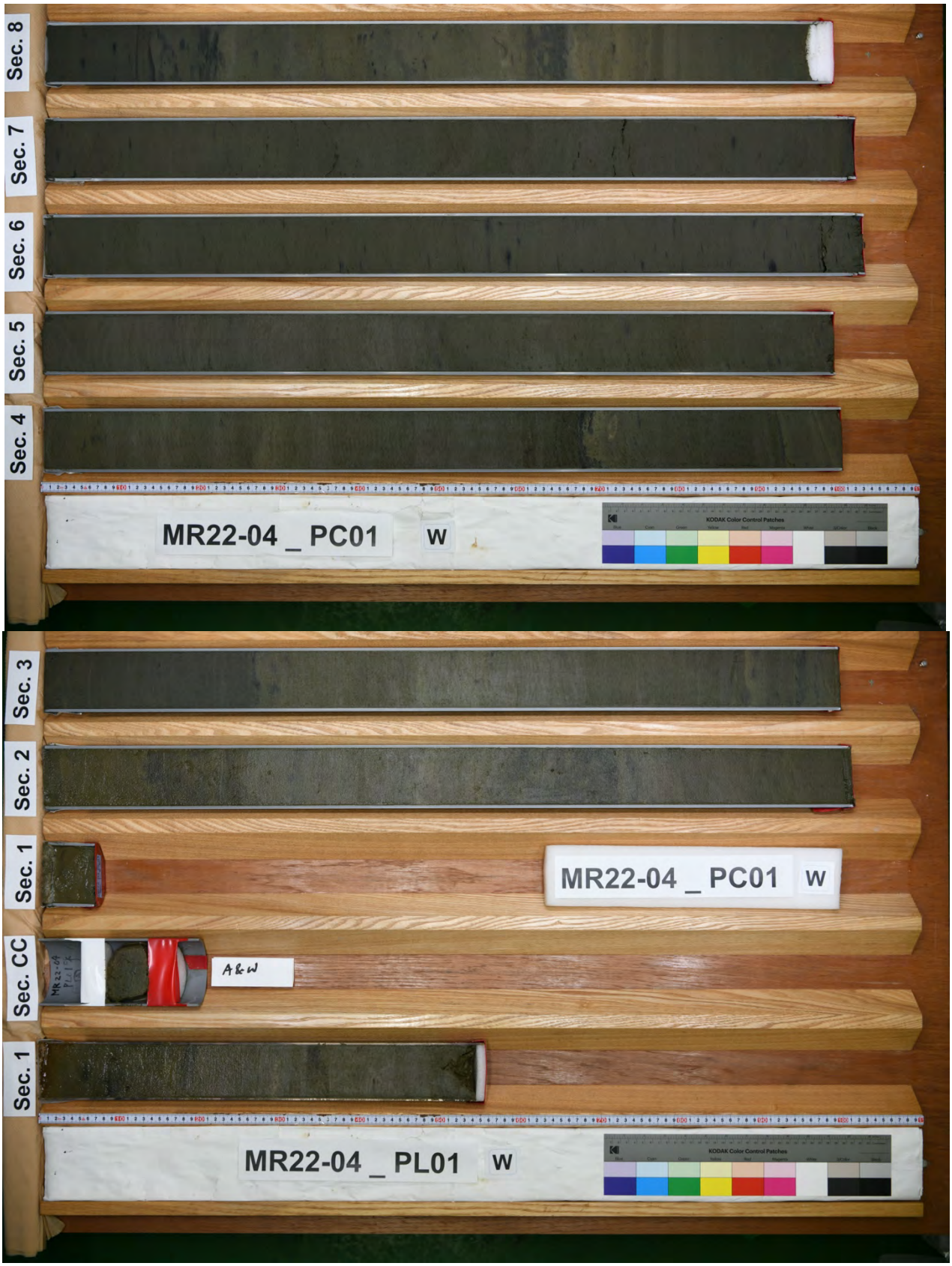


Figure 8-1-5: Core photo for MR22-04 PL01& PC01.

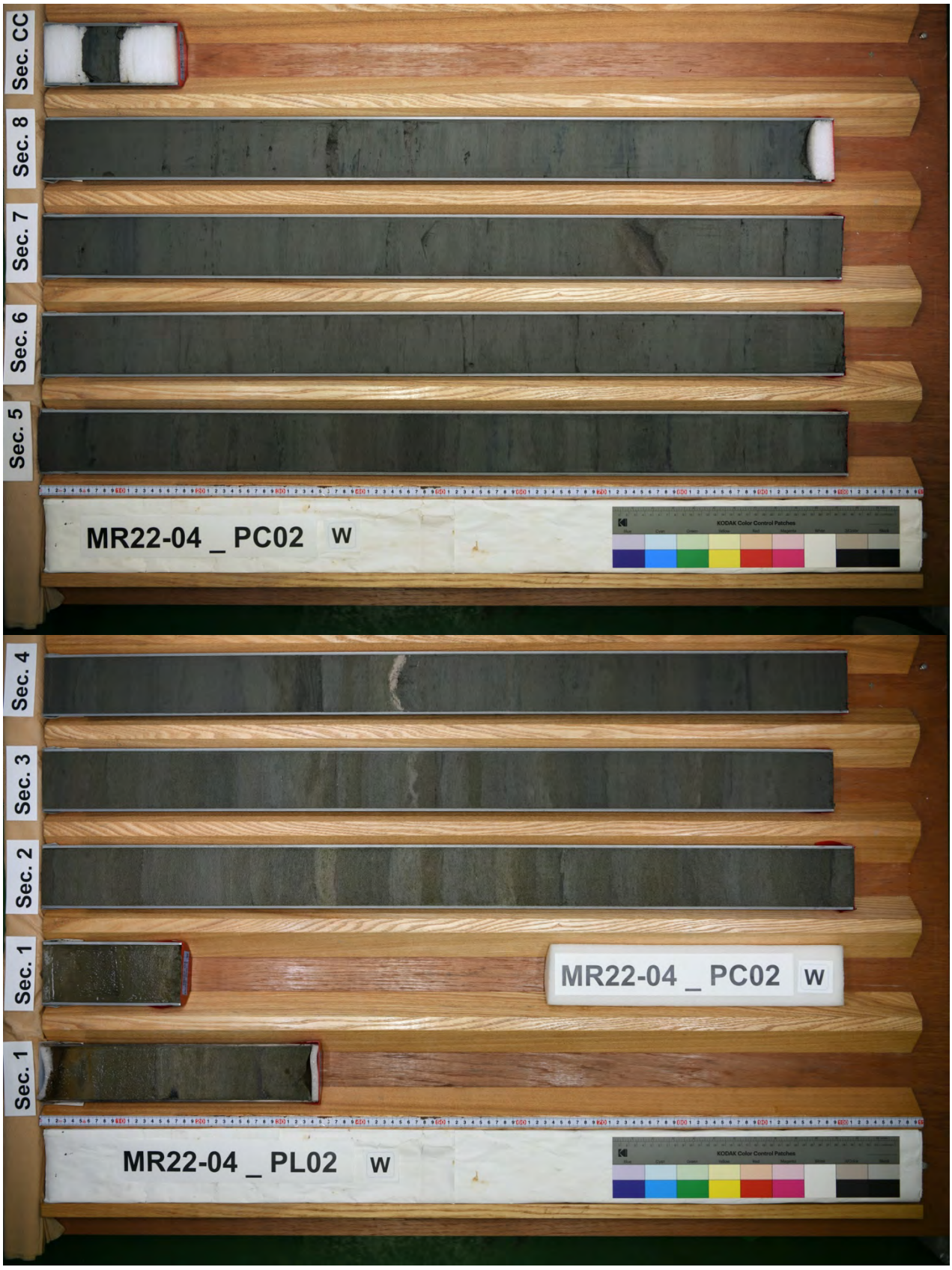


Figure 8-1-6: Core photo for MR22-04 PL02& PC02.

Figure 8-1-7: Core photo for MR22-04 PL03& PC03.

Figure 8-1-8: Core photo for MR22-04 PL04& PC04.

Figure 8-1-9: Core photo for MR22-04 PL05& PC05.

Figure 8-1-10: Core photo for MR22-04 PL06& PC06.

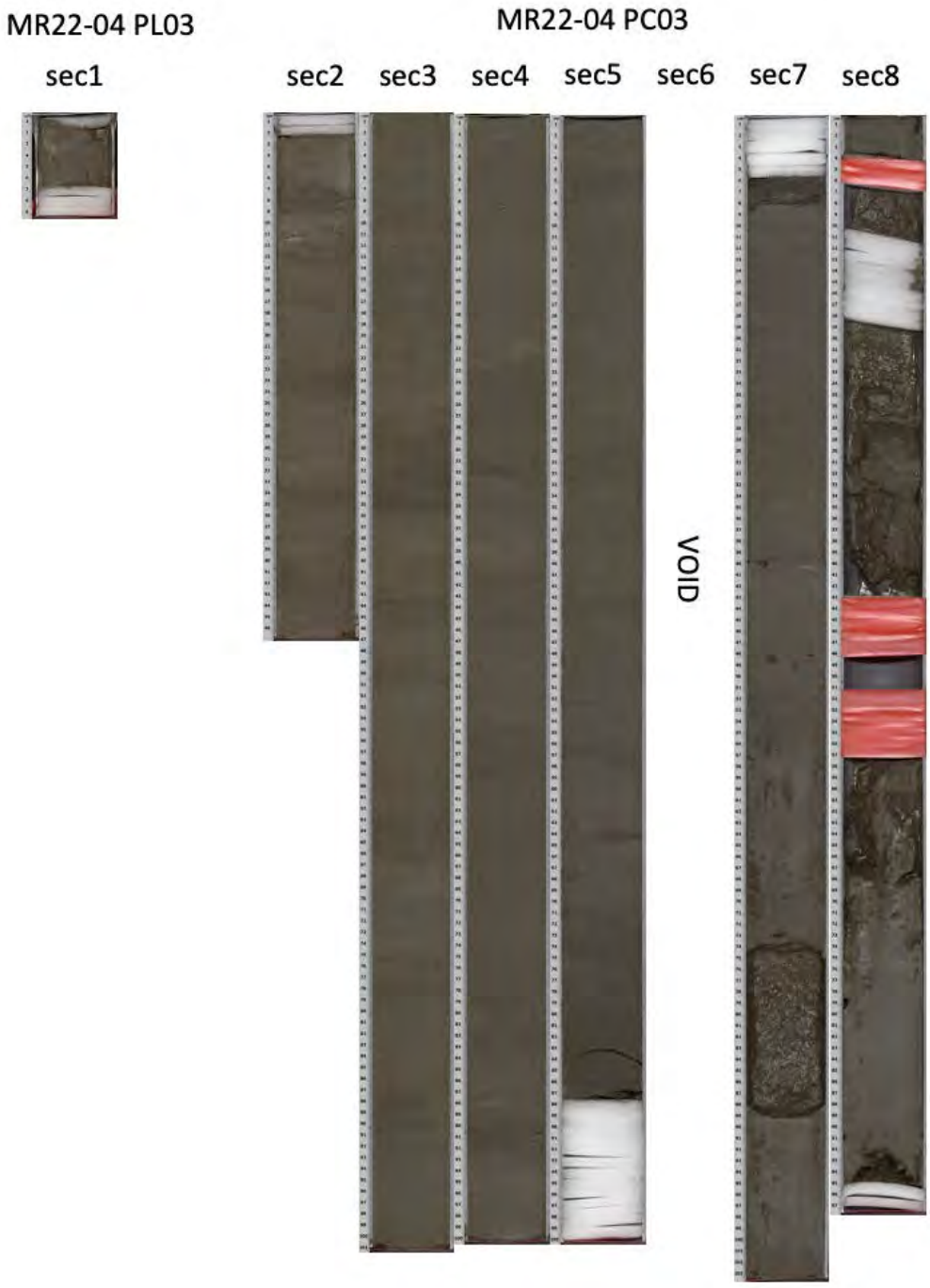


Figure 8-1-11: Scan image of MR22-04 PL03& PC03.

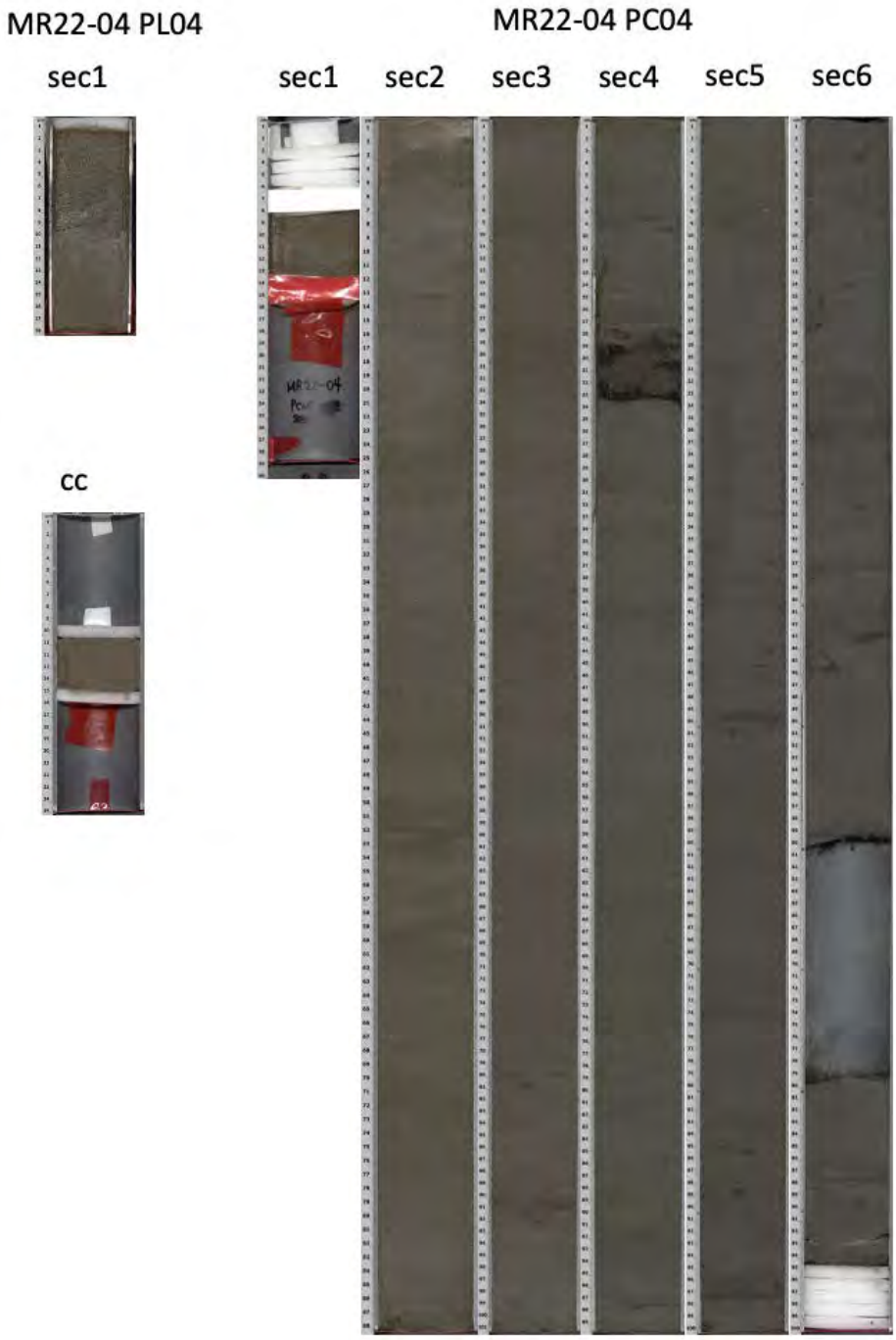


Figure 8-1-12: Scan image of MR22-04 PL04& PC04.

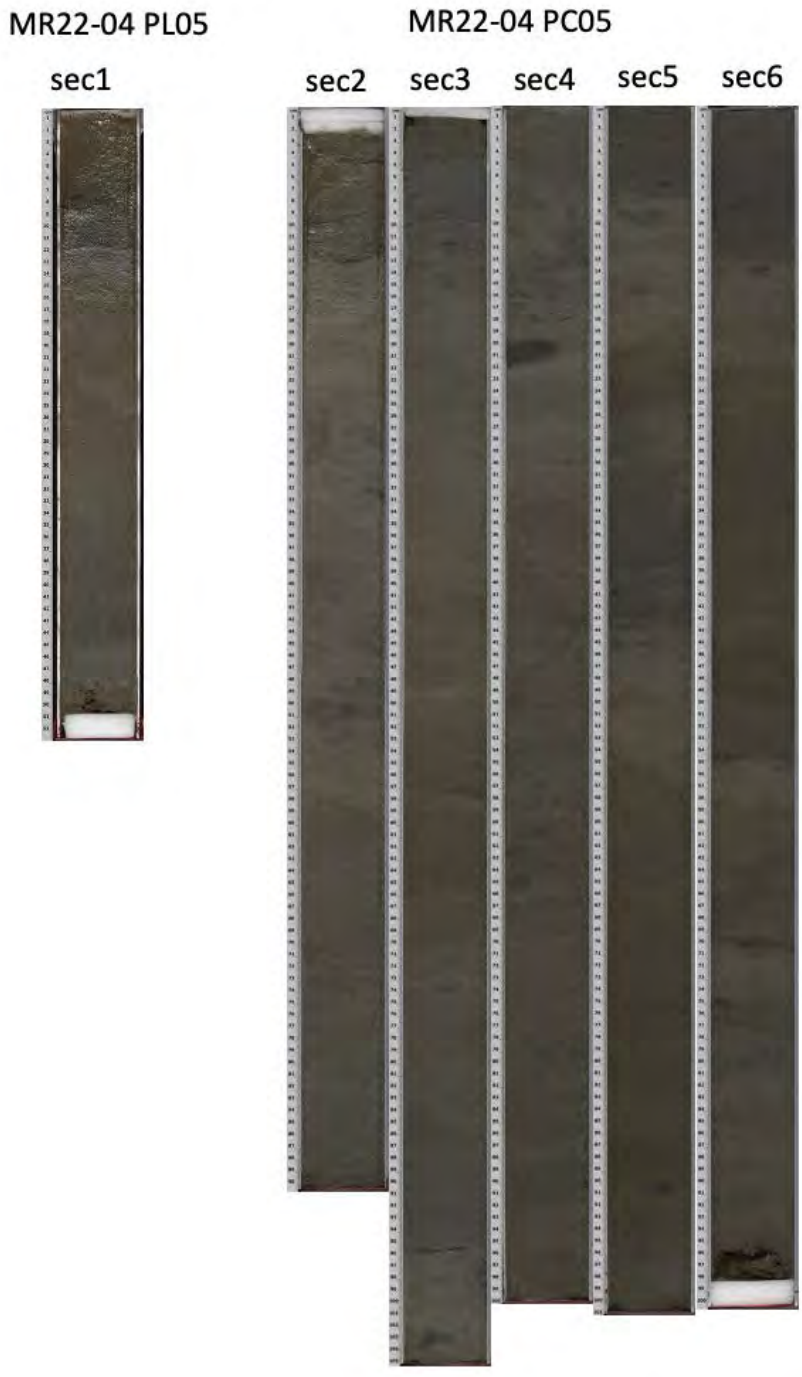


Figure 8-1-13: Scan image of MR22-04 PL05 & PC05.

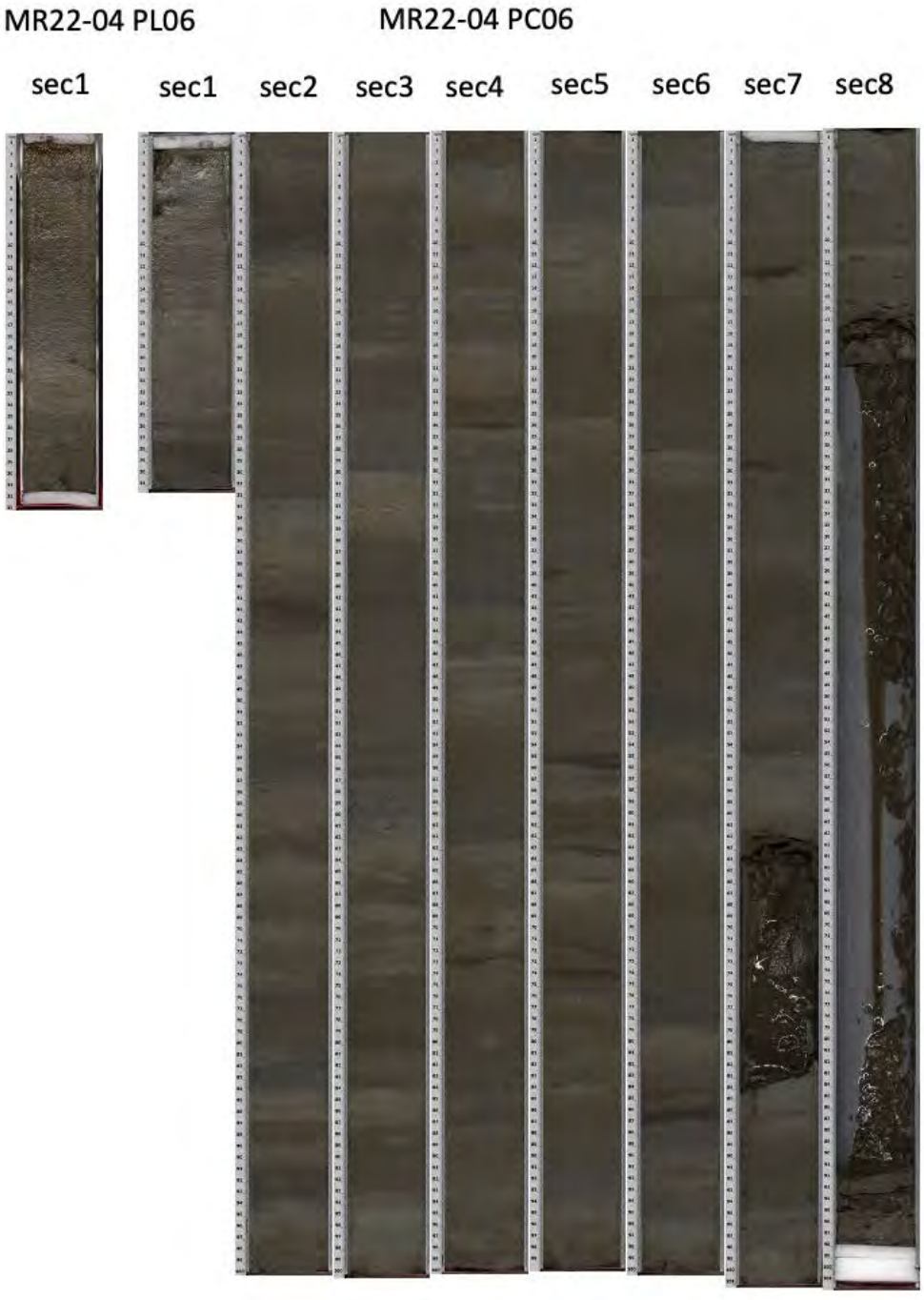


Figure 8-1-14: Scan image of MR22-04 PL06& PC06.

8-2. Multibeam Bathymetry

Bathymetry maps using the data obtained during the cruise are shown in **Figures 8-2-1** to **8-2-15**.

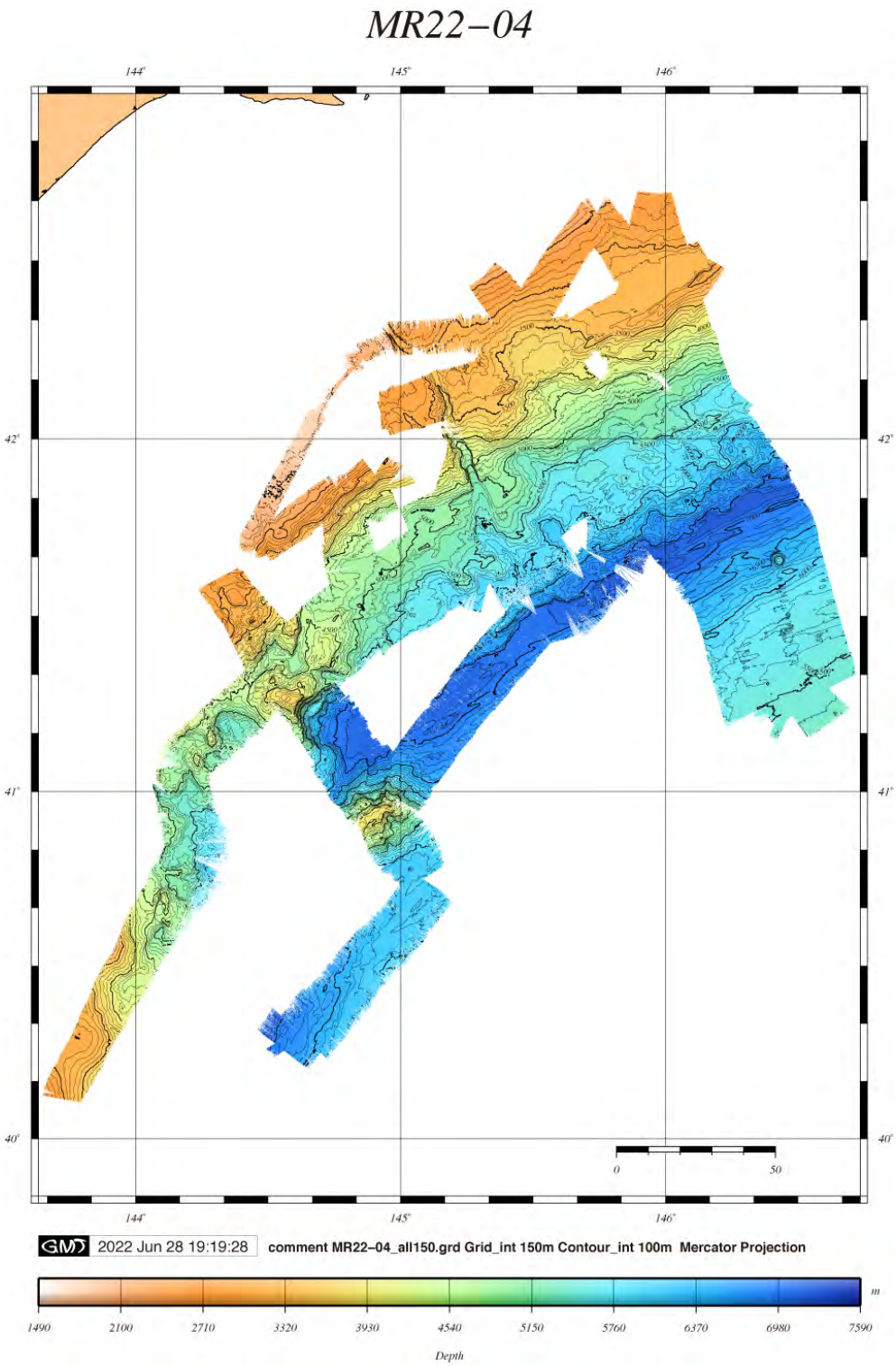


Figure 8-2-1: Bathymetry in the survey area.

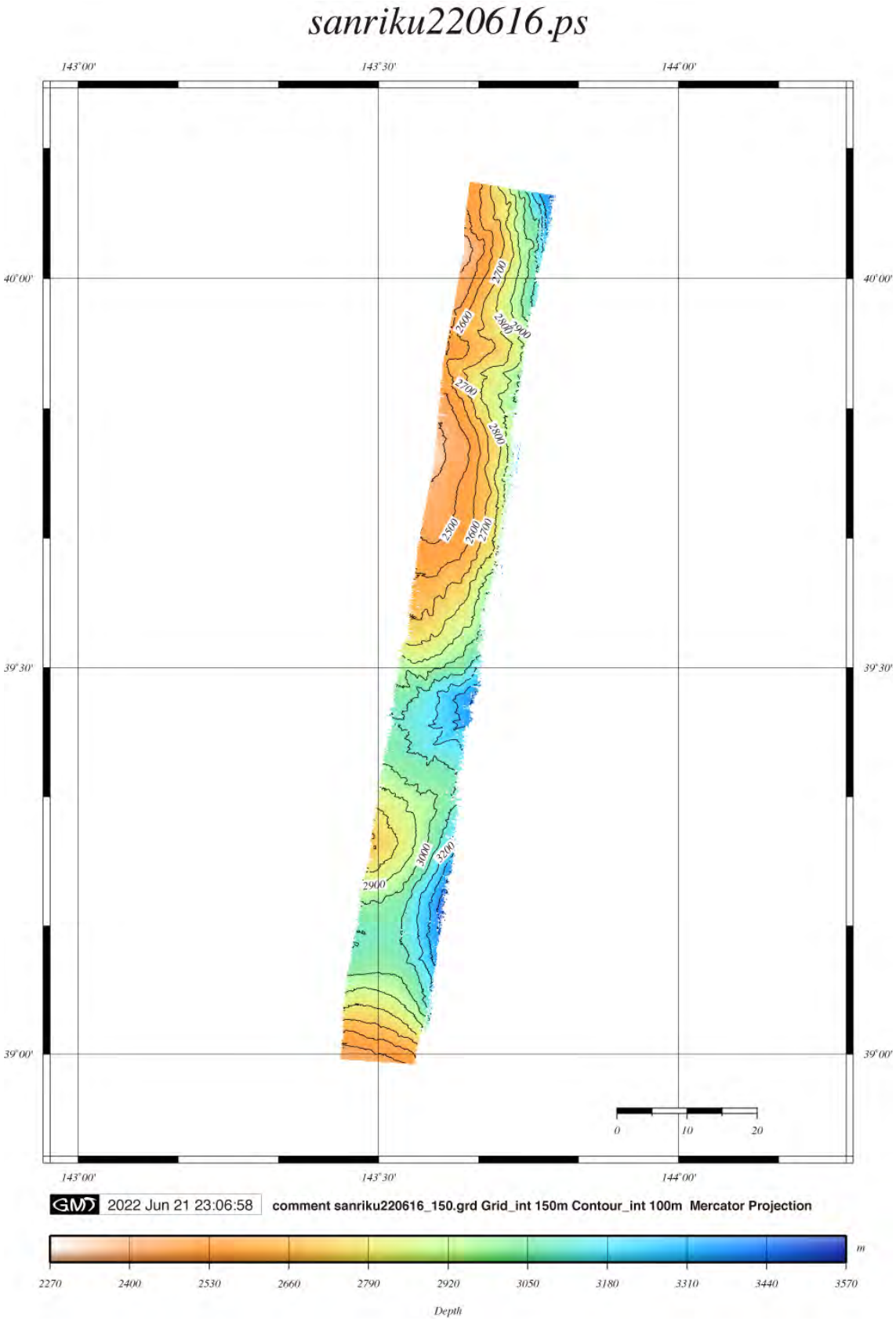


Figure 8-2-2: Bathymetry along the off-Sanriku line.

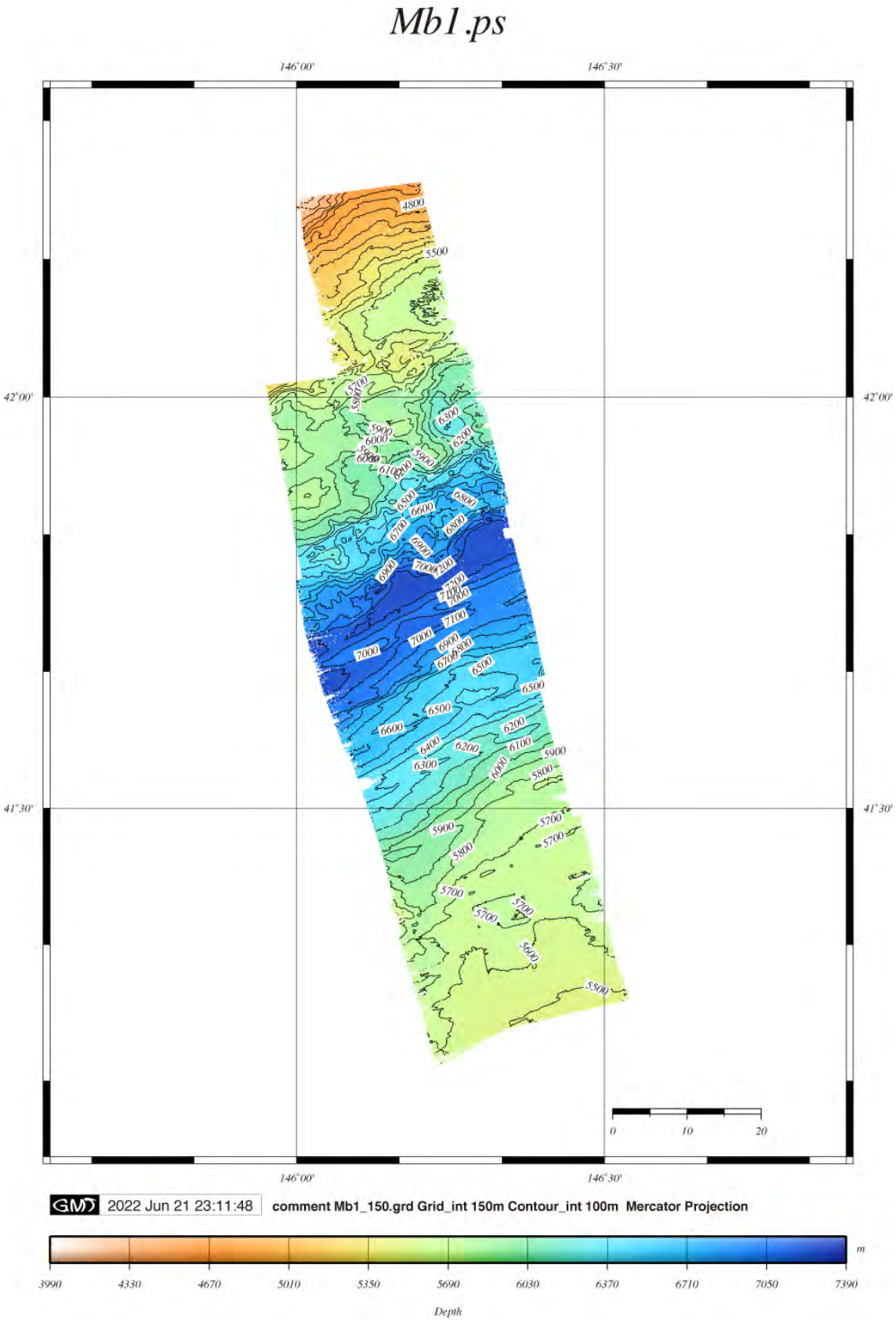


Figure 8-2-3: Bathymetry along Mb1 lines.

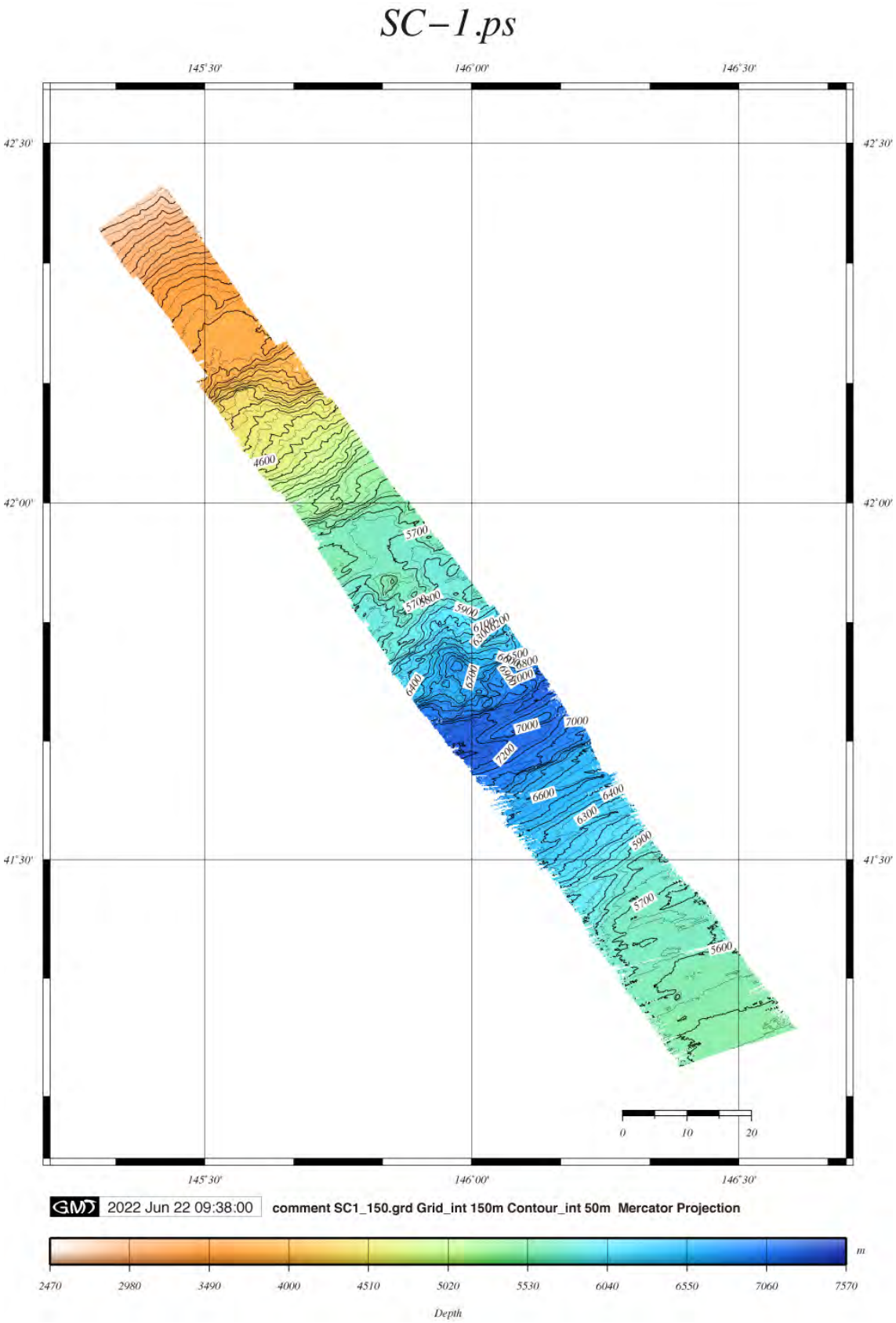


Figure 8-2-4: Bathymetry along the SCS survey SC1 line.

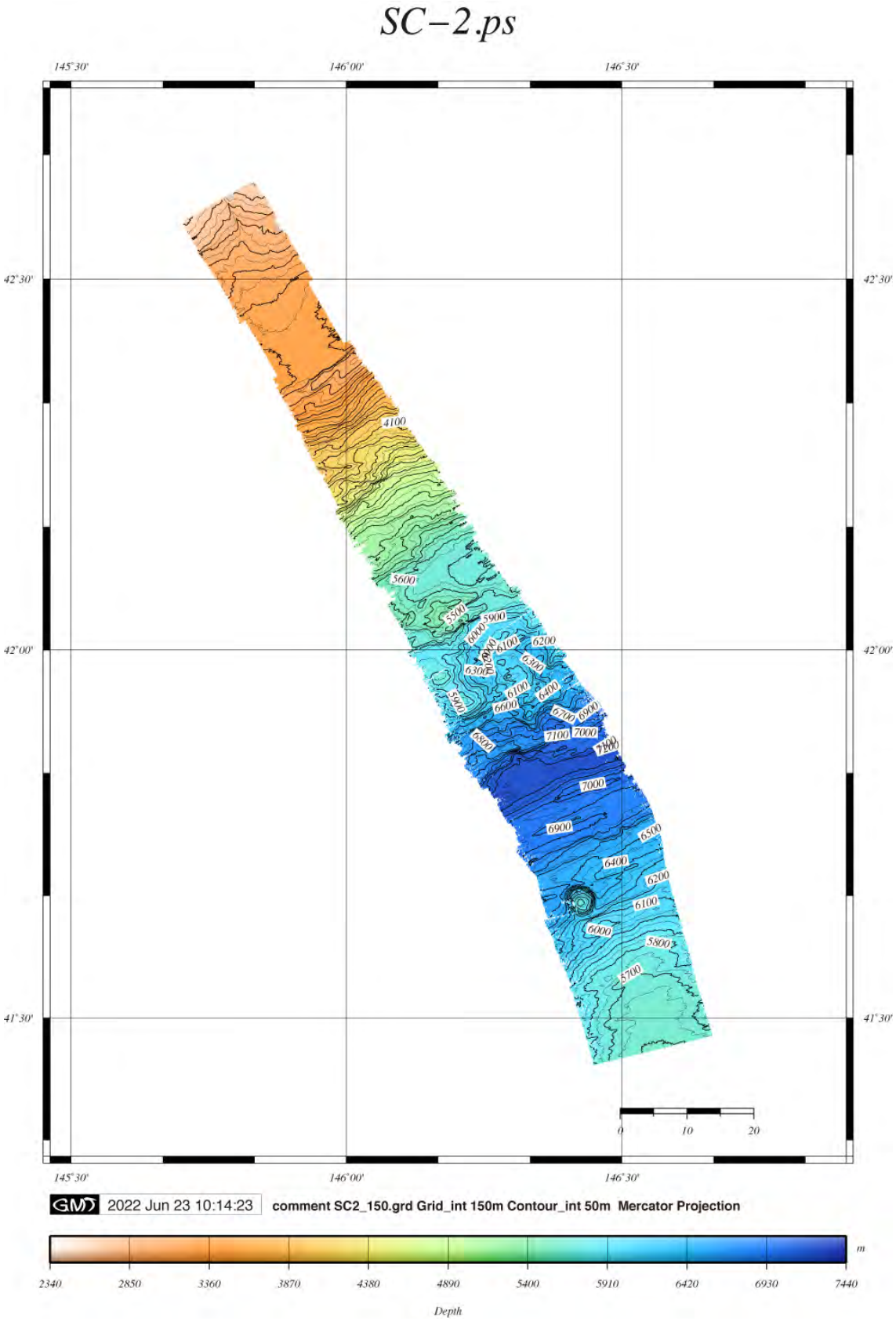


Figure 8-2-5: Bathymetry along the SCS survey SC2 line.

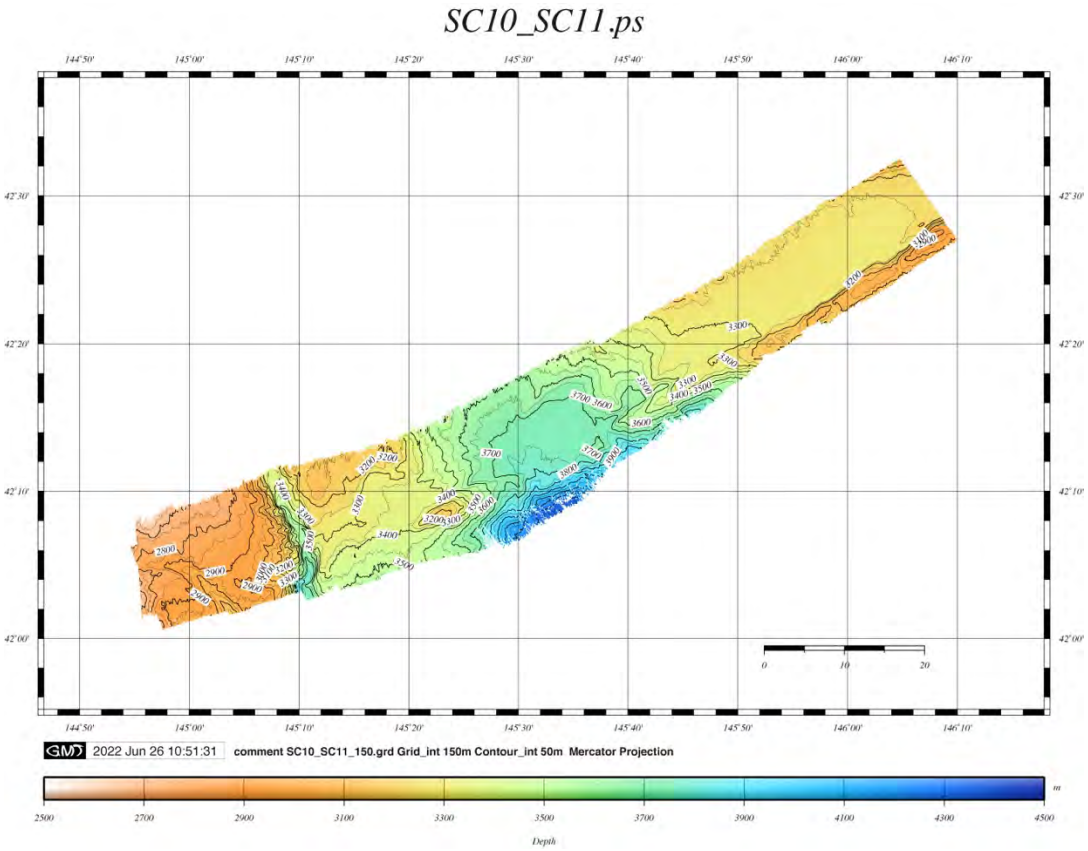


Figure 8-2-6: Bathymetry along SCS survey SC10 and 11 lines.

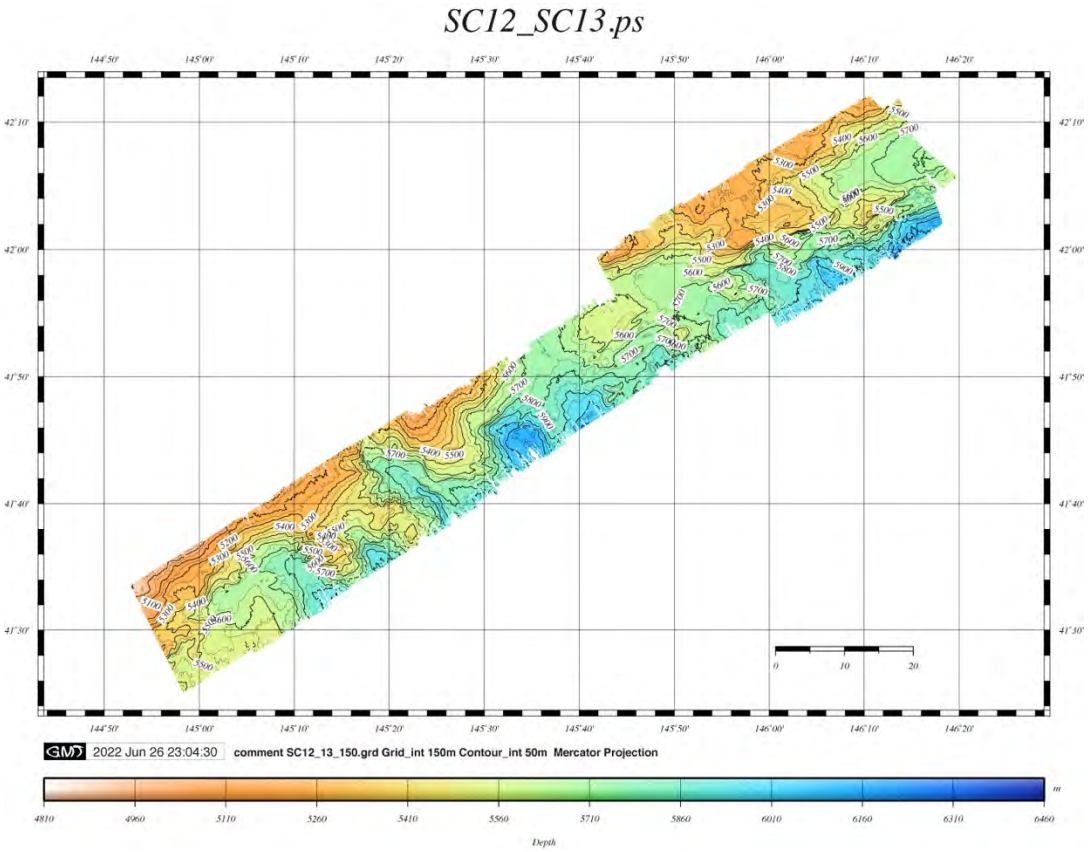


Figure 8-2-7: Bathymetry along SCS survey SC12 and 13 lines.

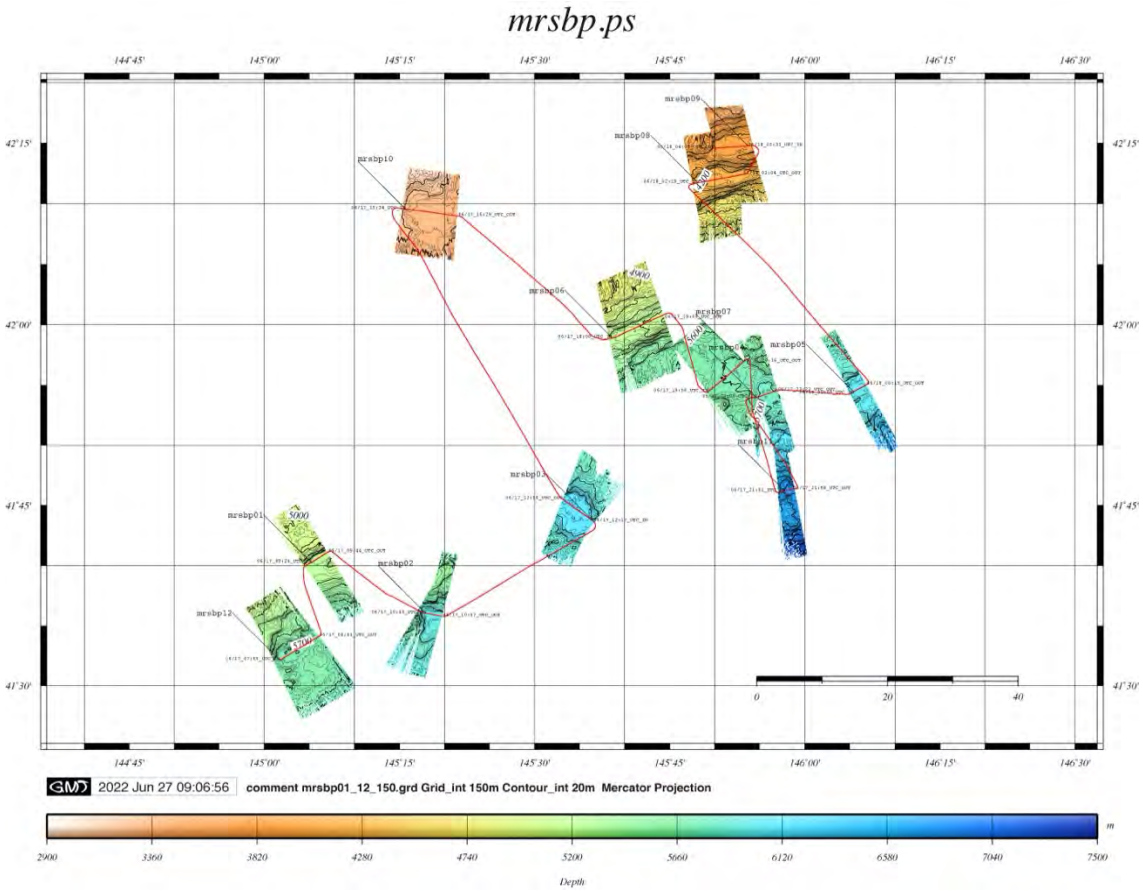


Figure 8-2-8: Bathymetry along SBP survey mrsbp01-12 lines. Red lines show the ship tracks.

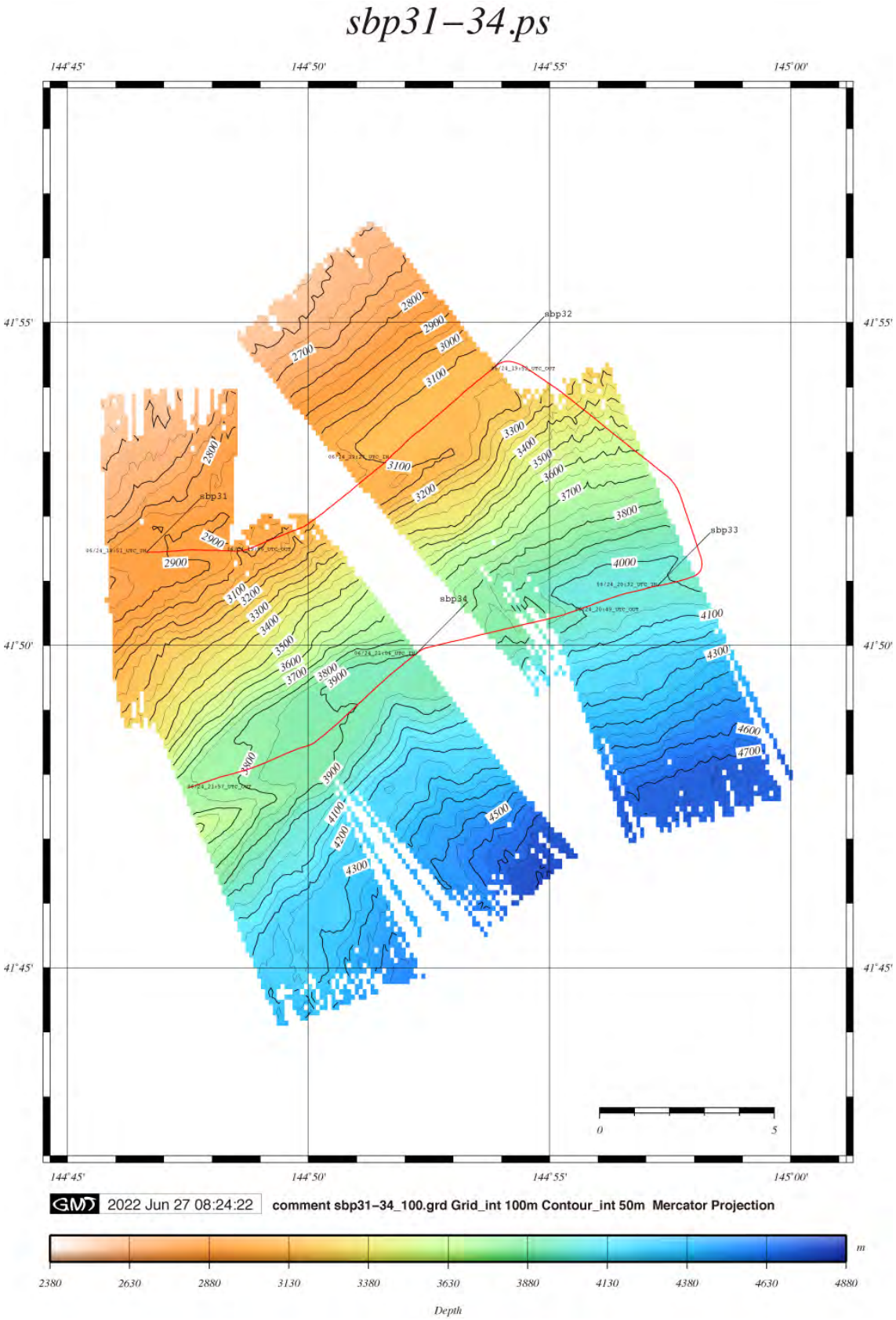


Figure 8-2-9: Bathymetry along SBP survey sbp31-34 lines. Red lines show the ship tracks.

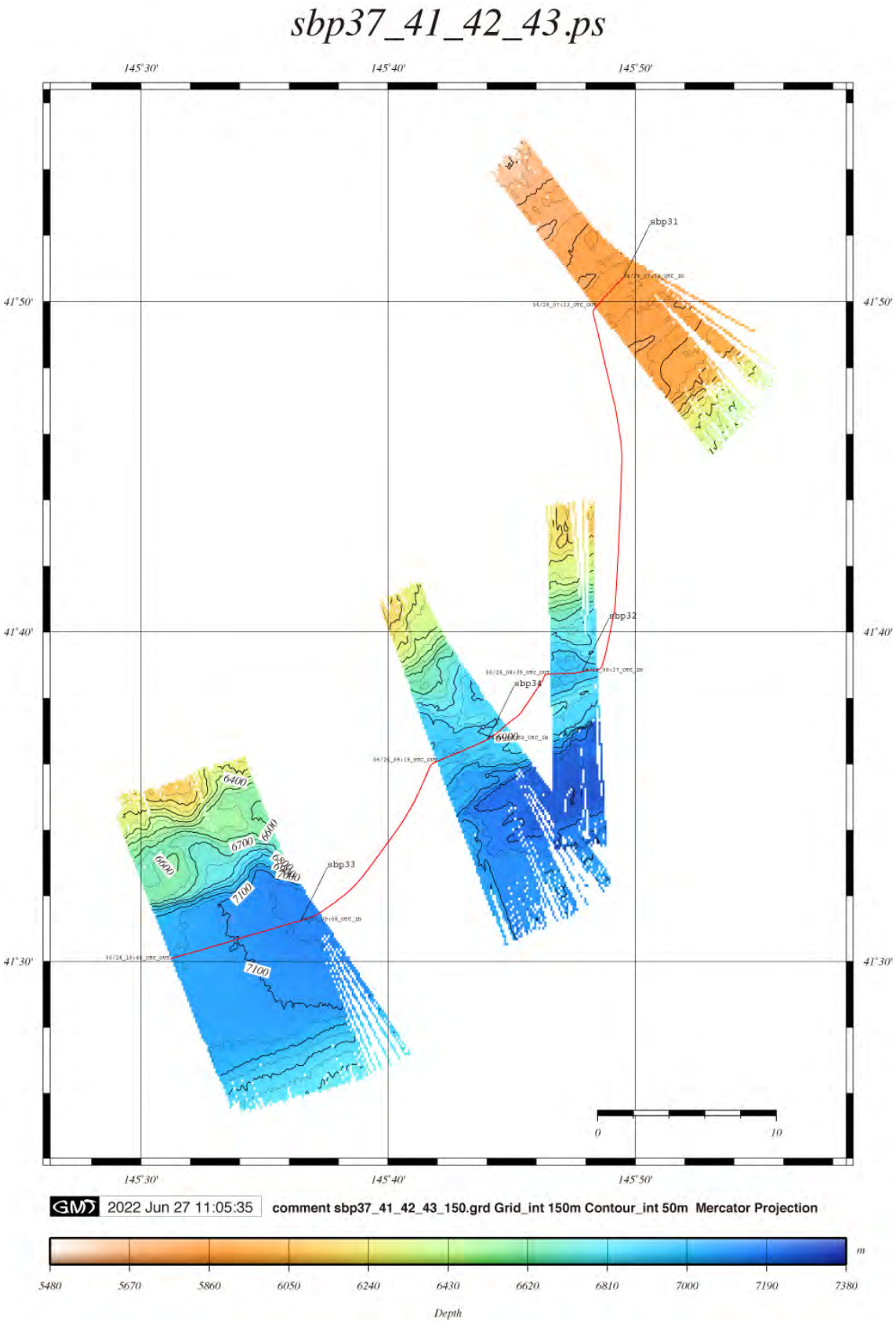


Figure 8-2-10: Bathymetry along SBP survey sbp37, 41, 42, and 43 lines. Red lines show the ship tracks.

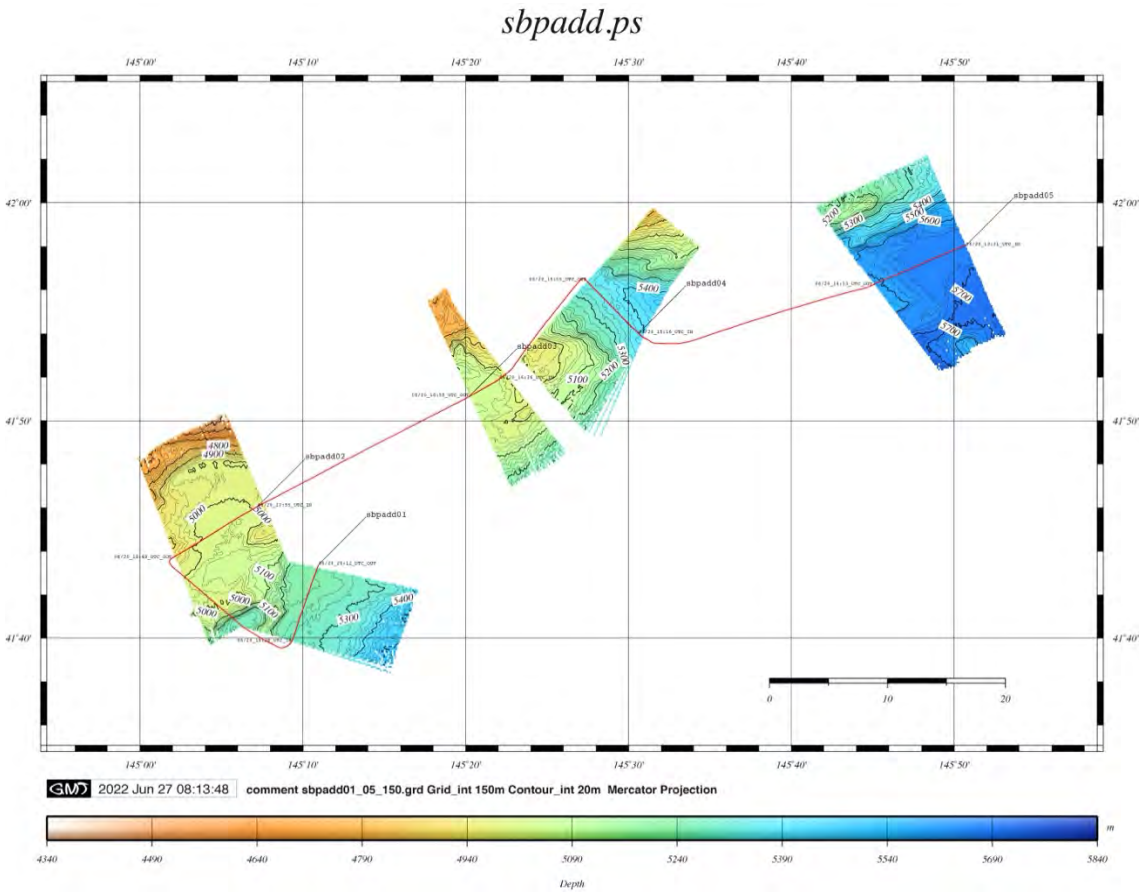


Figure 8-2-11: Bathymetry along SBP survey sbpadd01-05 lines. Red lines show the ship tracks.

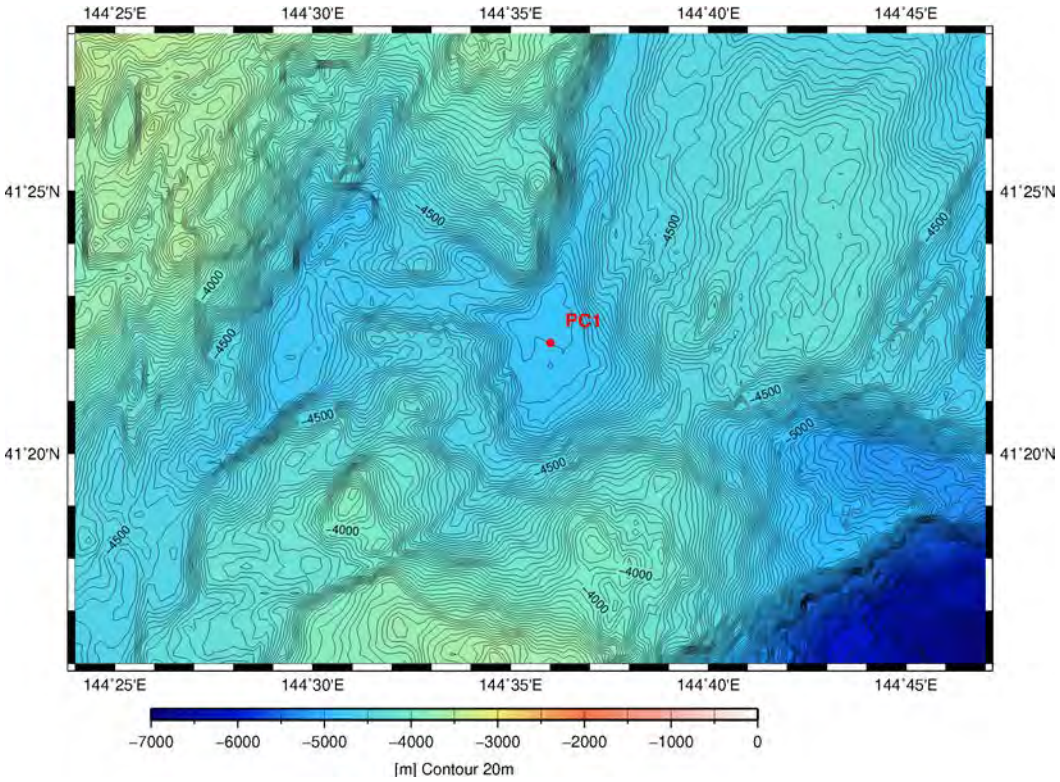


Figure 8-2-12: Bathymetry around PC1 site.

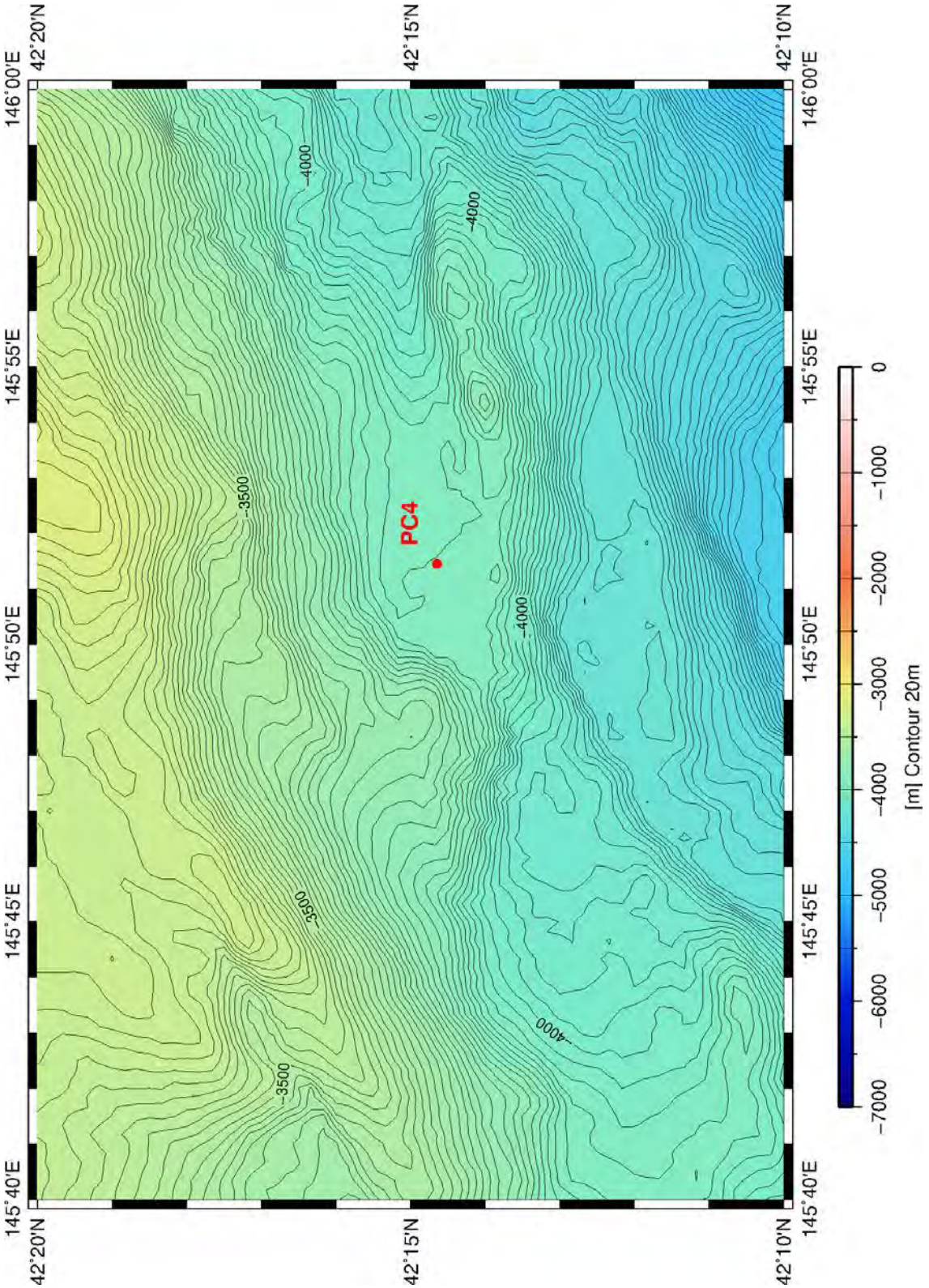


Figure 8-2-13: Bathymetry around PC4 site.

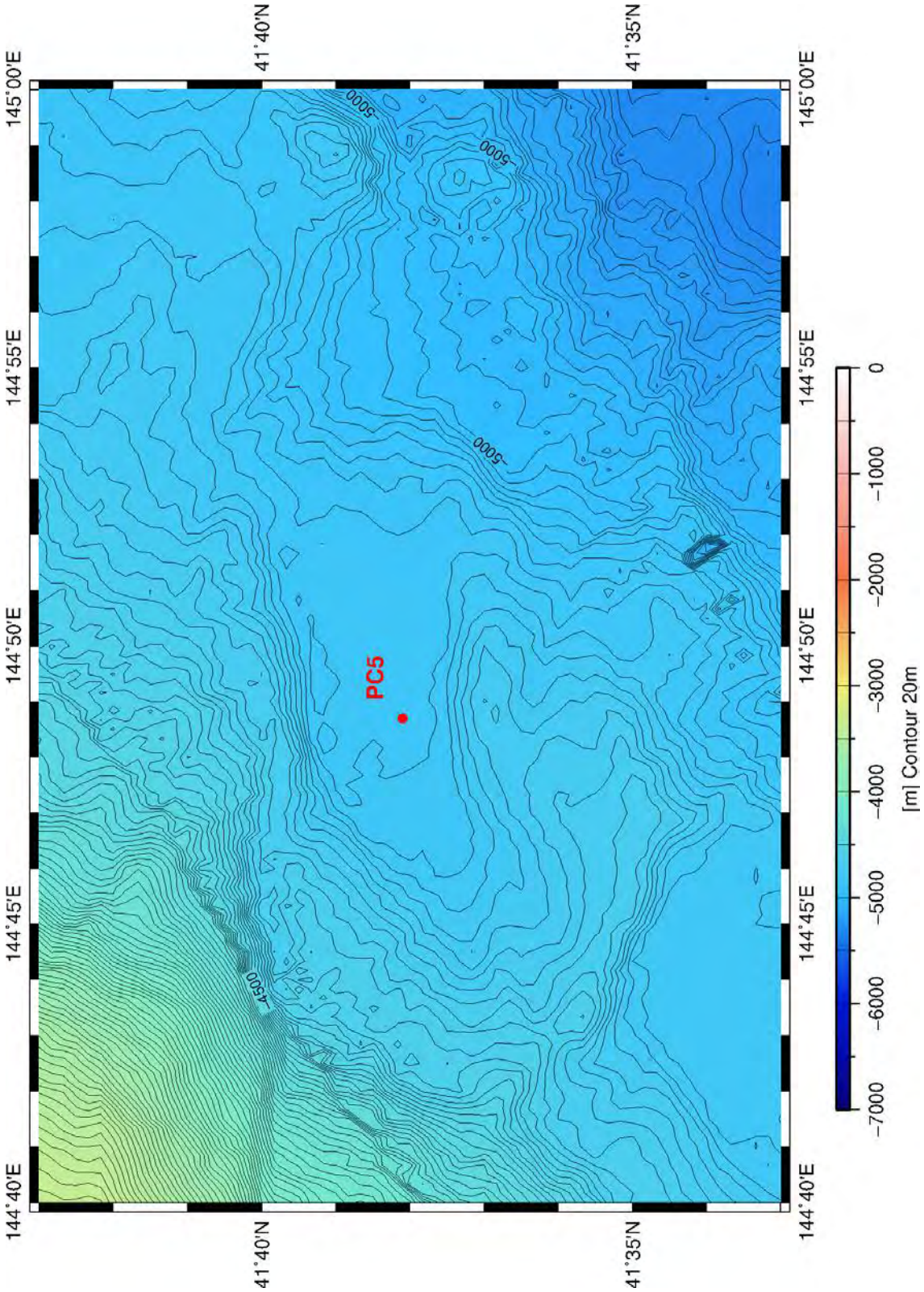


Figure 8-2-14: Bathymetry around PC5 site.

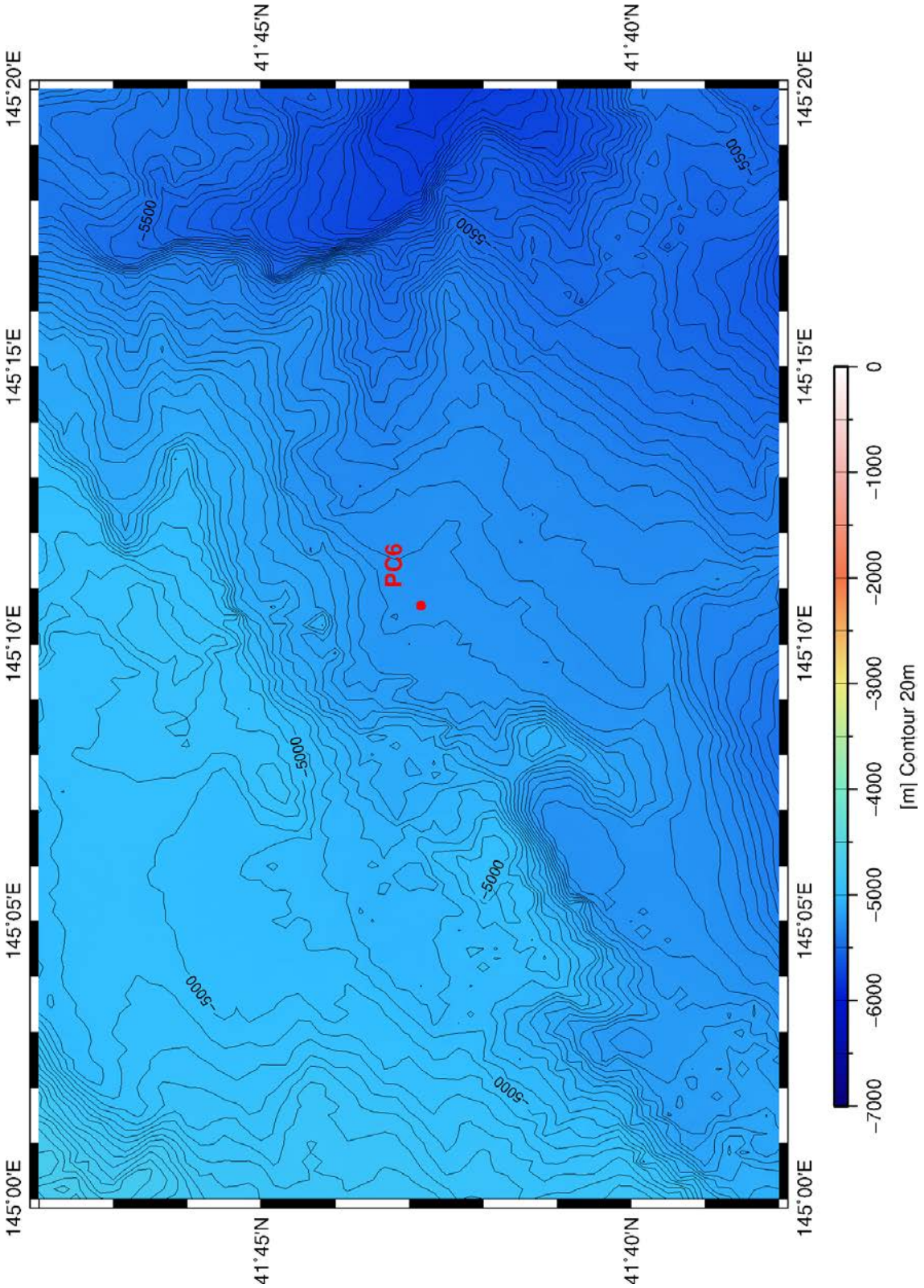


Figure 8-2-15: Bathymetry around PC6 site.

8-3. XCTD Profile

Vertical profiles of seawater temperature, conductivity, salinity, and calculated sound velocity conducted at 13 sites are shown in **Figures 8-3-1** to **8-3-13**.

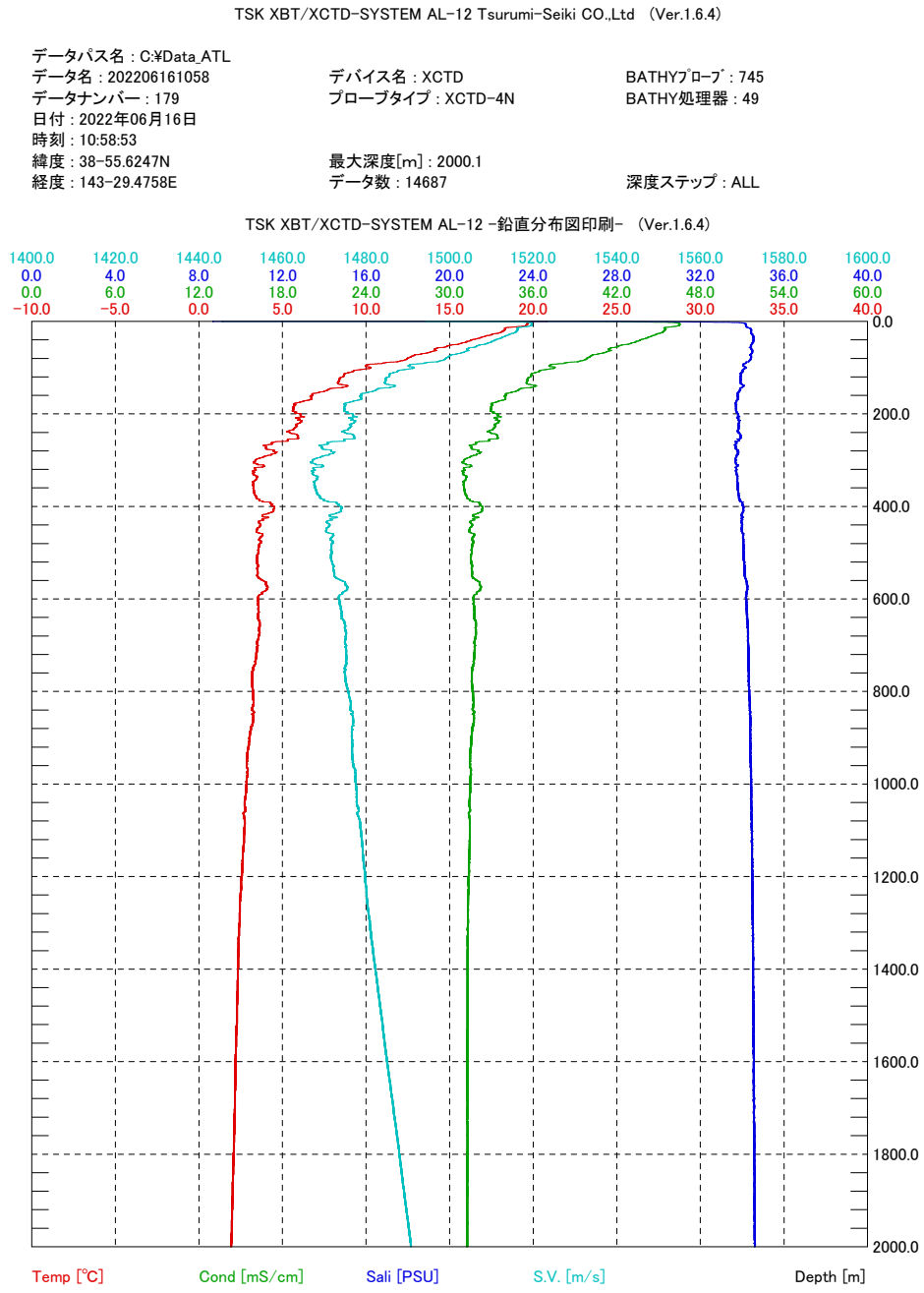


Figure 8-3-1: Profile at Sanriku station. See **Table 7-3-1** for information on the station.

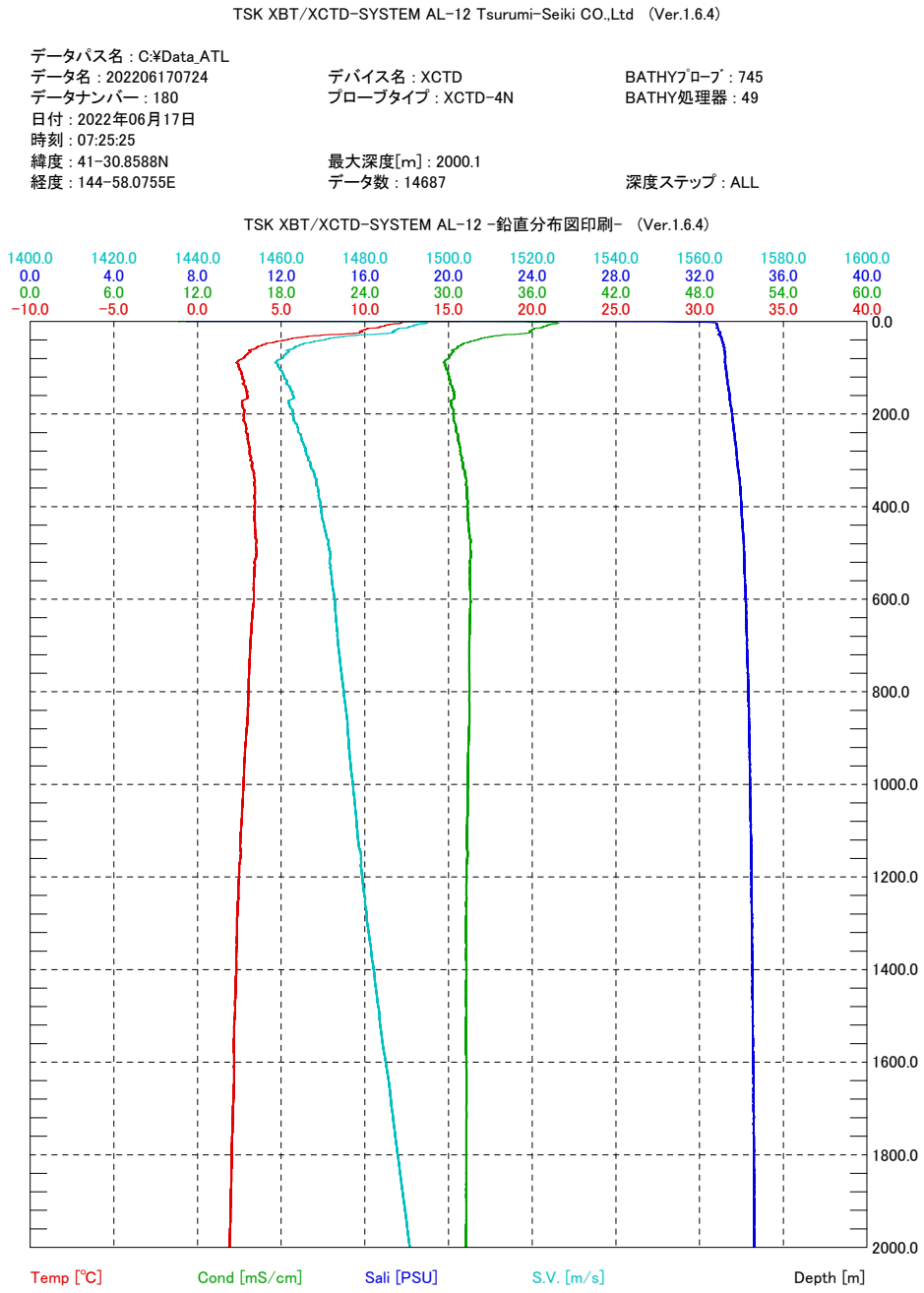


Figure 8-3-2: Profile at PC1 station. See **Table 7-3-1** for information on the station.

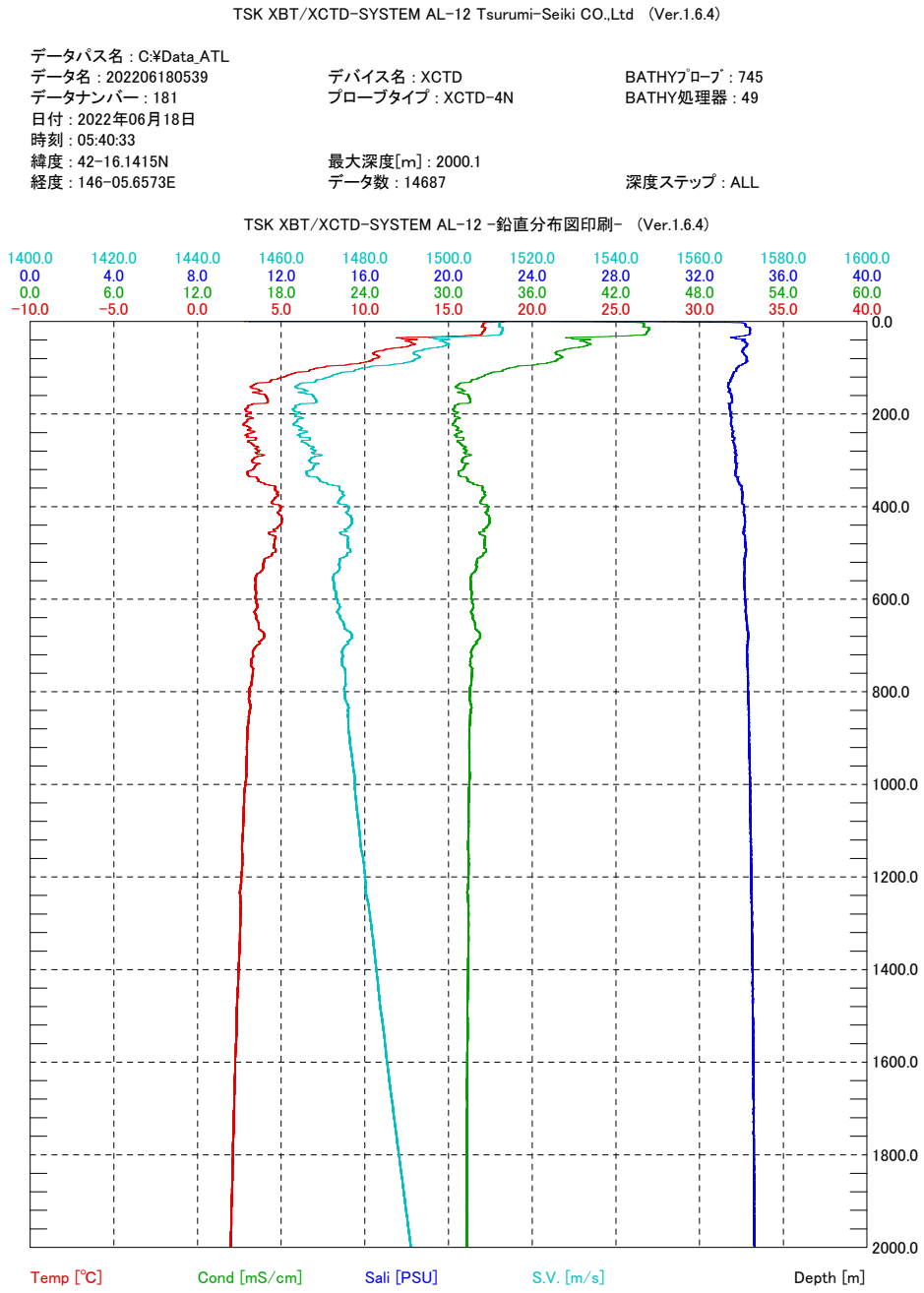


Figure 8-3-3: Profile at Mb1-m-a station. See **Table 7-3-1** for information on the station.

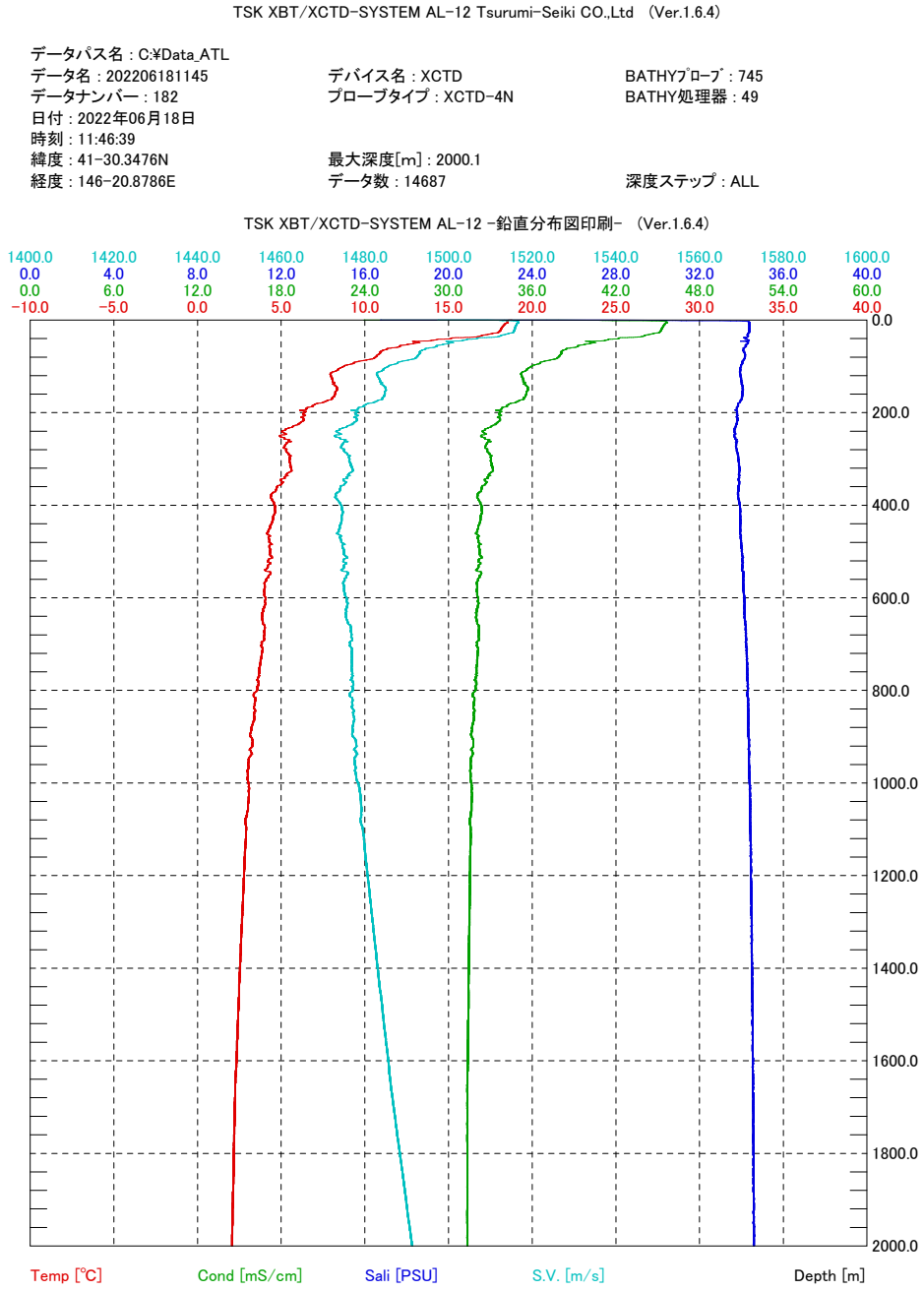


Figure 8-3-4: Profile at Mb1-m-b station. See **Table 7-3-1** for information on the station.

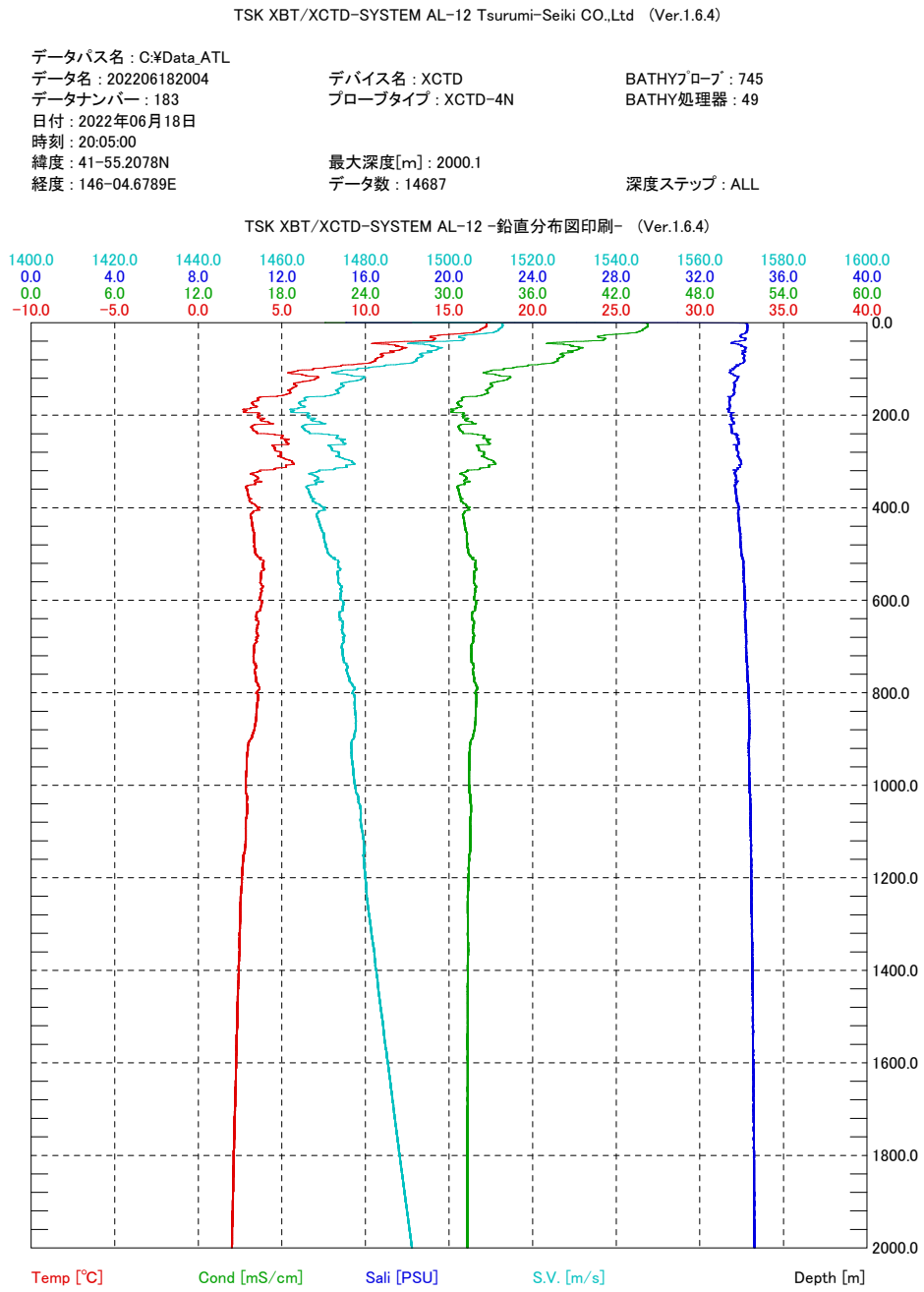


Figure 8-3-5: Profile at Mb1-sw station. See **Table 7-3-1** for information on the station.

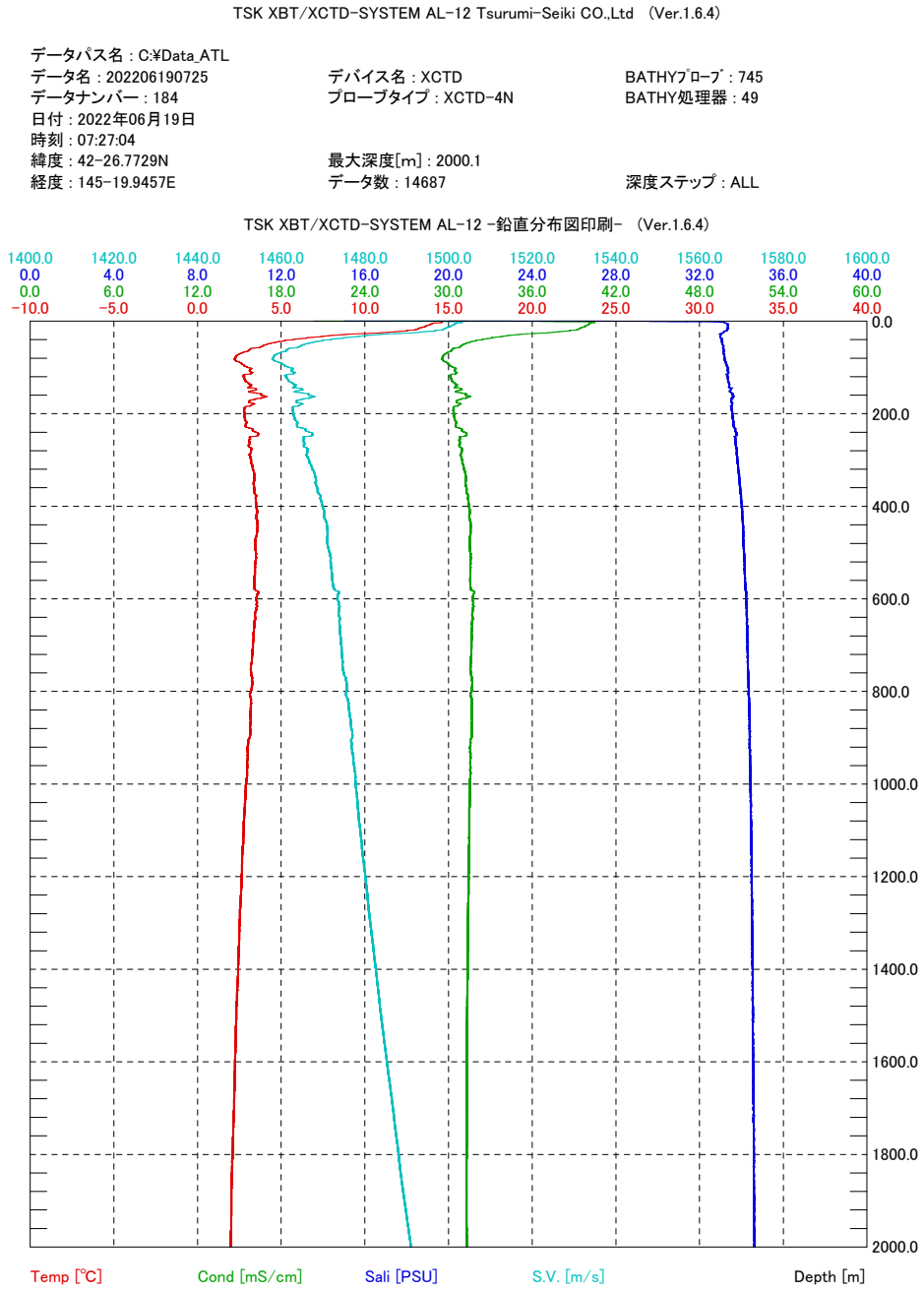


Figure 8-3-6: Profile at SC1-a station. See **Table 7-3-1** for information on the station.

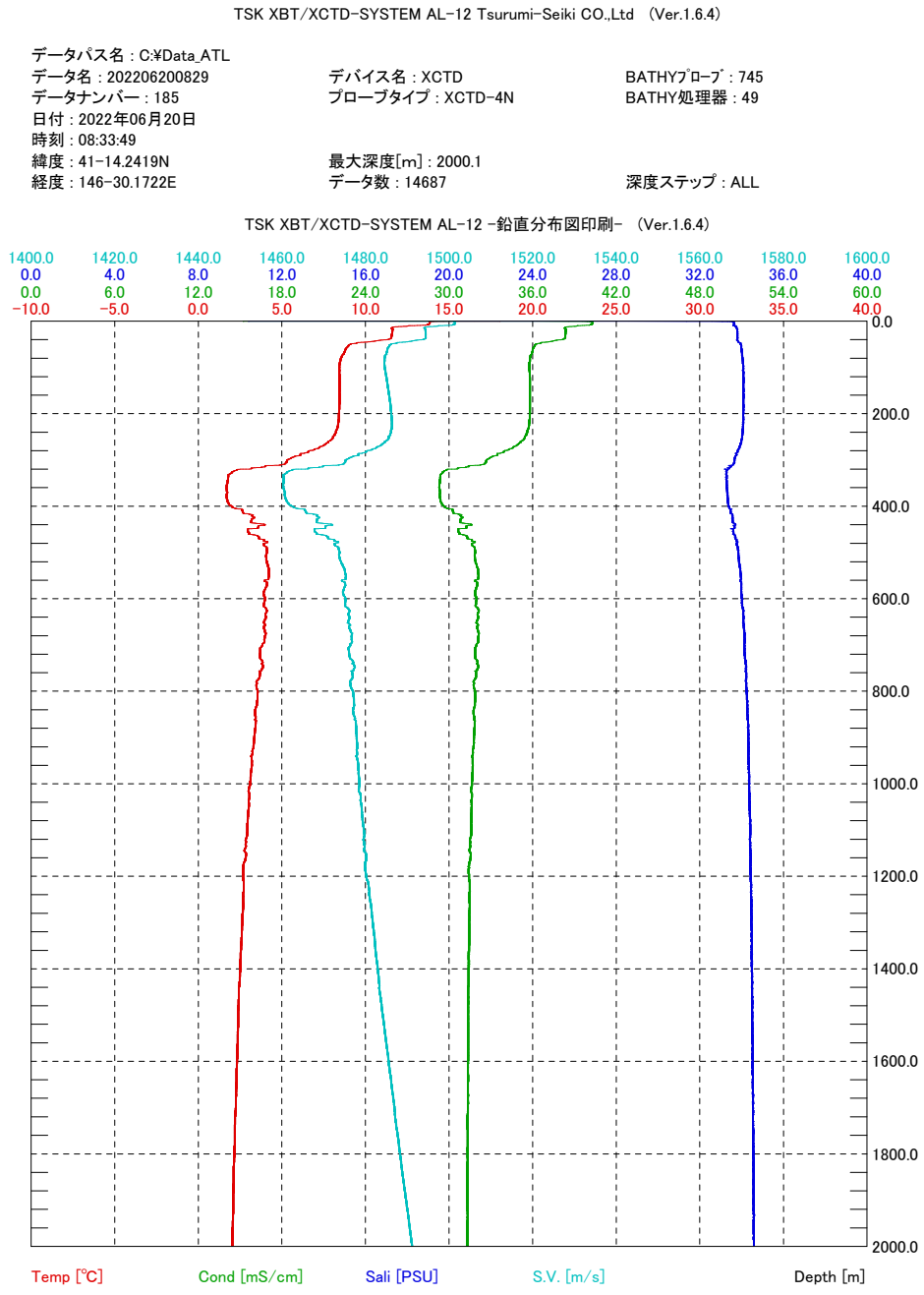


Figure 8-3-7: Profile at SC1-b station. See **Table 7-3-1** for information on the station.

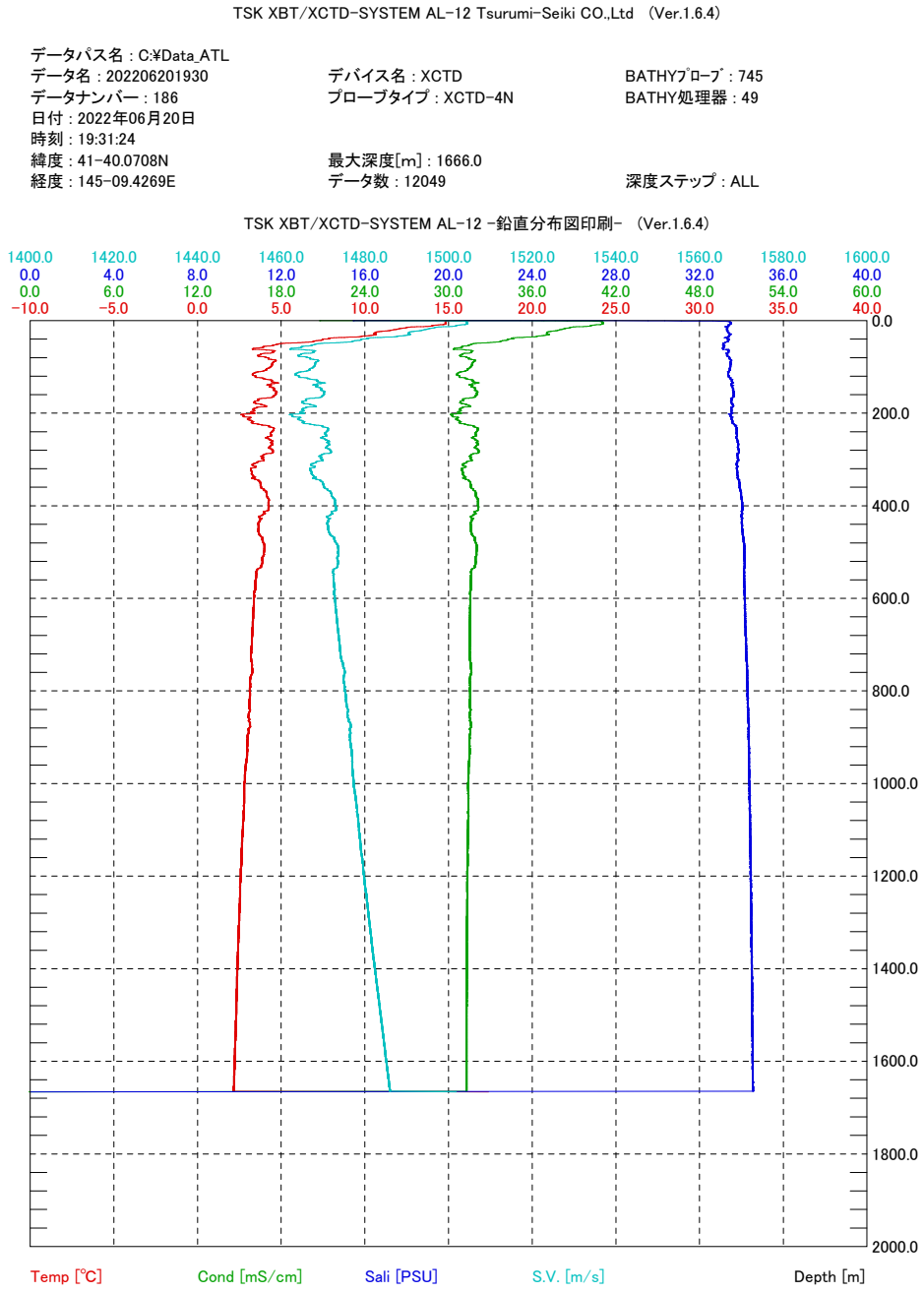


Figure 8-3-8: Profile at sbpadd01 station. See **Table 7-3-1** for information on the station.

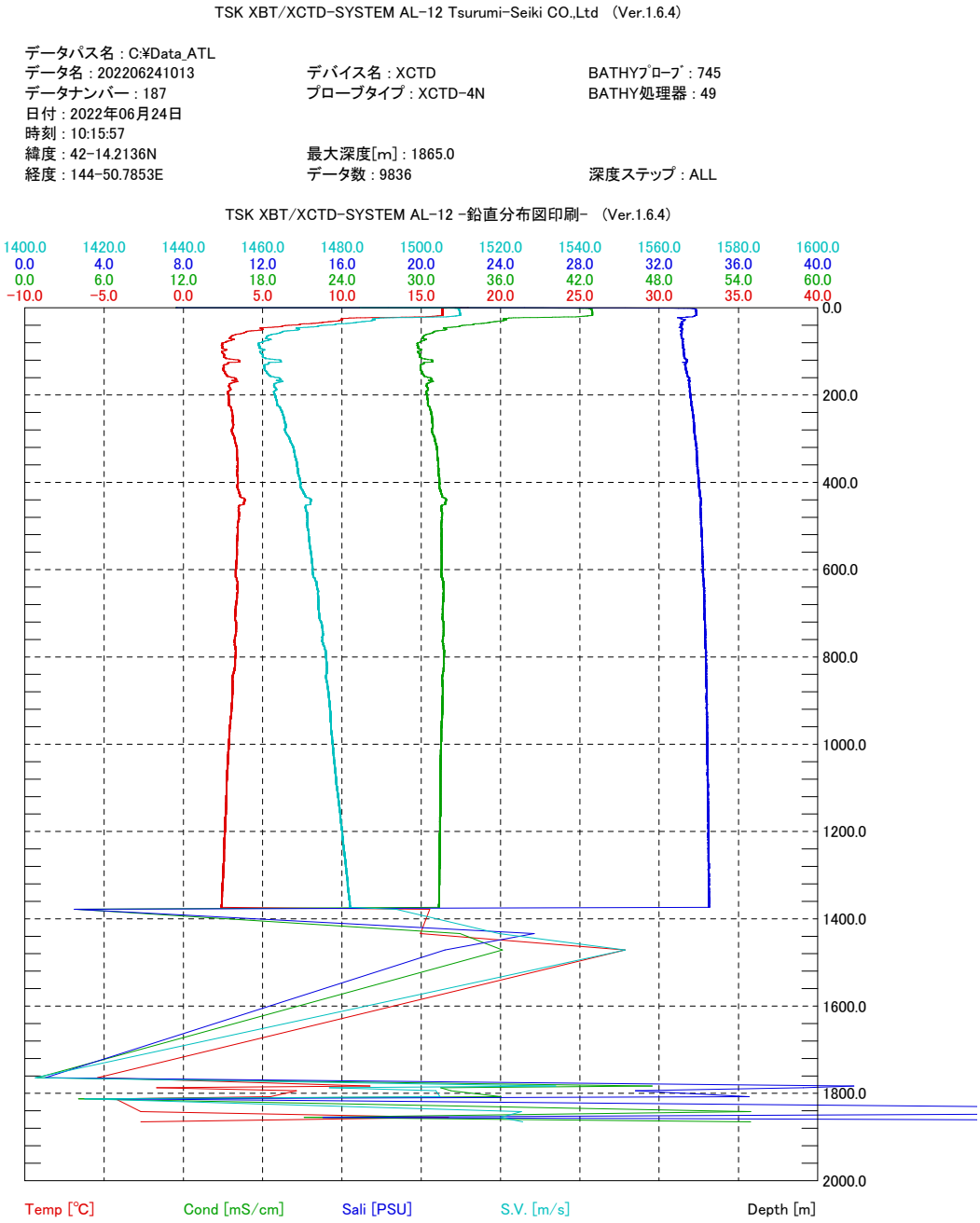


Figure 8-3-9: Profile at PG2 station. See **Table 7-3-1** for information on the station.

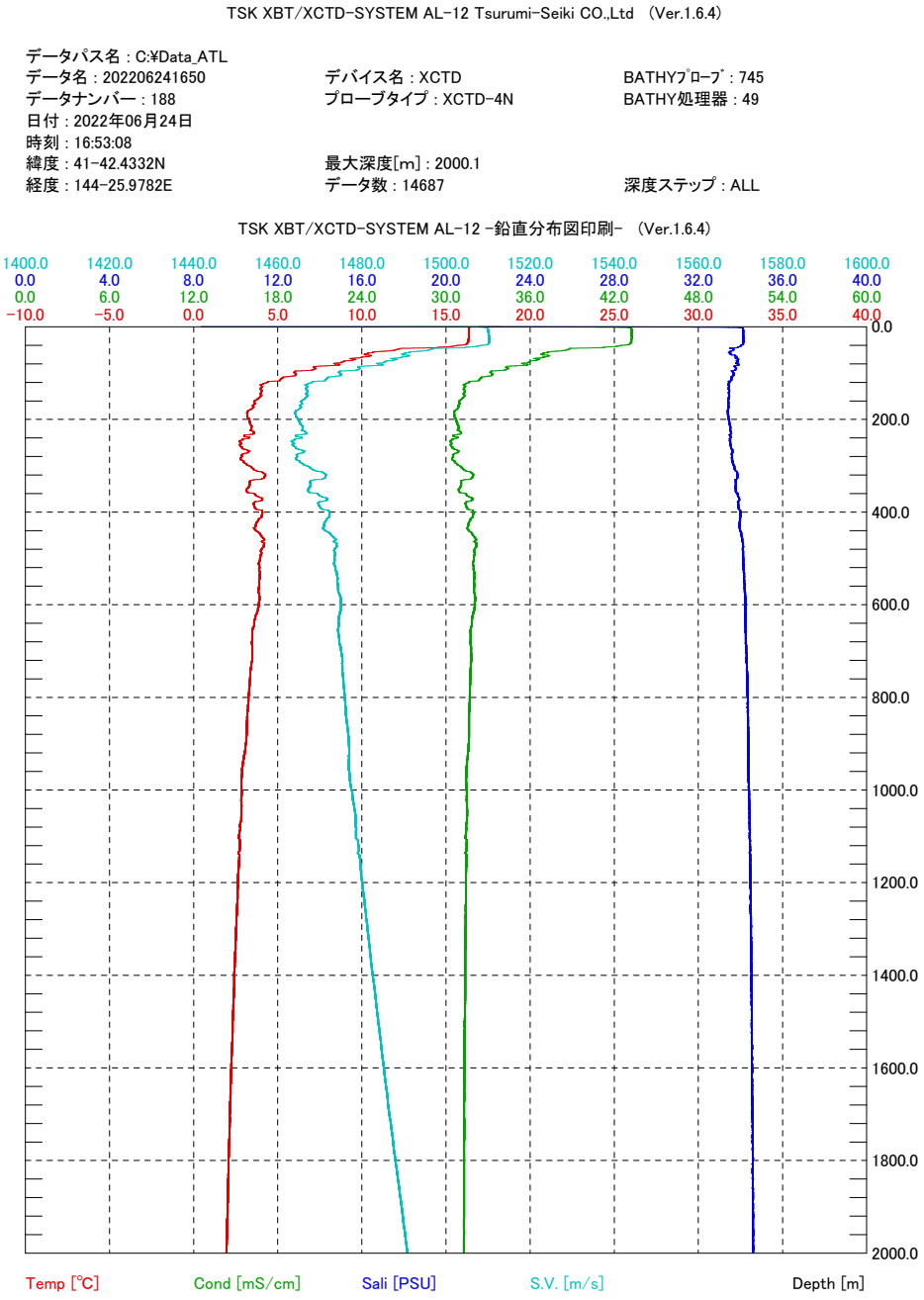


Figure 8-3-10: Profile at PG1 station. See **Table 7-3-1** for information on the station.

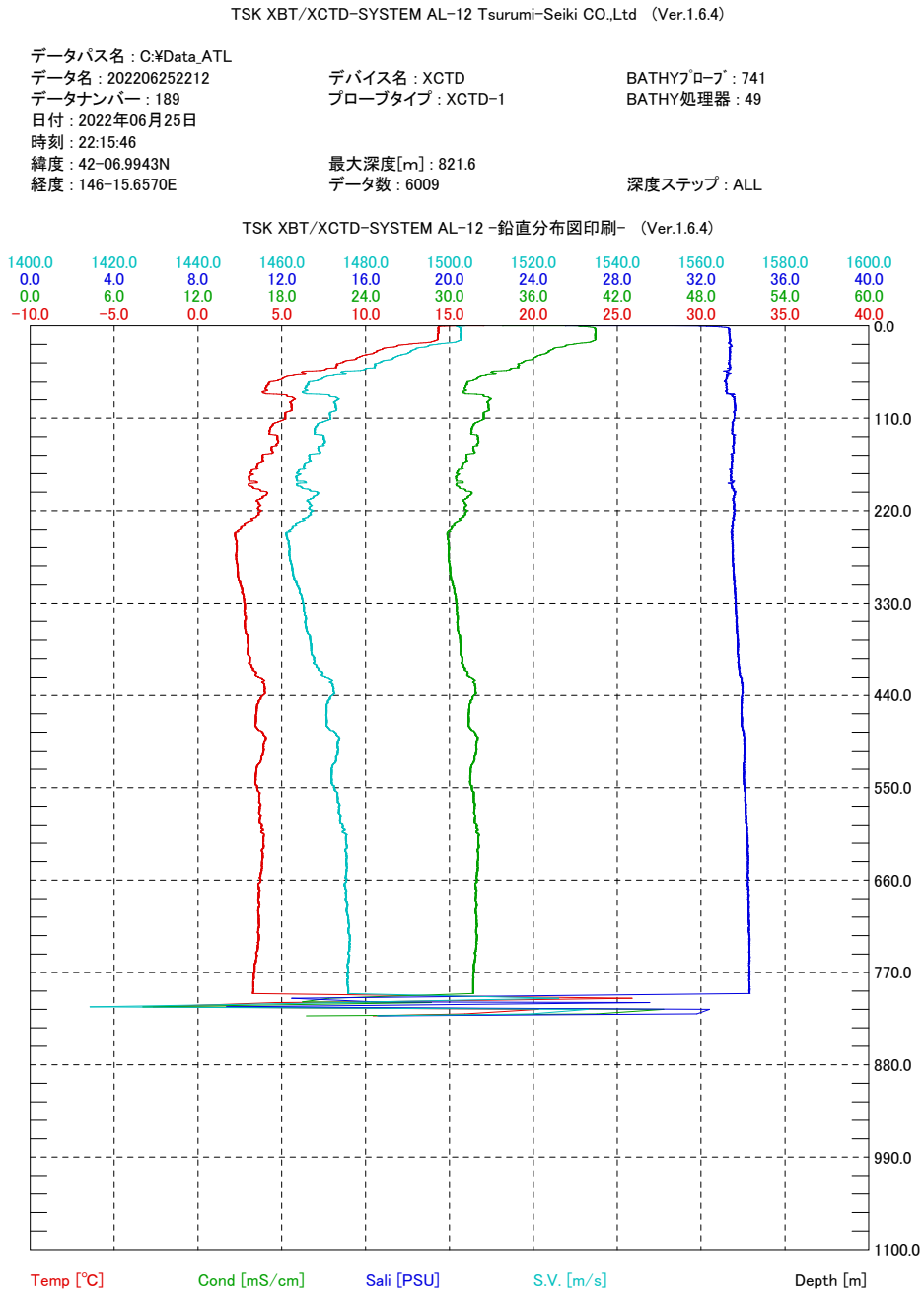


Figure 8-3-11: Profile at SC12 station. See **Table 7-3-1** for information on the station.

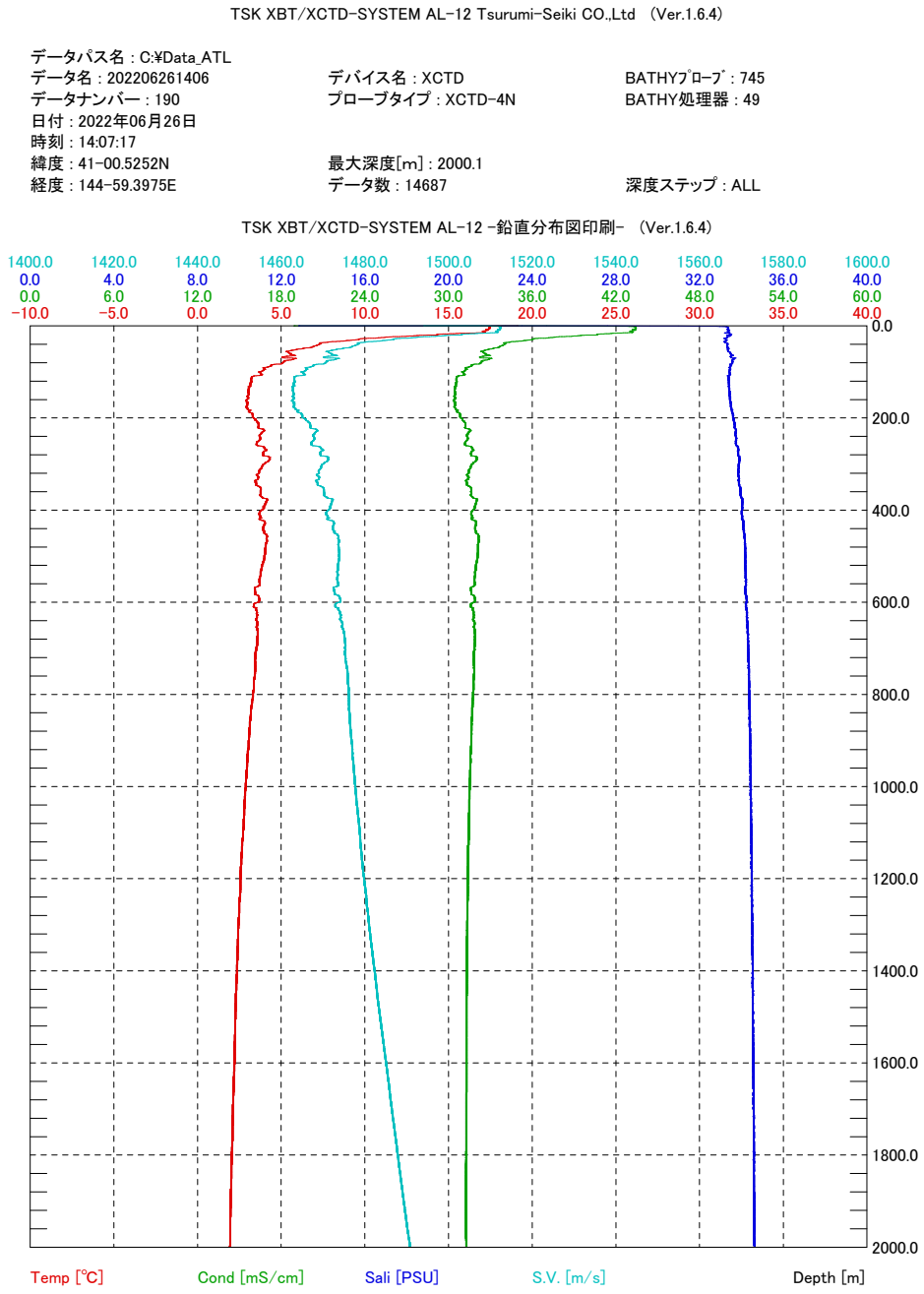


Figure 8-3-12: Profile at Mb2-se-1 station. See **Table 7-3-1** for information on the station.

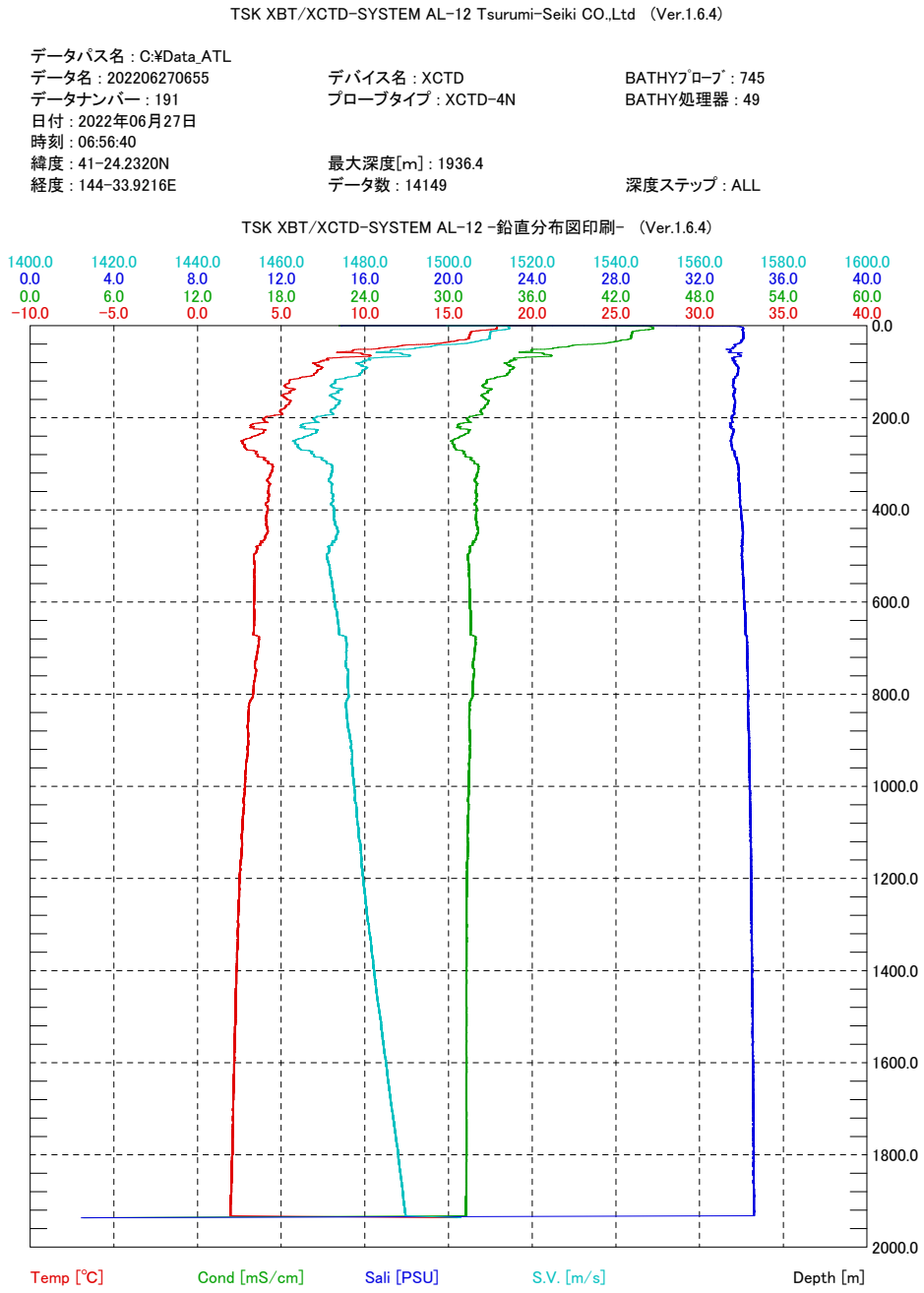


Figure 8-3-13: Profile at Mb2-m-se-2_Start station. See **Table 7-3-1** for information on the station.

8-4. Sub-Bottom Profile

8-4-1. Sub-bottom profiling survey

To find the piston coring points, sub-bottom profiling (SBP) surveys were performed in advance. Bathymetric features showing basin-like were selected for the SBP survey, and 25 lines were profiled. Six points in the surveyed lines were selected for the piston coring.

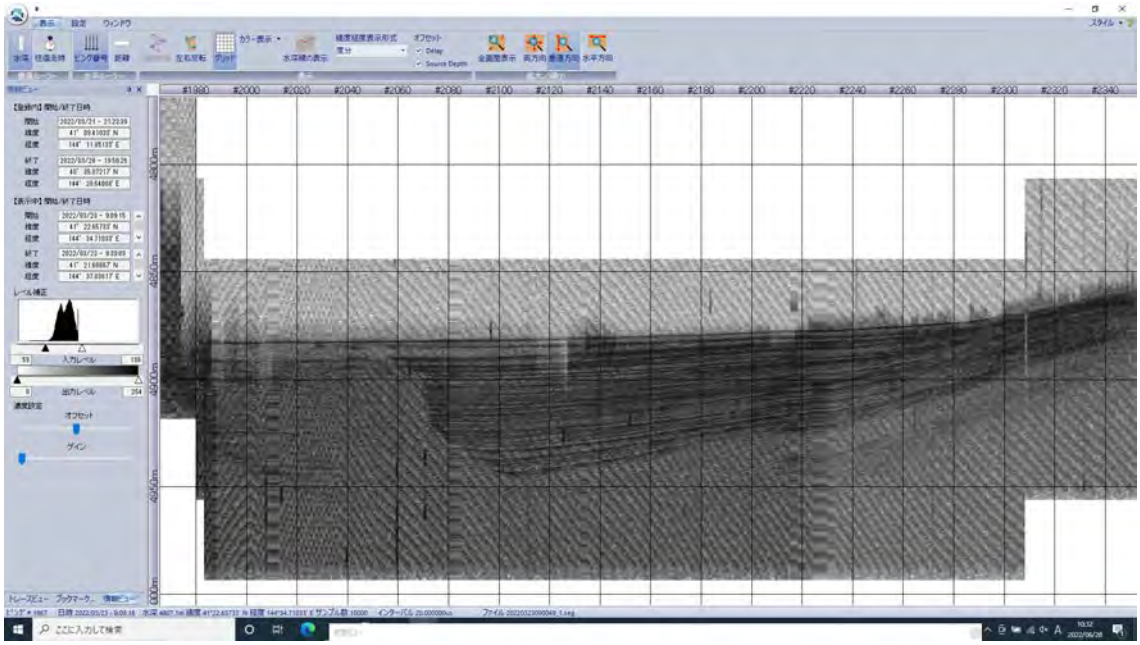


Figure 8-4-1: Sub-bottom profiling record around PC01 point. The SBP data were acquired during the R/V Kaimei KM22-05 cruise using a Kongsberg TOPAS PS18. Refer to locations in the left panel for SBP images. This image was produced by the software SeaProfile7.

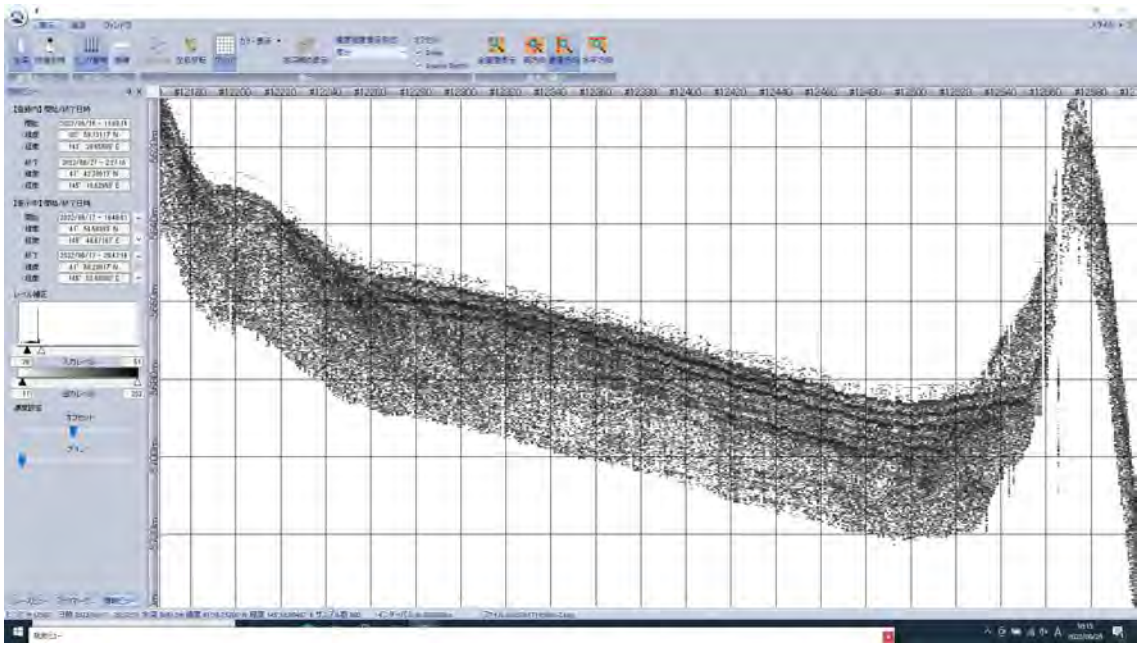


Figure 8-4-2: Sub-bottom profiling record around PC02 point. Refer to locations in the left panel for SBP images. This image was produced by the software SeaProfile7.

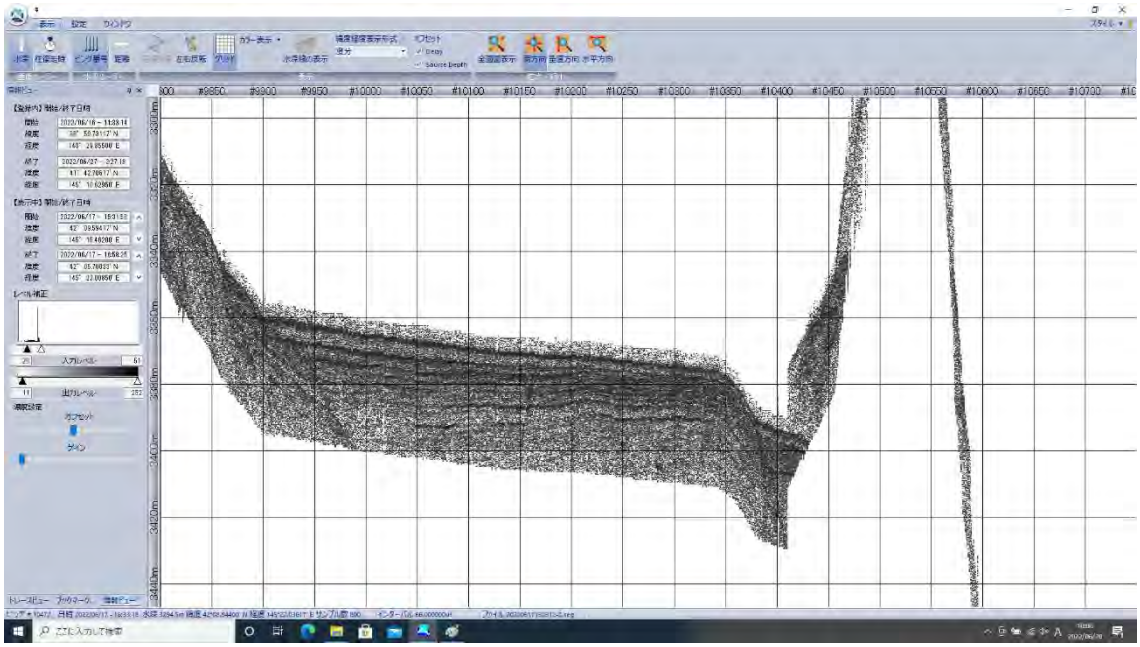


Figure 8-4-3: Sub-bottom profiling record around PC03 point. Refer to locations in the left panel for SBP images. This image was produced by the software SeaProfile7.

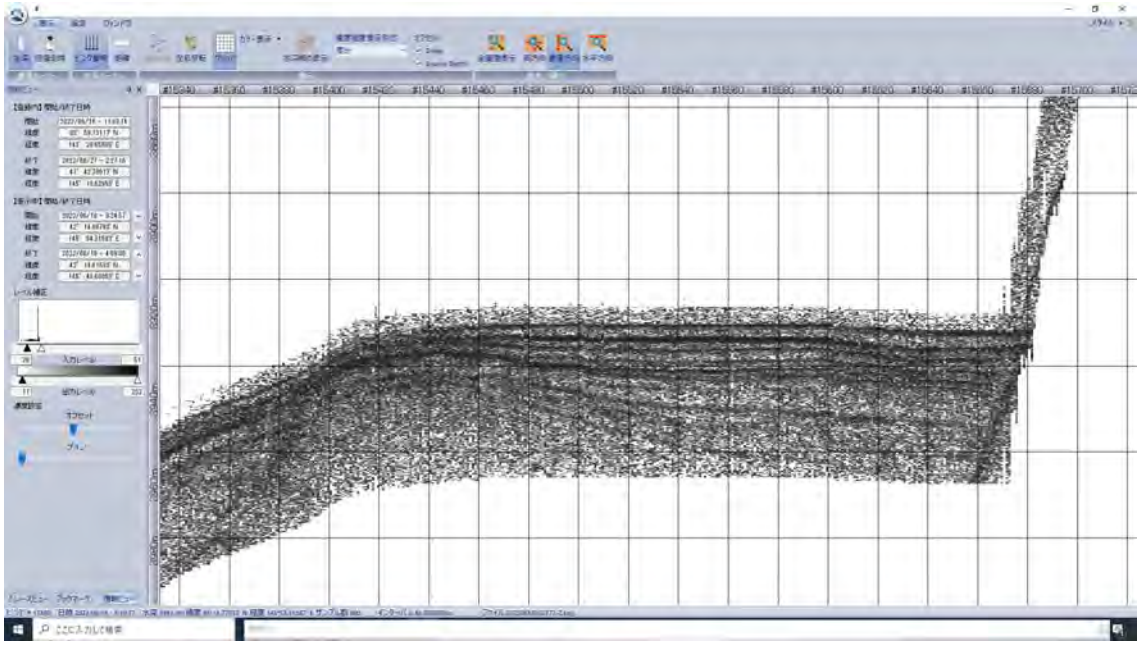


Figure 8-4-4: Sub-bottom profiling record around PC04 point. Refer to locations in the left panel for SBP images. This image was produced by the software SeaProfile7.

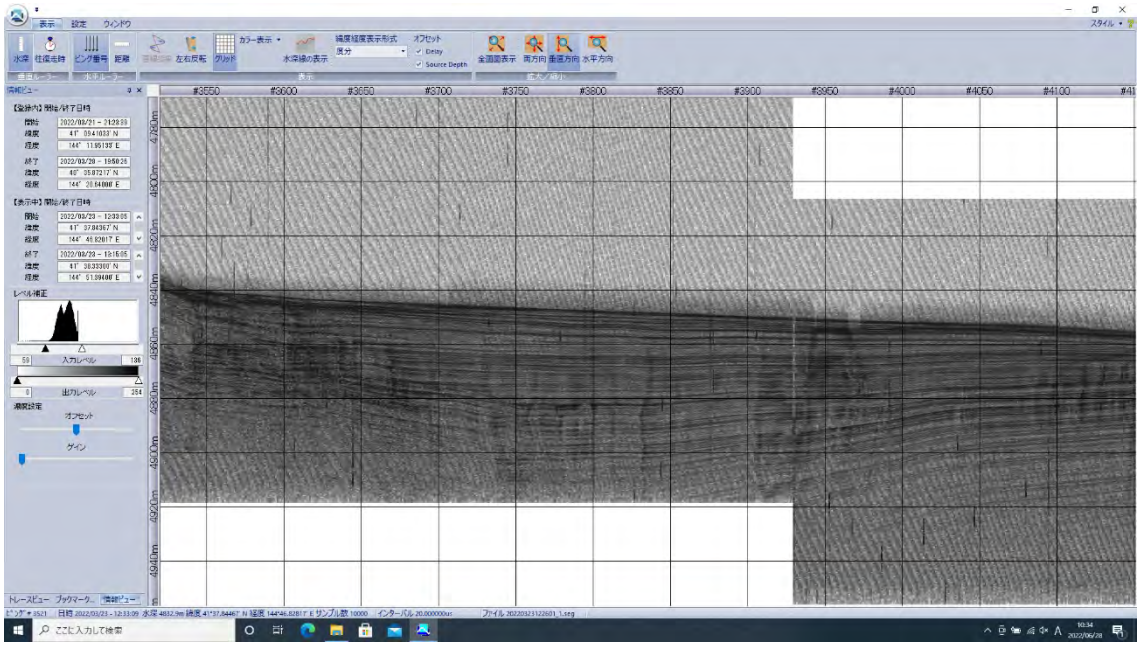


Figure 8-4-5: Sub-bottom profiling record around PC05 point. The SBP data were acquired during the R/V Kaimei KM22-05 cruise using a Kongsberg TOPAS PS18. Refer to locations in the left panel for SBP images. This image was produced by the software SeaProfile7.

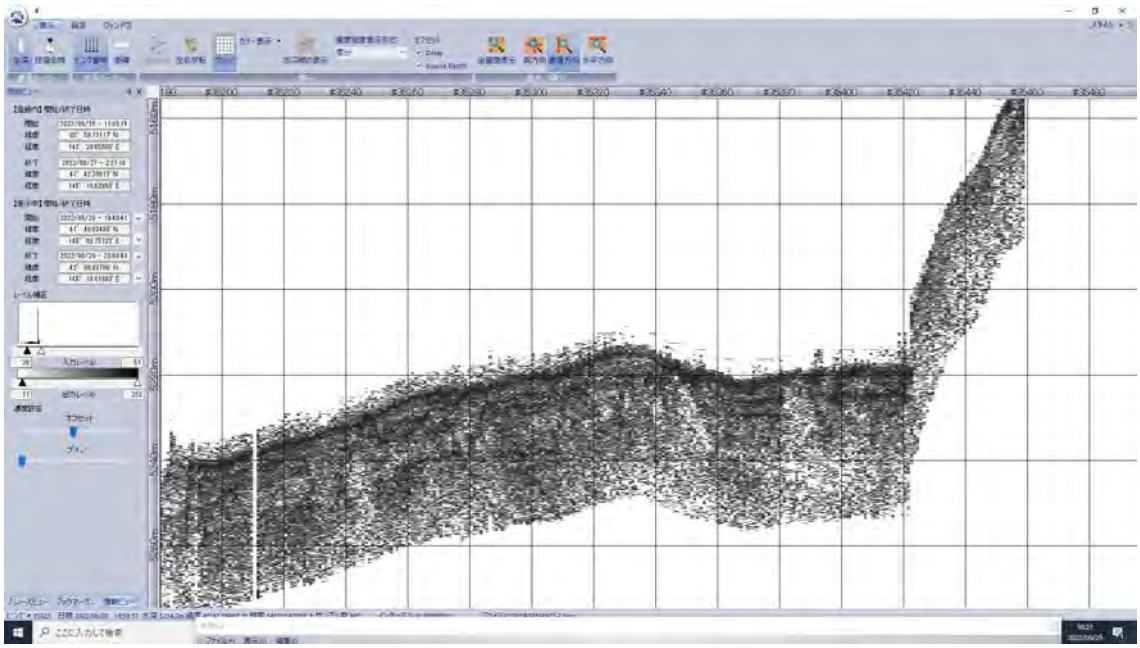


Figure 8-4-6: Sub-bottom profiling record around PC06 point. Refer to locations in the left panel for SBP images. This image was produced by the software SeaProfile7.

8-4-2. SBP continuous imaging during PC operation

We conducted SBP imaging to refine the sub-bottom structure at the PC points during PC operation. Because the ship stays at the same position, it is possible to make the images clearer at the PC point. Capture images are presented in **Figures 8-4-7** to **8-4-12**.

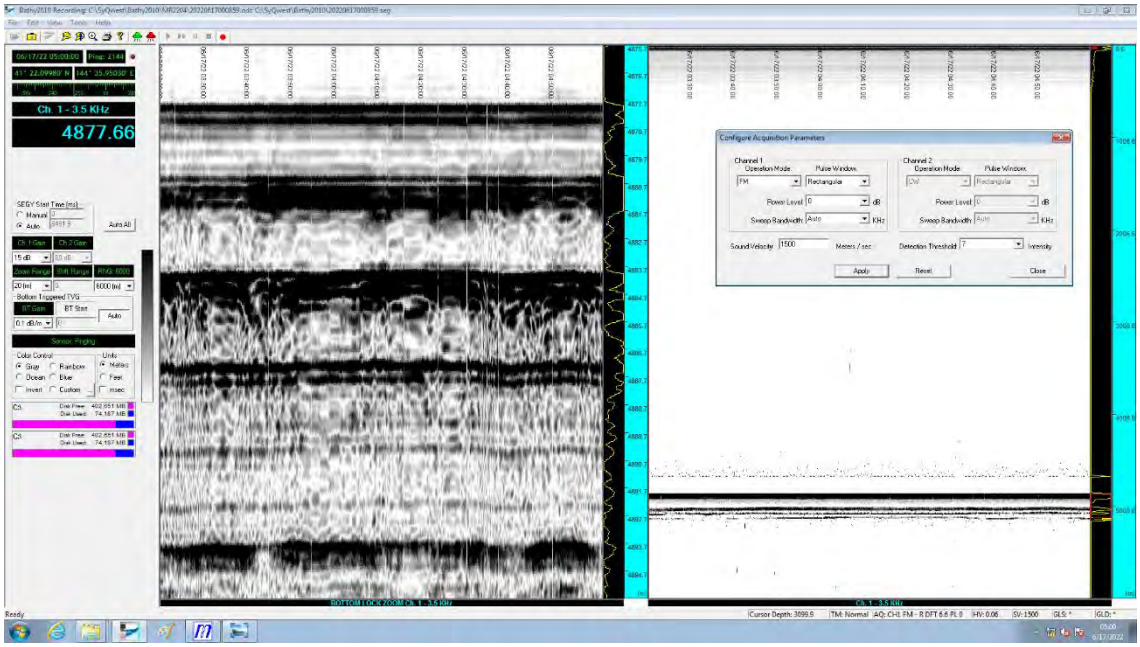


Figure 8-4-7: Sub-bottom image at PC01.

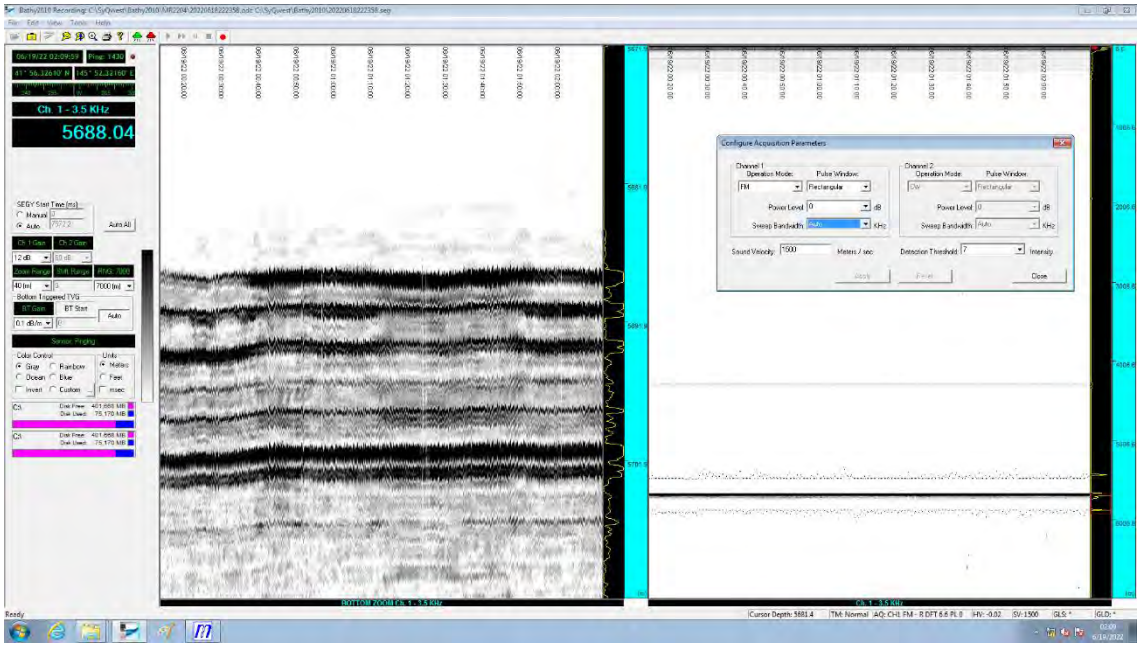


Figure 8-4-8: Sub-bottom image at PC02.

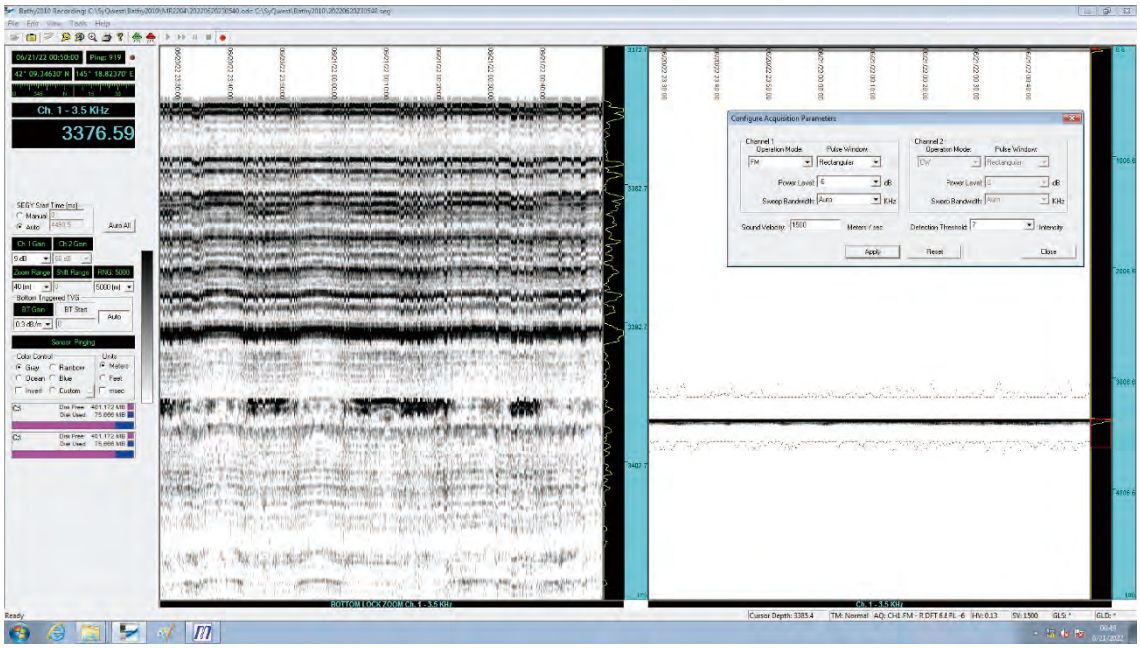


Figure 8-4-9: Sub-bottom image at PC03.

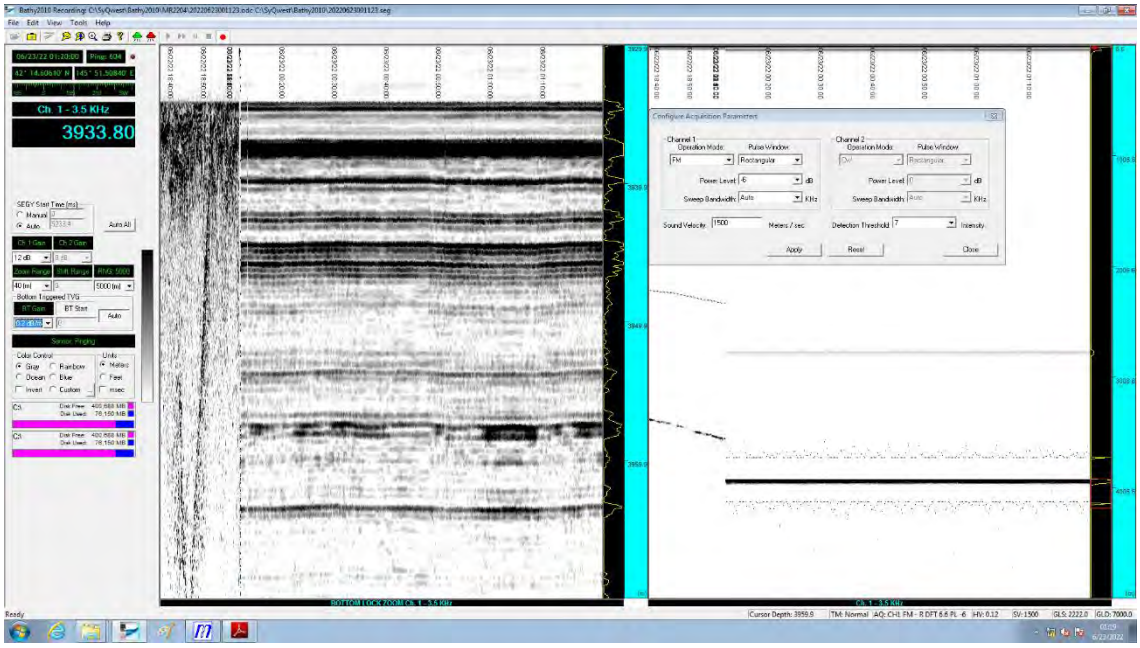


Figure 8-4-10: Sub-bottom image at PC04.

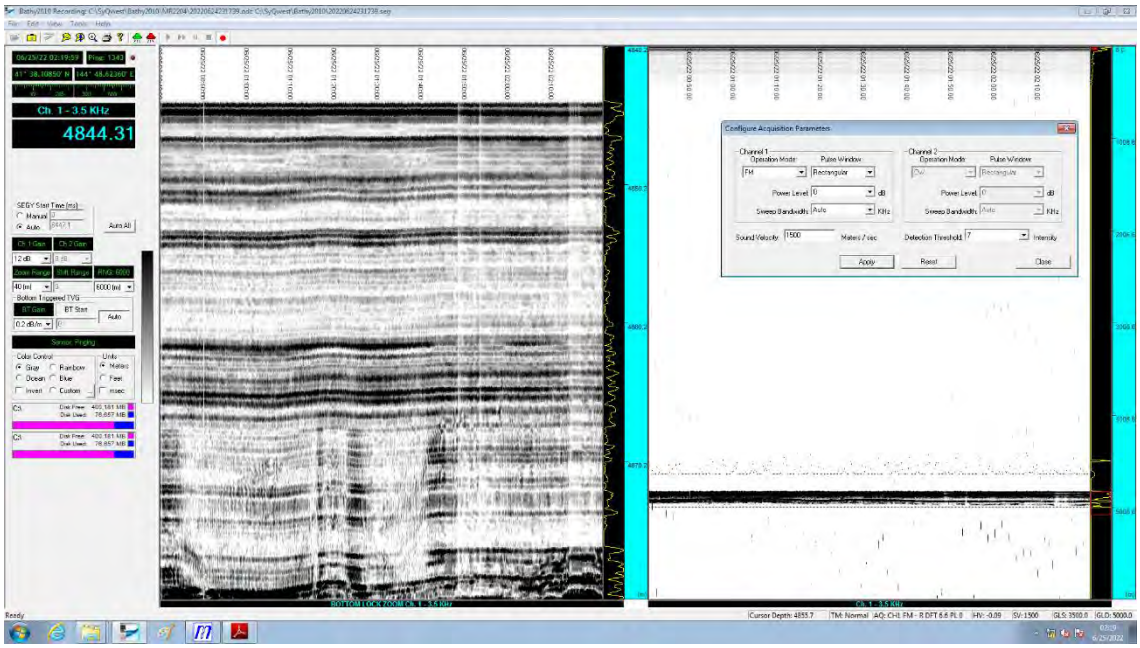


Figure 8-4-11: Sub-bottom image at PC05.

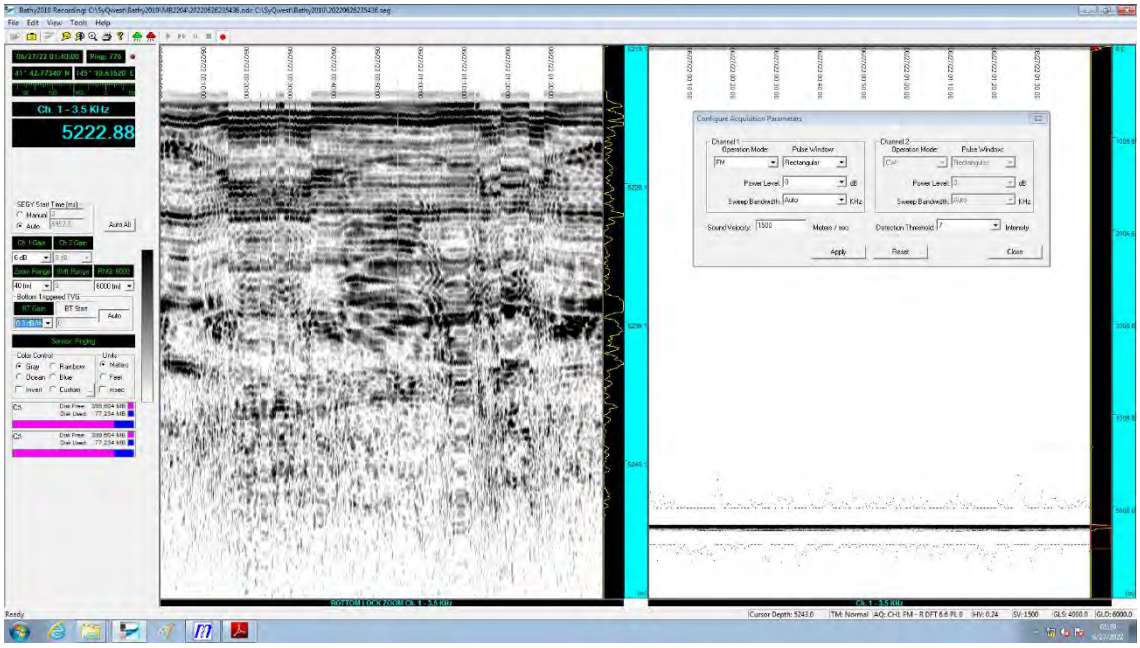


Figure 8-4-12: Sub-bottom image at PC06.

8-5. Single Channel Seismic Reflection Profile

Onboard processing seismic profiles are shown in **Figures 8-5-1** to **8-5-12**. Note that the aspect ratio is different for each profile.

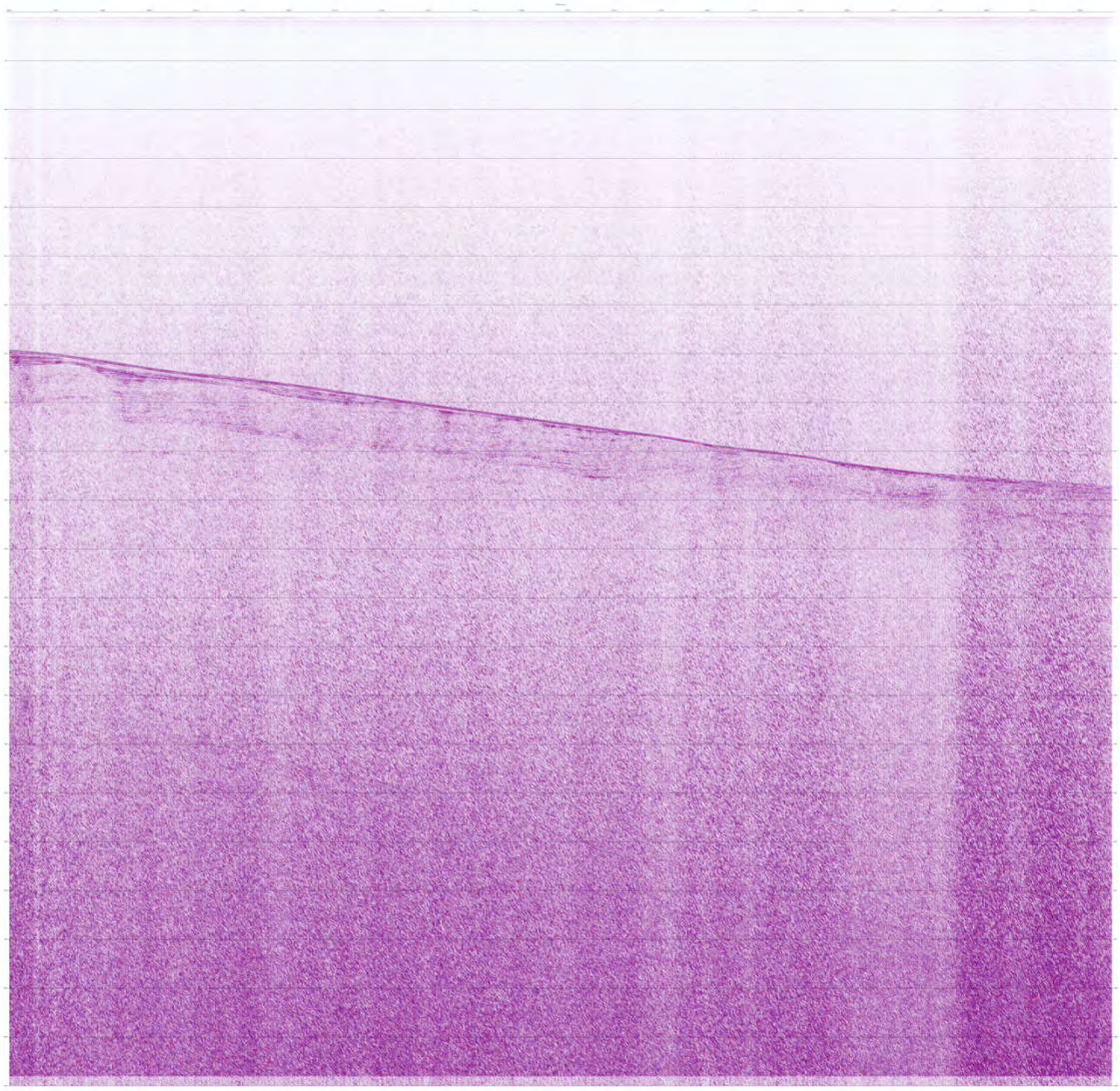


Figure 8-5-1: Seismic profile of Line SC1_0. Left (Northwest) – Right (Southeast). The interval of horizontal grid lines is 500 msec.

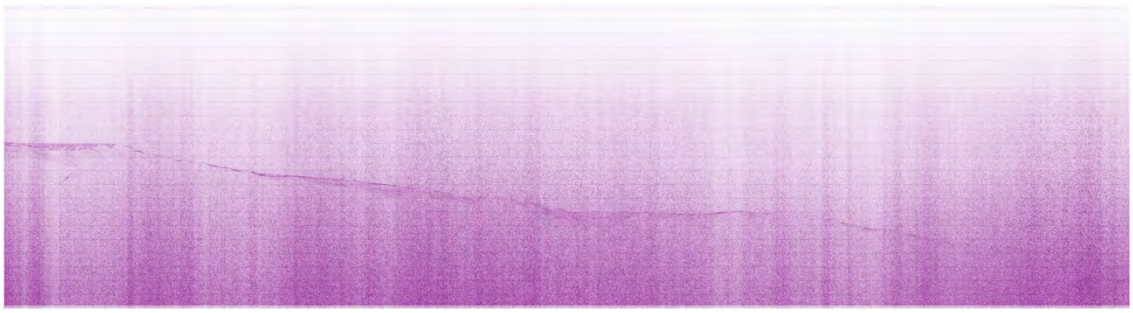


Figure 8-5-2: Seismic profile of Line SC1_1. Left (Northwest) – Right (Southeast). The interval of horizontal grid lines is 500 msec.

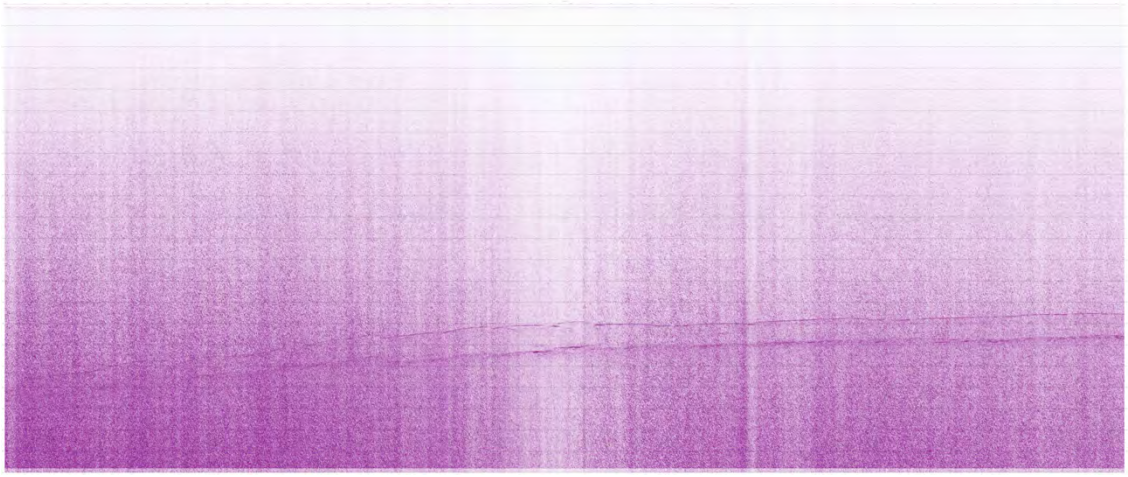


Figure 8-5-3: Seismic profile of Line SC1_2. Left (Northwest) – Right (Southeast). The interval of horizontal grid lines is 500 msec.

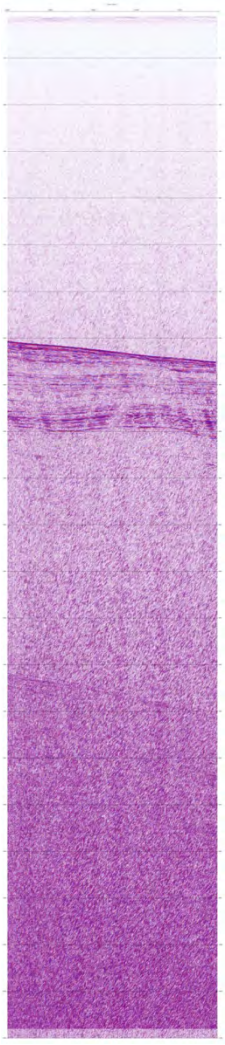


Figure 8-5-4: Seismic profile of Line SC2_0. Left (Northwest) – Right (Southeast). The interval of horizontal grid lines is 500 msec.

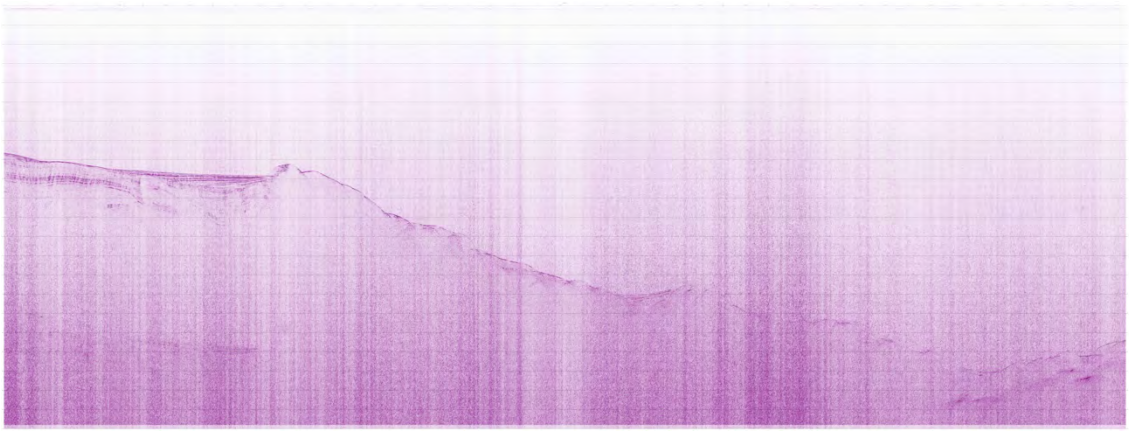


Figure 8-5-5: Seismic profile of Line SC2_1. Left (Northwest) – Right (Southeast). The interval of horizontal grid lines is 500 msec.

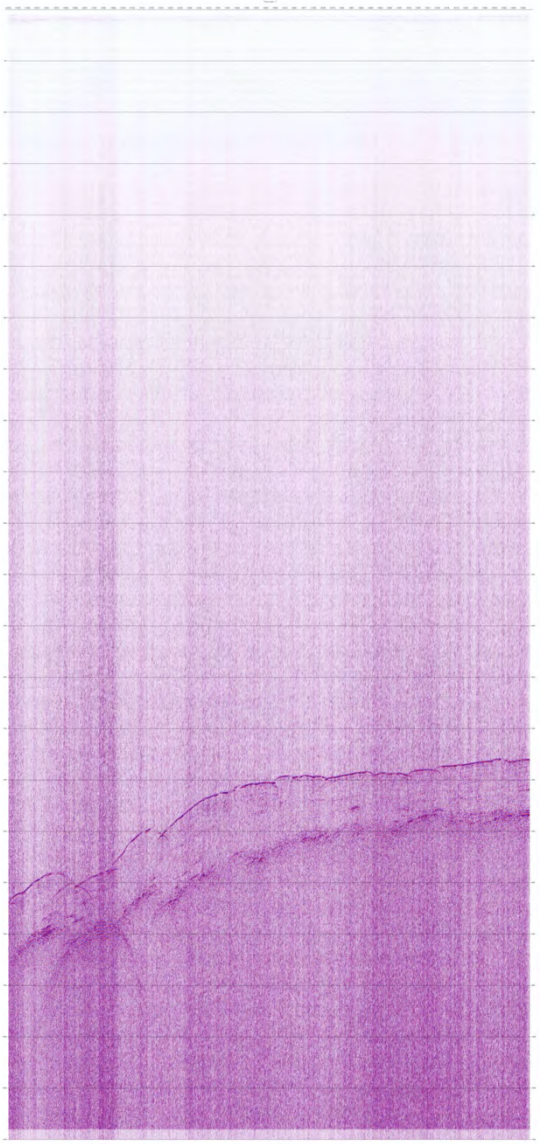


Figure 8-5-6: Seismic profile of Line SC2_2. Left (Northwest) – Right (Southeast). The interval of horizontal grid lines is 500 msec.

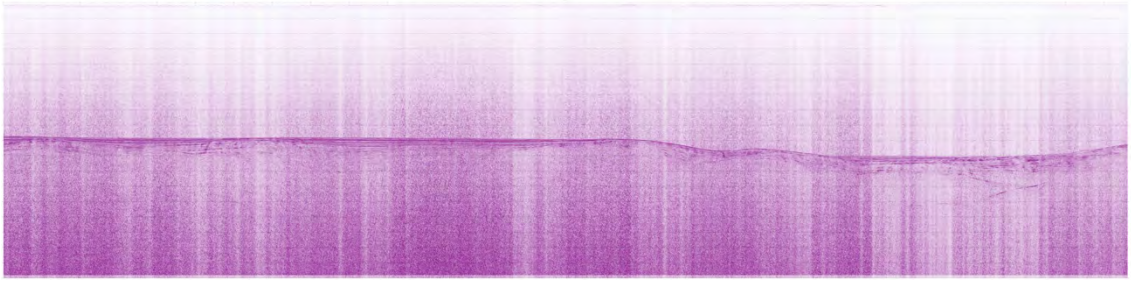


Figure 8-5-7: Seismic profile of Line SC10_0. Left (West Northwest) – Right (East Southeast). The interval of horizontal grid lines is 500 msec.

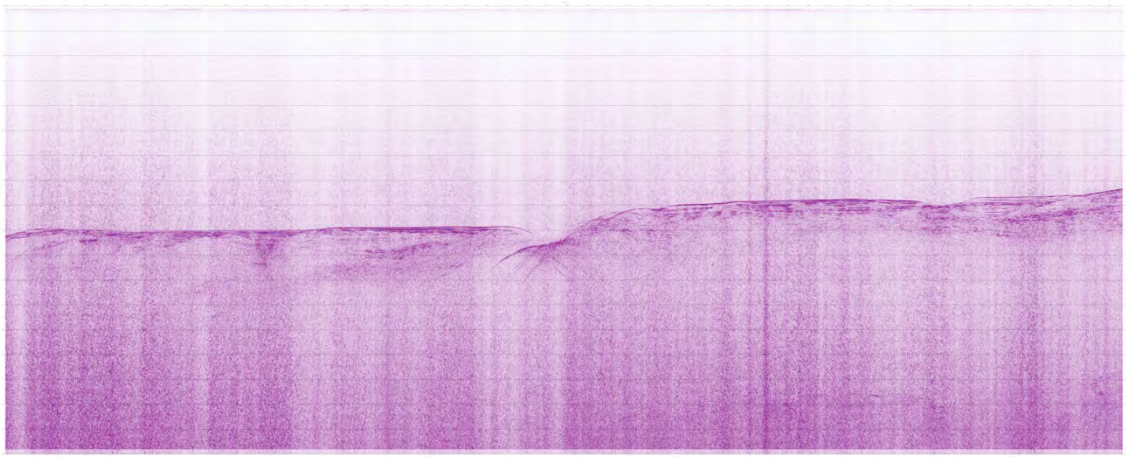


Figure 8-5-8: Seismic profile of Line SC10_1. Left (West Northwest) – Right (East Southeast). The interval of horizontal grid lines is 500 msec.

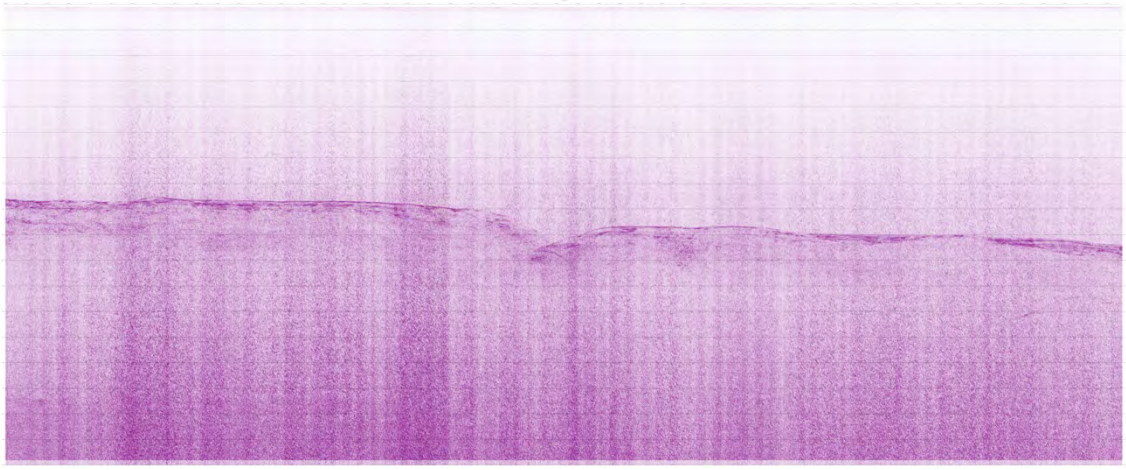


Figure 8-5-9: Seismic profile of Line SC11_0. Left (East Southeast) – Right (West Northwest). The interval of horizontal grid lines is 500 msec.

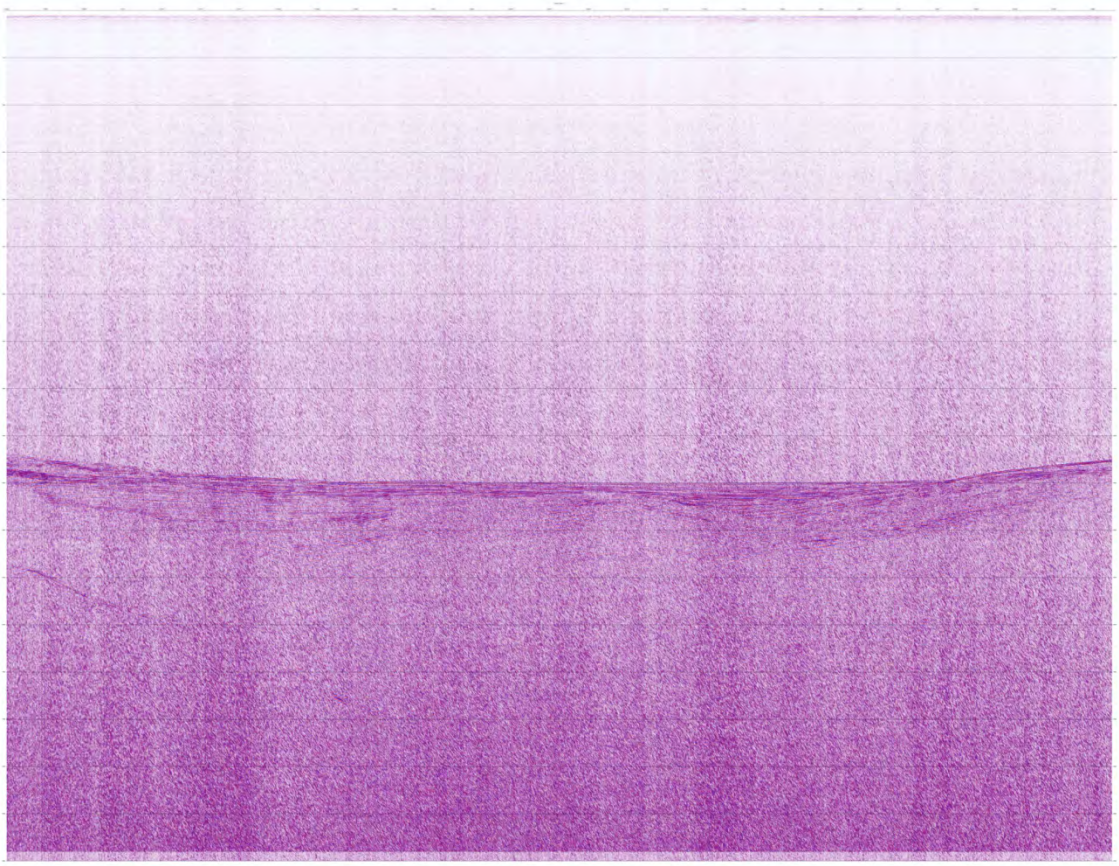


Figure 8-5-10: Seismic profile of Line SC11_1. Left (East Southeast) – Right (West Northwest). The interval of horizontal grid lines is 500 msec.

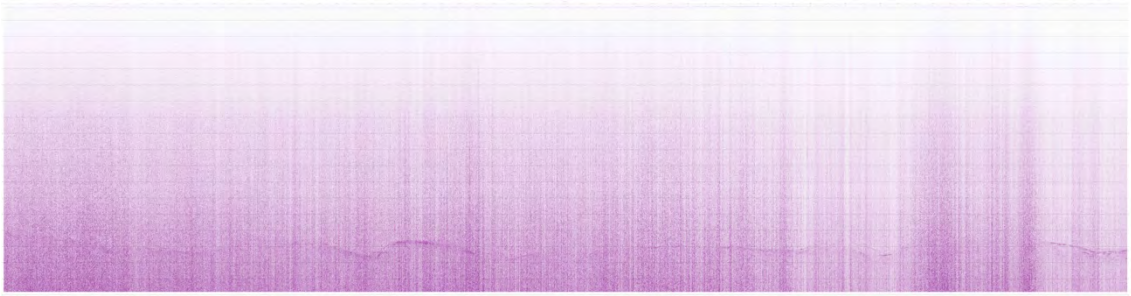


Figure 8-5-11: Seismic profile of Line SC12_0. Left (West Southwest) – Right (East Northeast). The interval of horizontal grid lines is 500 msec.

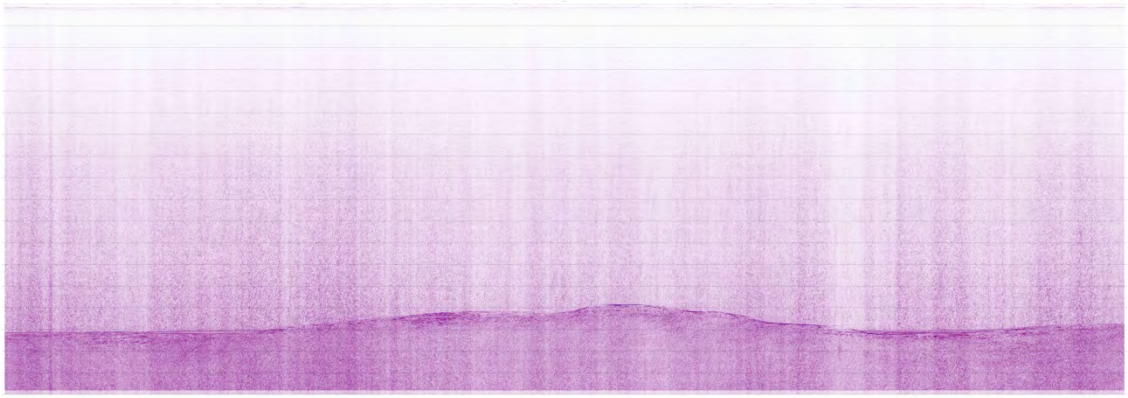


Figure 8-5-12: Seismic profile of Line SC13_0. Left (East Northeast) – Right (West Southwest)). The interval of horizontal grid lines is 500 msec.

8-6. Magnetic Anomaly

Surface-towed geomagnetic measurements using a cesium magnetometer were conducted during the single-channel seismic reflection survey and the multibeam bathymetric line survey. The survey tracks are perpendicular to or parallel to the Chishima Trench axis. Mesozoic magnetic anomalies M5, M6, M7, and M8 are identified along the tracks perpendicular to the trench axis (**Figure 8-6-1**).

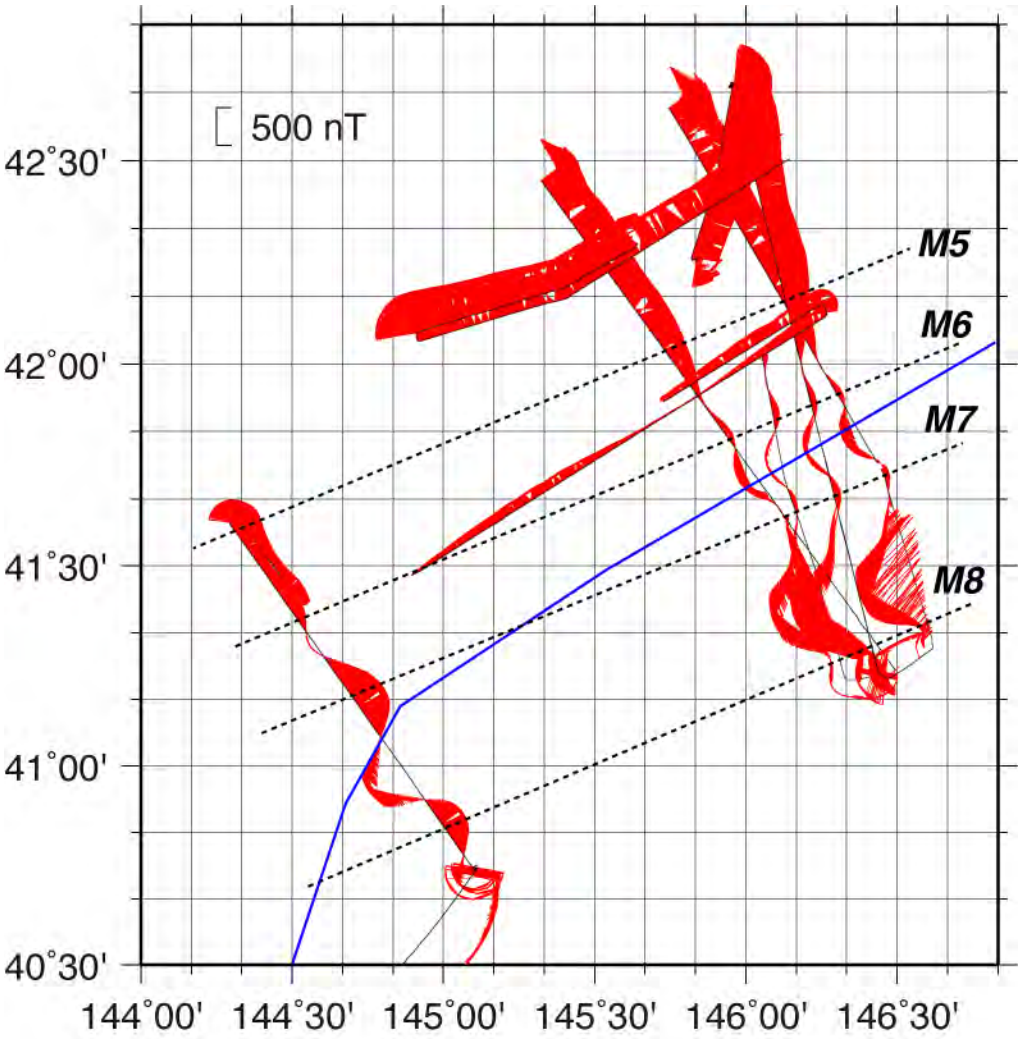


Figure 8-6-1: Quick look at the geomagnetic total force data. Observed data are plotted along tracks. Areas, where the observed data are greater than 48500 nT, are filled in red. The blue line points to the trench axis. Dot lines show approximate locations of the magnetic anomaly lineations (e.g. Nakanishi et al., 1989).

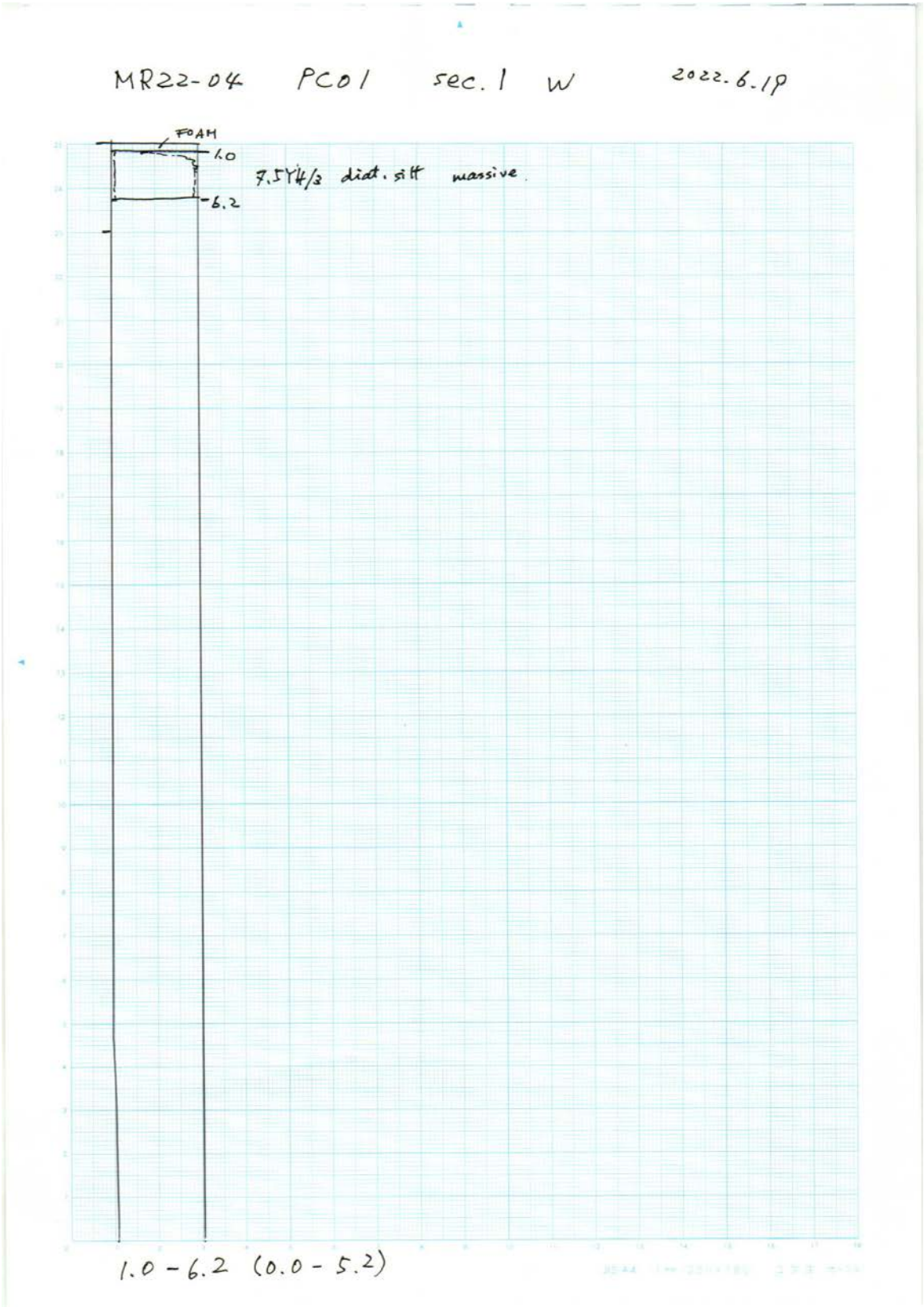
After correction of position considering the sensor cable length, magnetic anomalies (total force anomaly and vector anomaly) are calculated by subtracting the International Geomagnetic Reference Field (IGRF) the 13th generation.

8-7. Gravity Anomaly

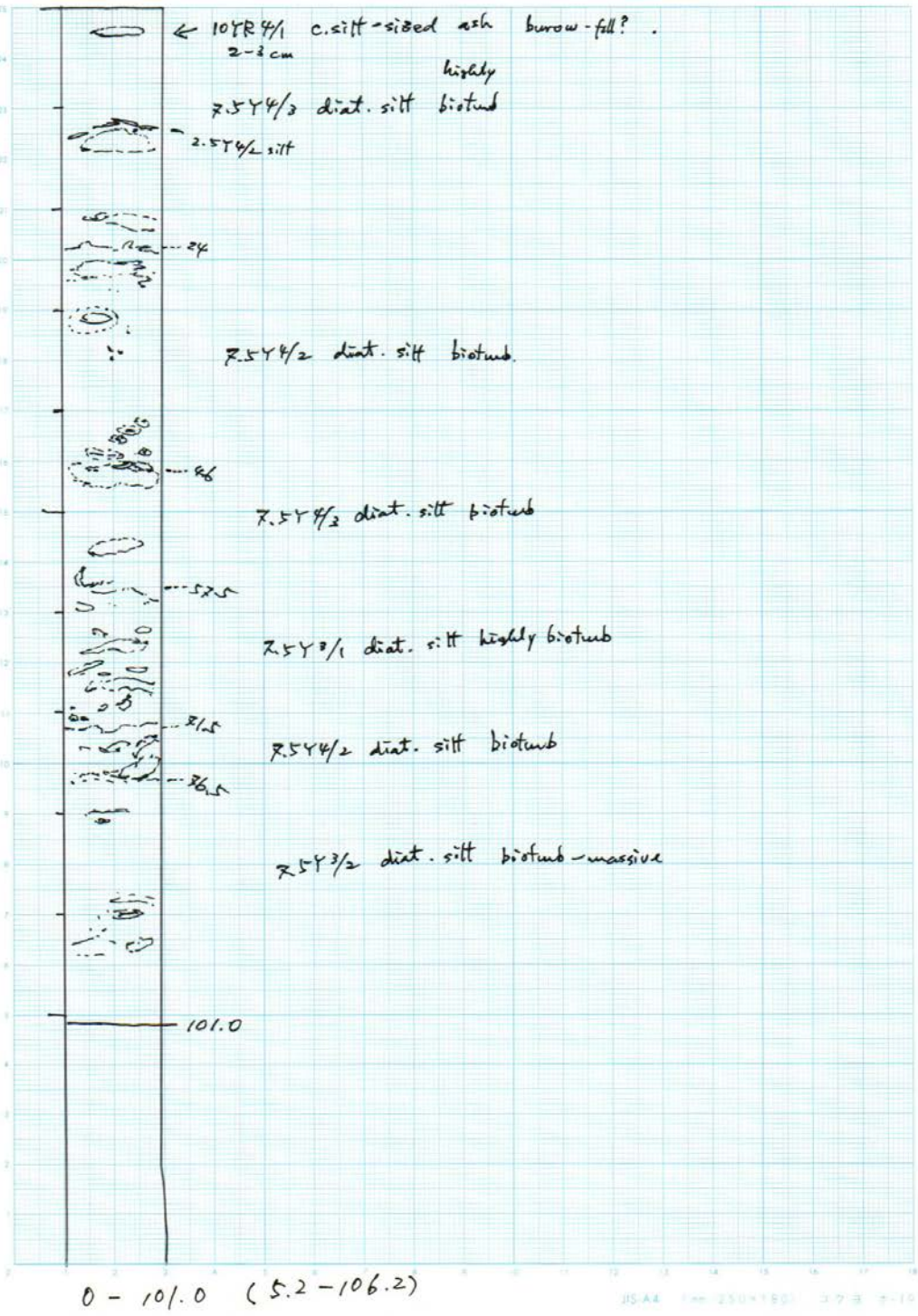
The gravity data are output with a delay of 120 seconds because of the QC filtering. Eotvos correction is performed after correcting for the 120-second delay. Free-air gravity anomaly is calculated by subtracting from the corrected data the theoretical gravity formula of the Geodetic Reference System 1980.

9. Appendix

9-1. Visual Core Description

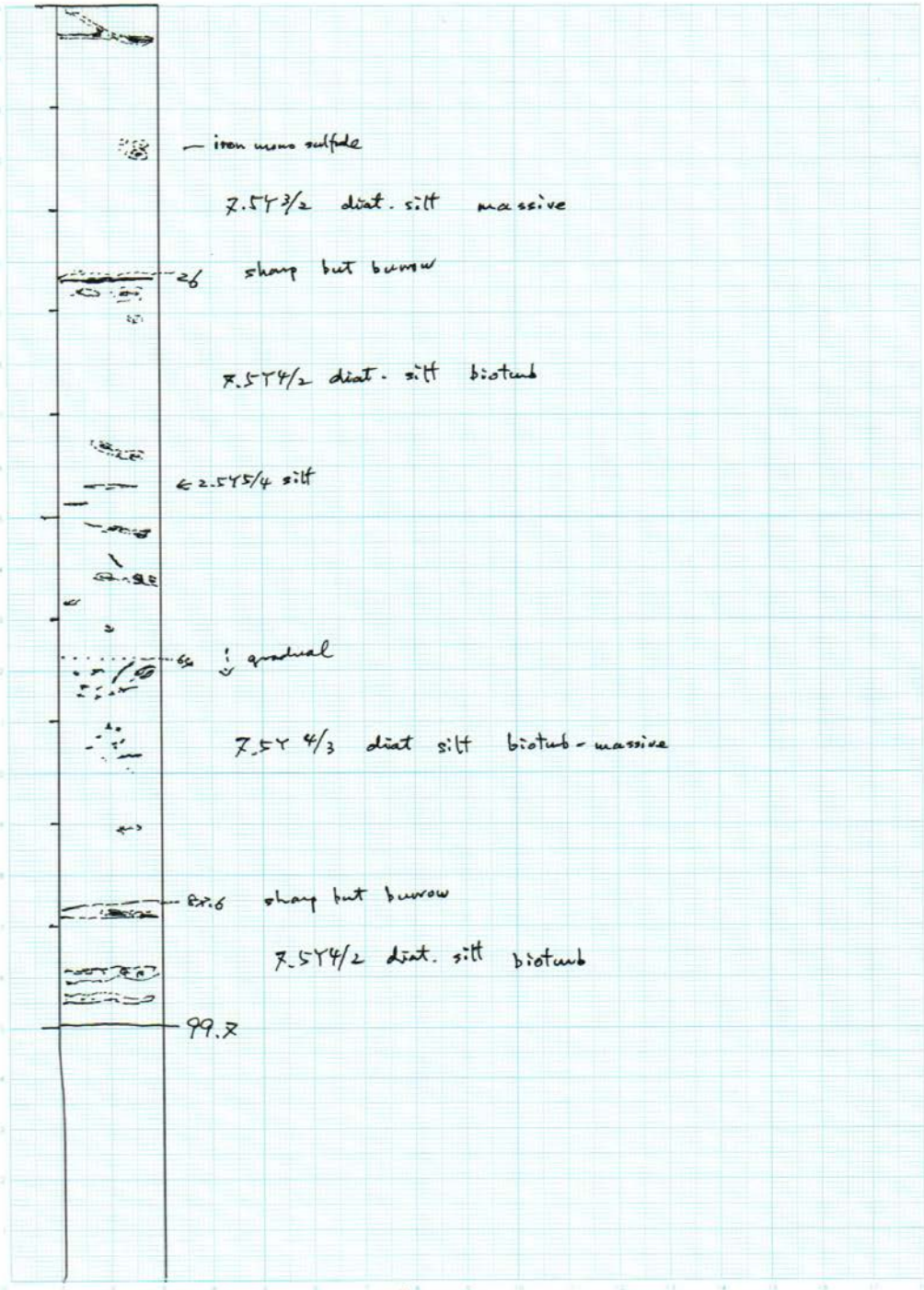


MR22-04 PC01 sec. 2 W 2022. 6.19



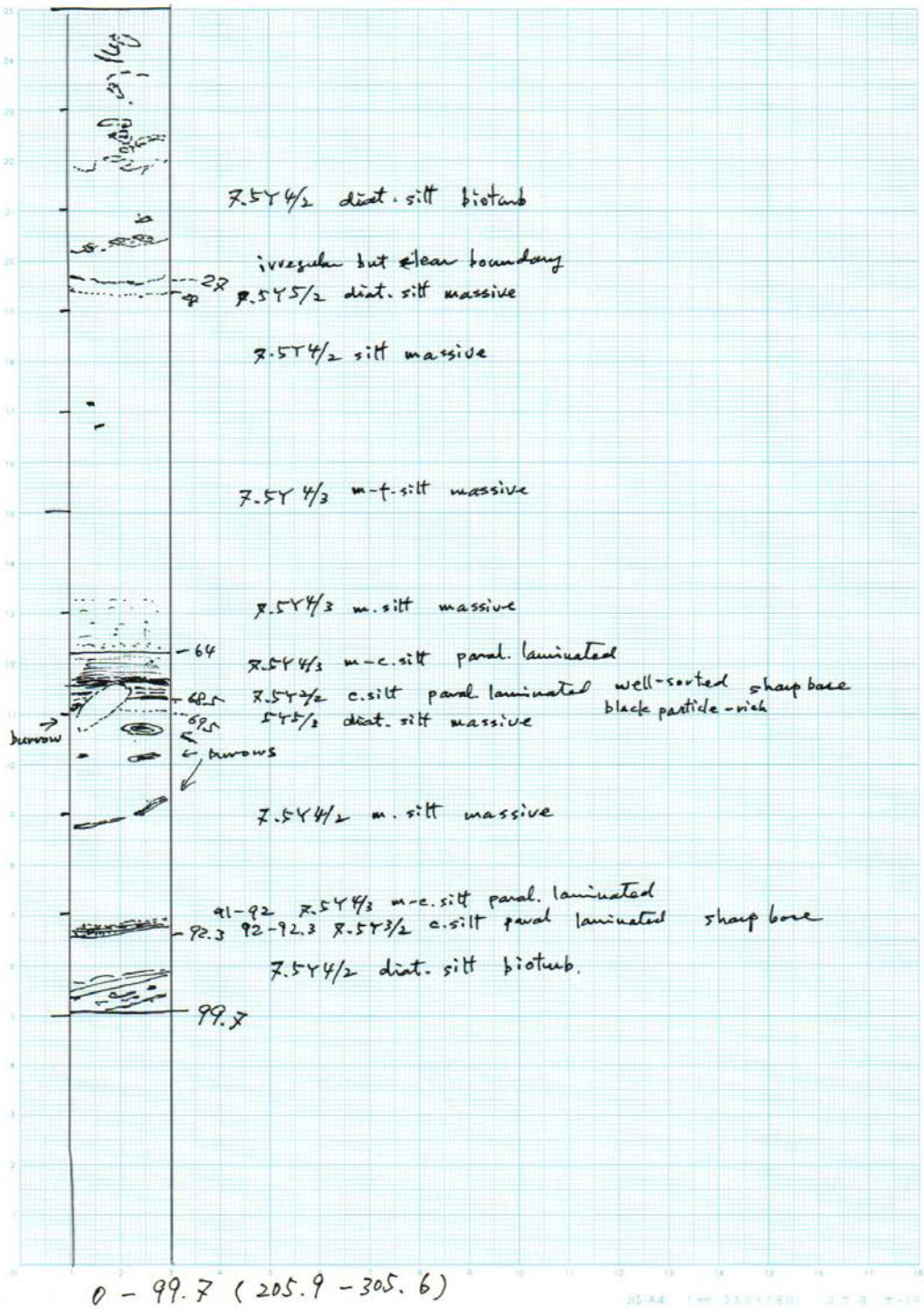
0 - 101.0 (5.2 - 106.2)

MR 22-04 PC01 sec. 3 W 2022. 6. 19



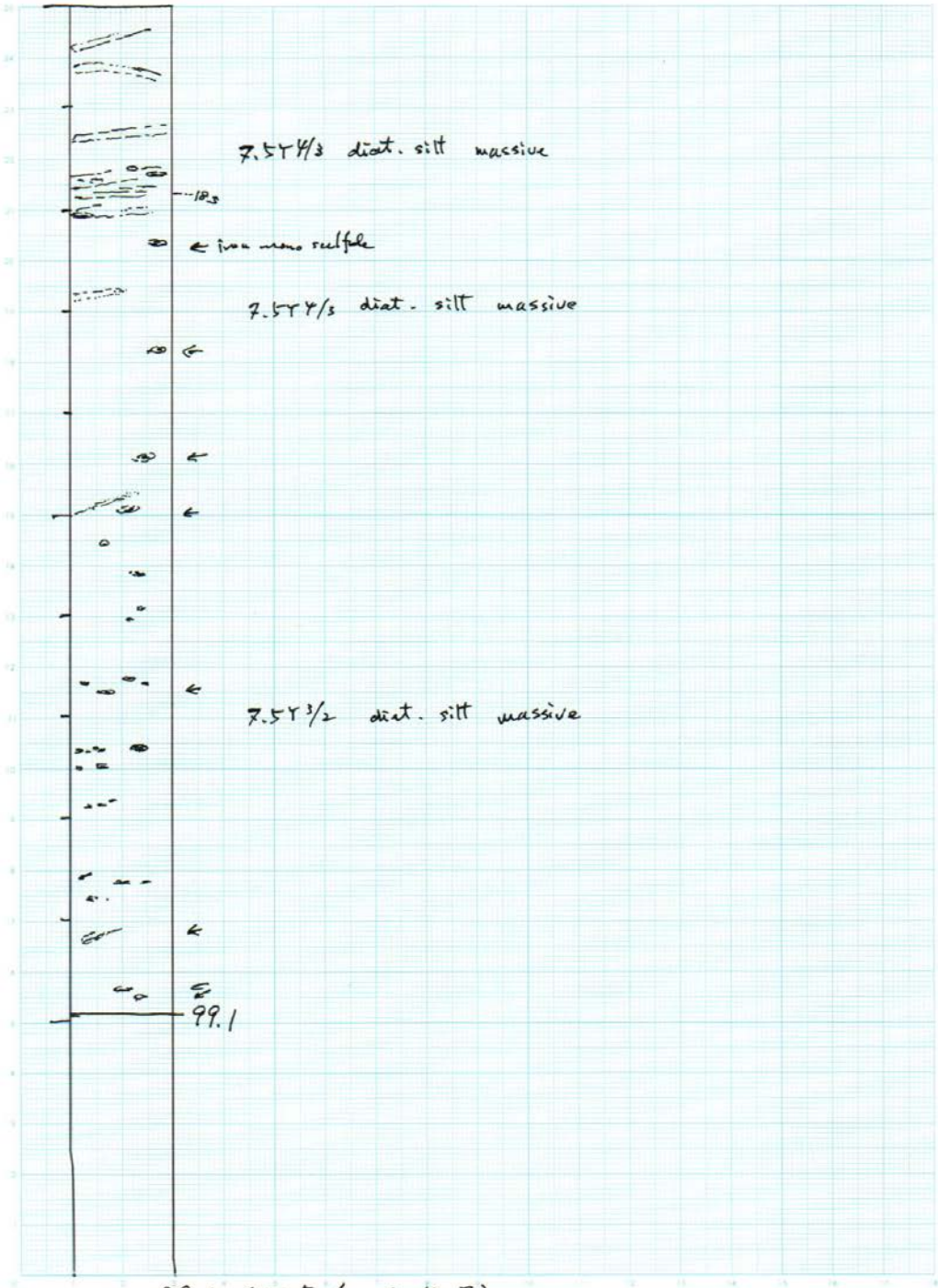
0 - 99.7 (106.2 - 205.9)

MR22-04 PC01 sec. 4 W 2022.6.19



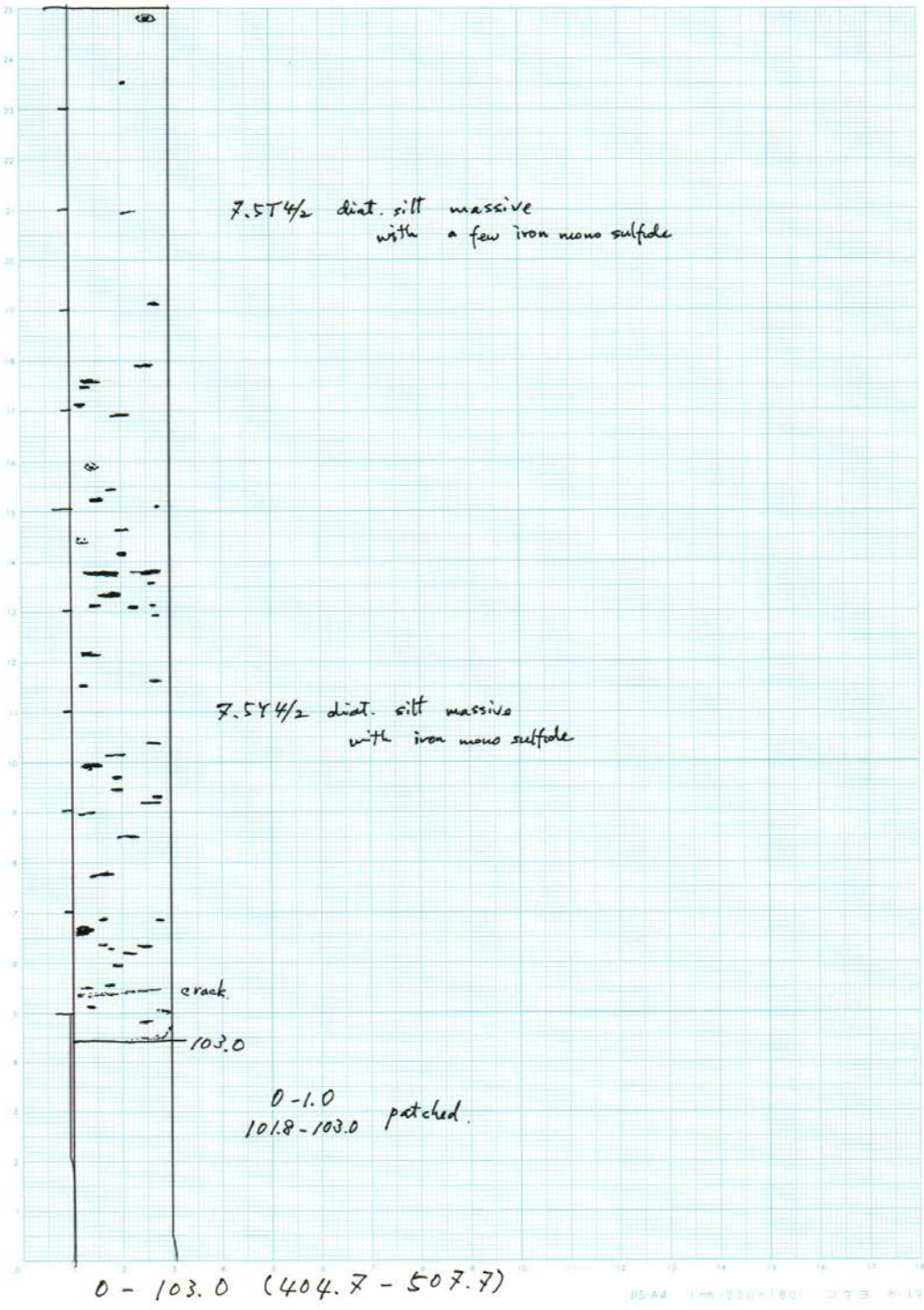
0 - 99.7 (205.9 - 305.6)

MR22-04 PC01 sec. 5 w 2022.6.19



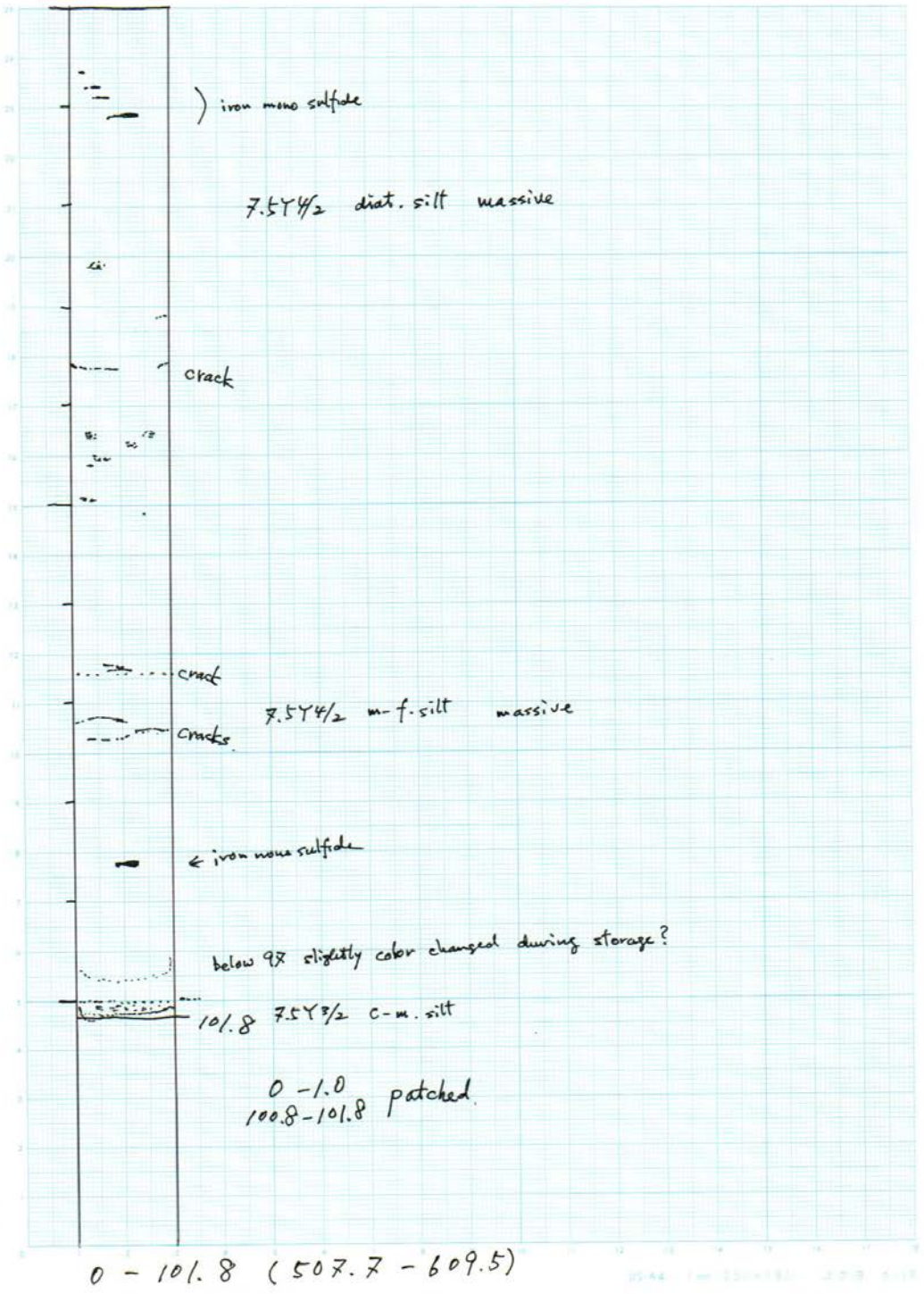
0 - 99.1 (305.6 - 404.7)

MR 22-04 PC01 sec. 6 W 2022.6.20



0 - 103.0 (404.7 - 507.7)

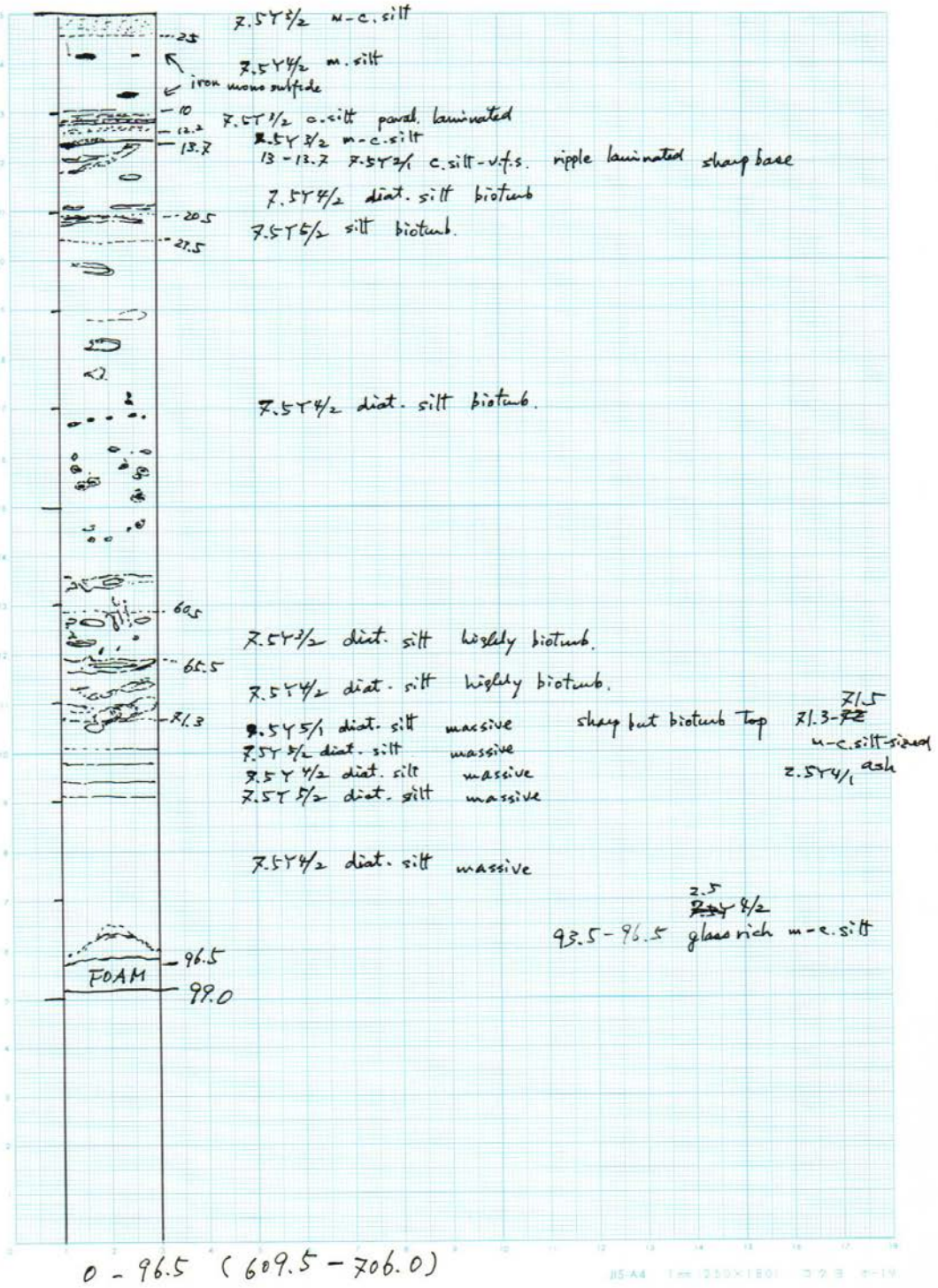
MR22-04 PC01 sec. 7 W 2022. 6.20



0 - 1.0
100.8 - 101.8 patched

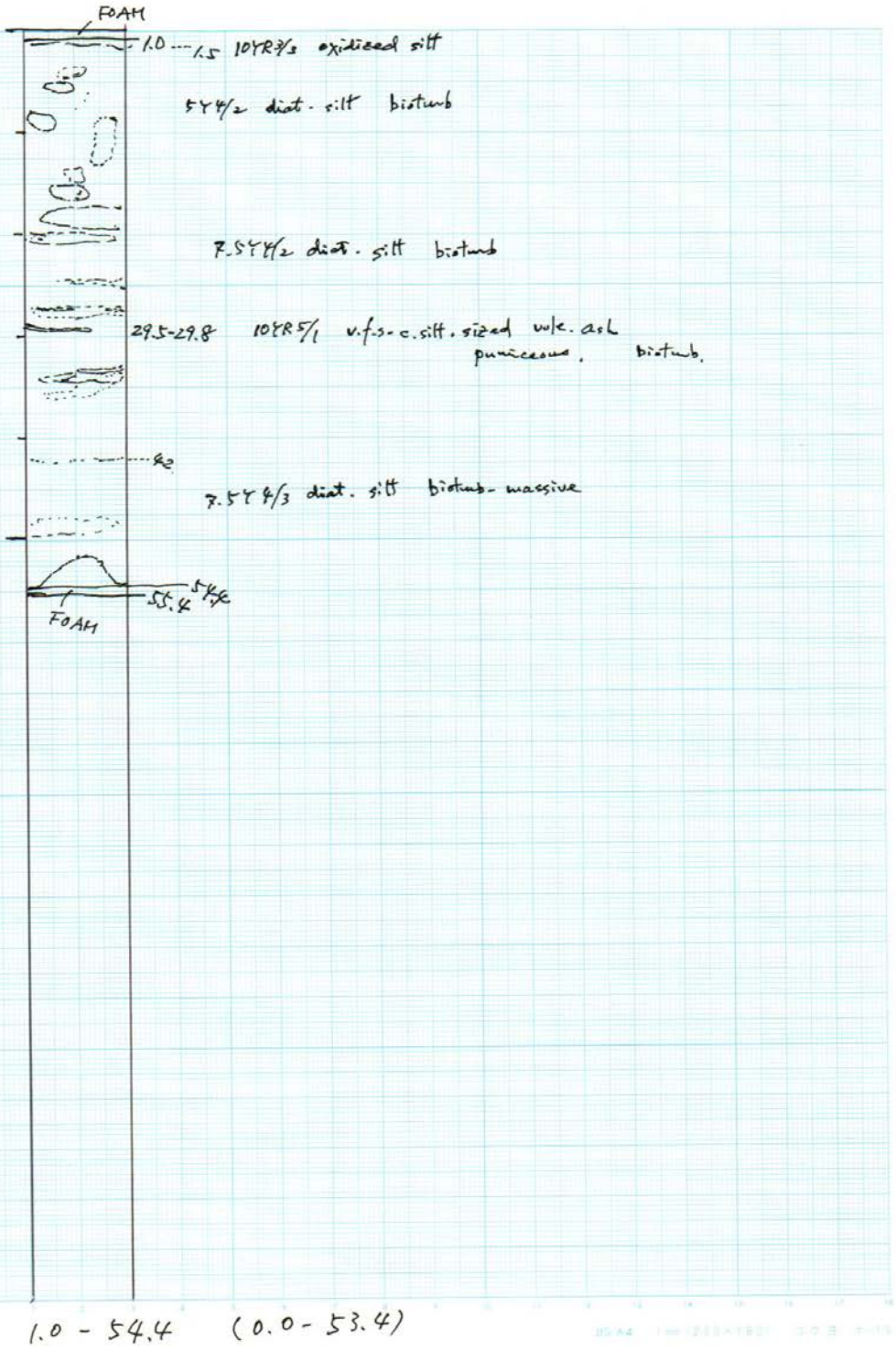
0 - 101.8 (507.7 - 609.5)

MR 22-04 PC01 sec. 8 W 2022. 6. 20



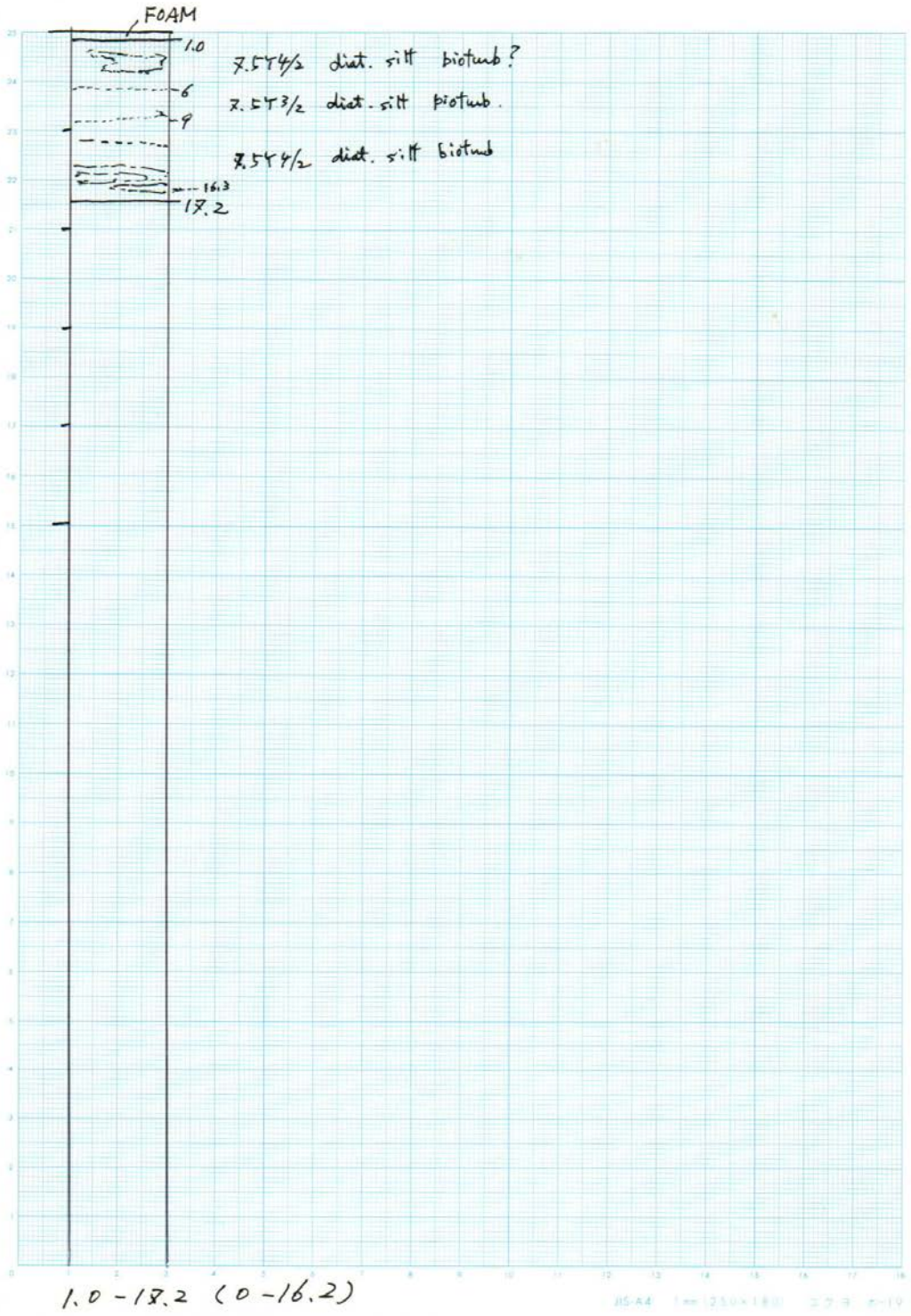
0 - 96.5 (609.5 - 706.0)

MR22-04 PL01 sec. 1 W 2022.6.19



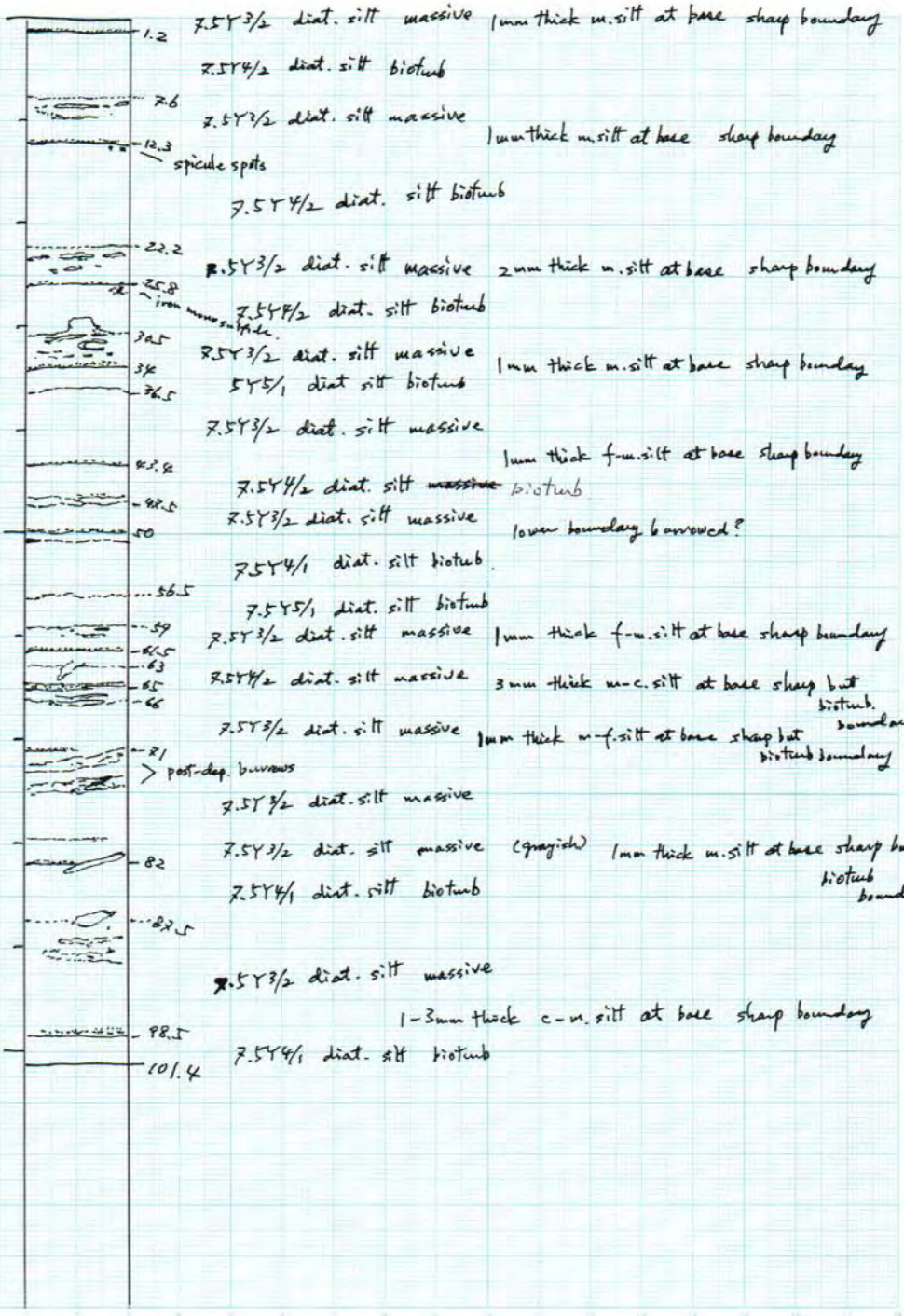
1.0 - 54.4 (0.0 - 53.4)

MR22-04 PC02 sec. / W 2022. 6. 20



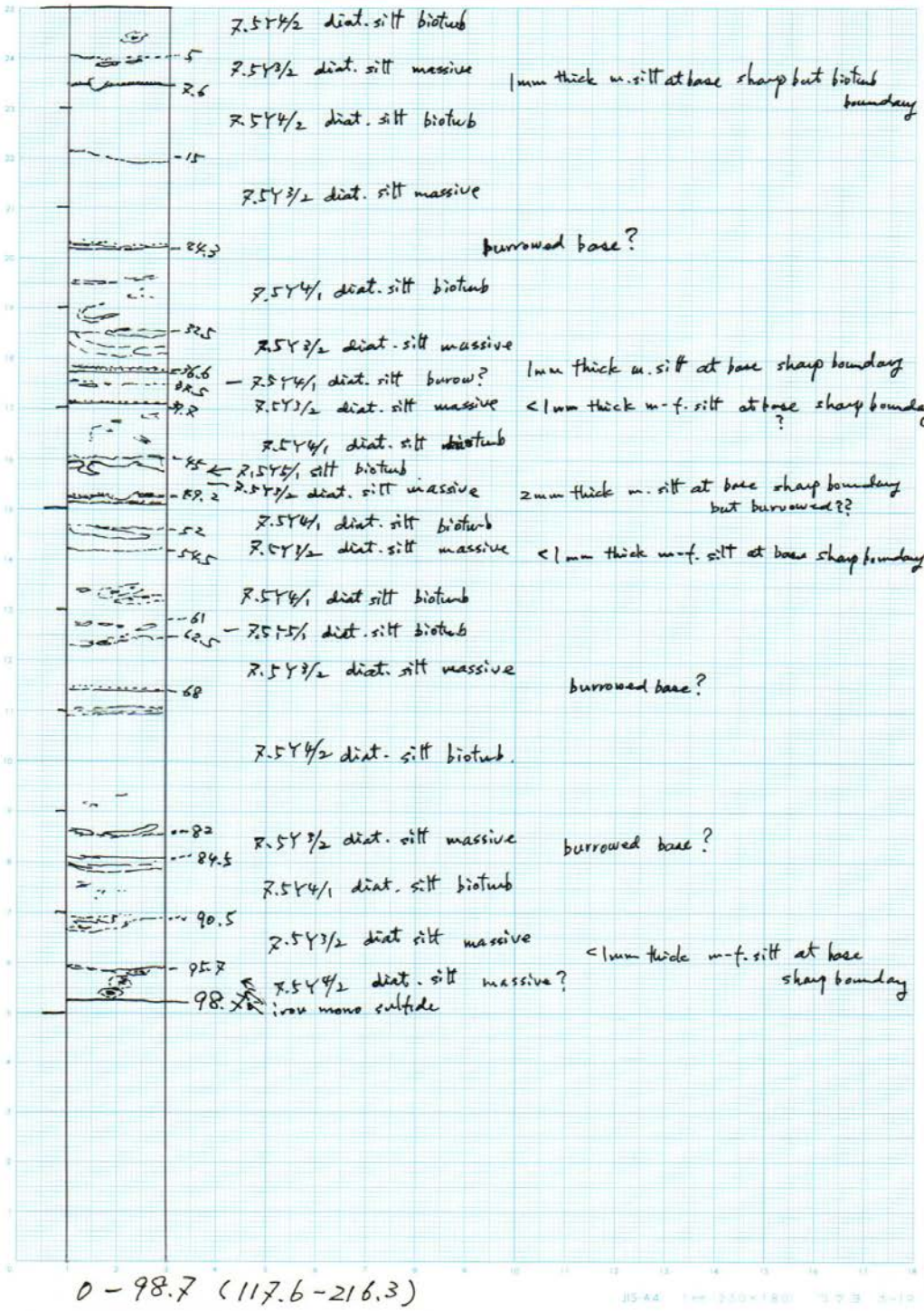
1.0 - 17.2 (0 - 16.2)

MR 22-04 PC02 Sec. 2 W 2022. 6. 20



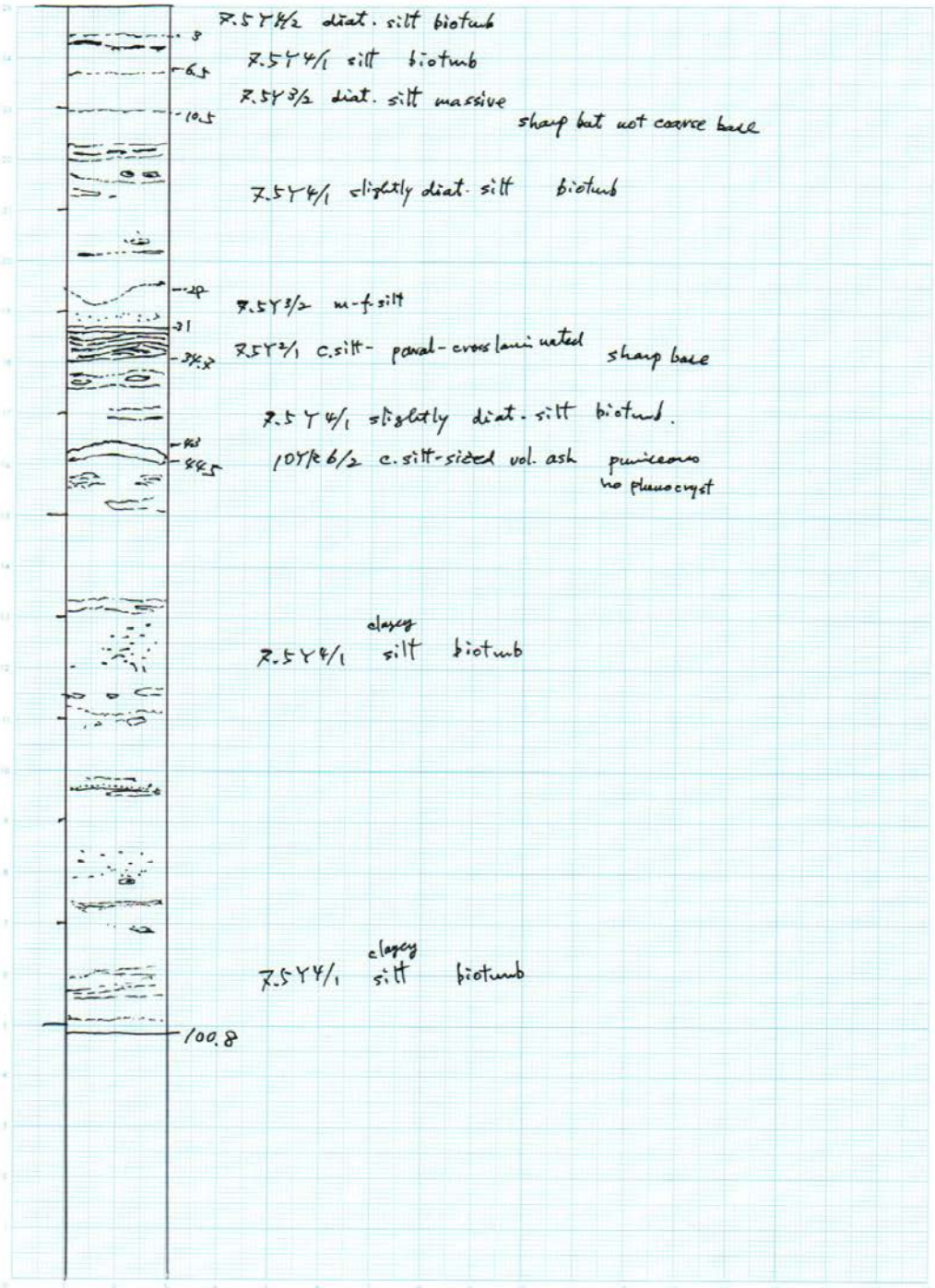
0 -101.4 (16.2-117.6)

MR22-04 PC02 sec. 3 W 2022. 6. 20



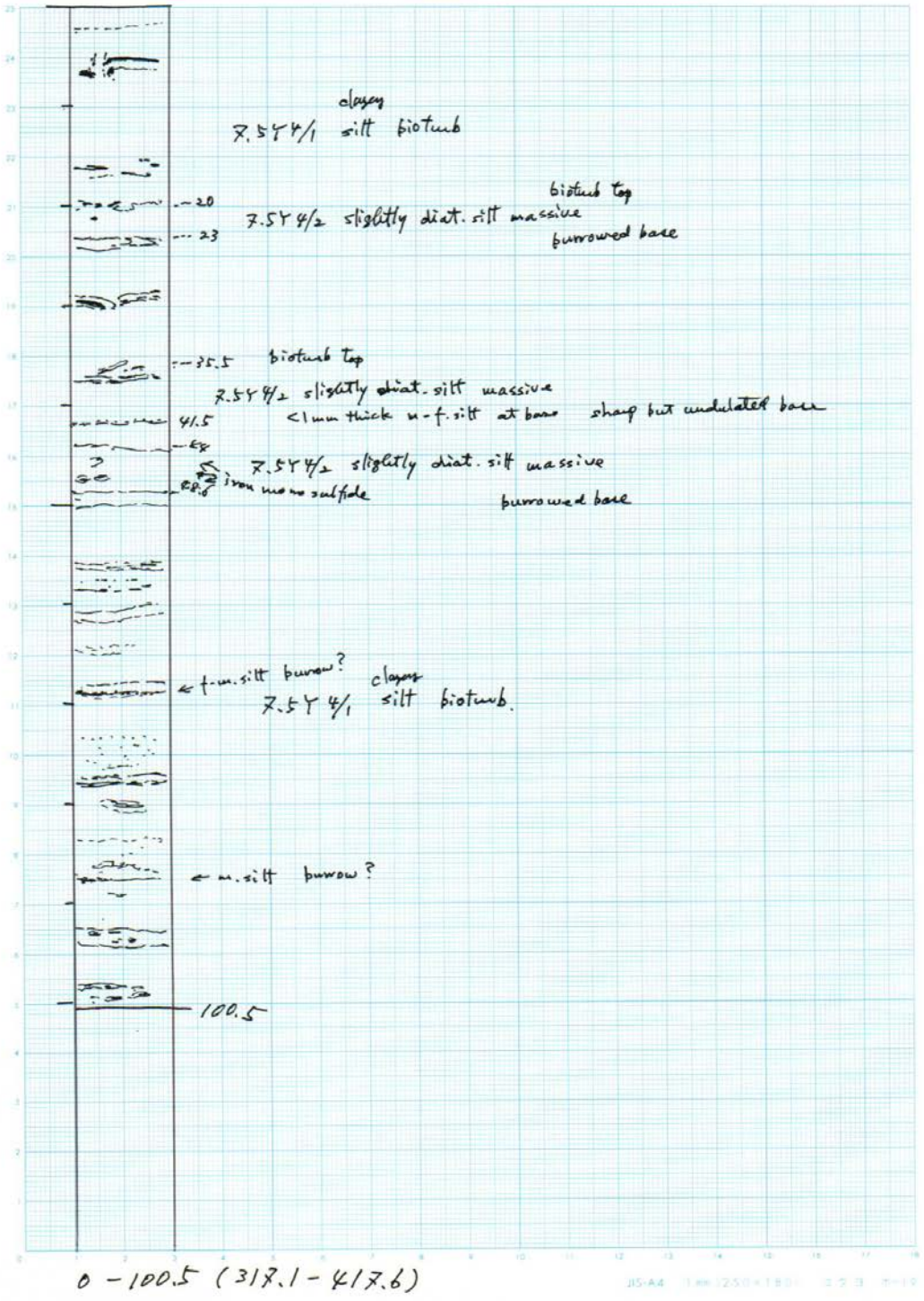
0 - 98.7 (117.6 - 216.3)

MR22-04 PC02 sec. 4 W 2022.6.20



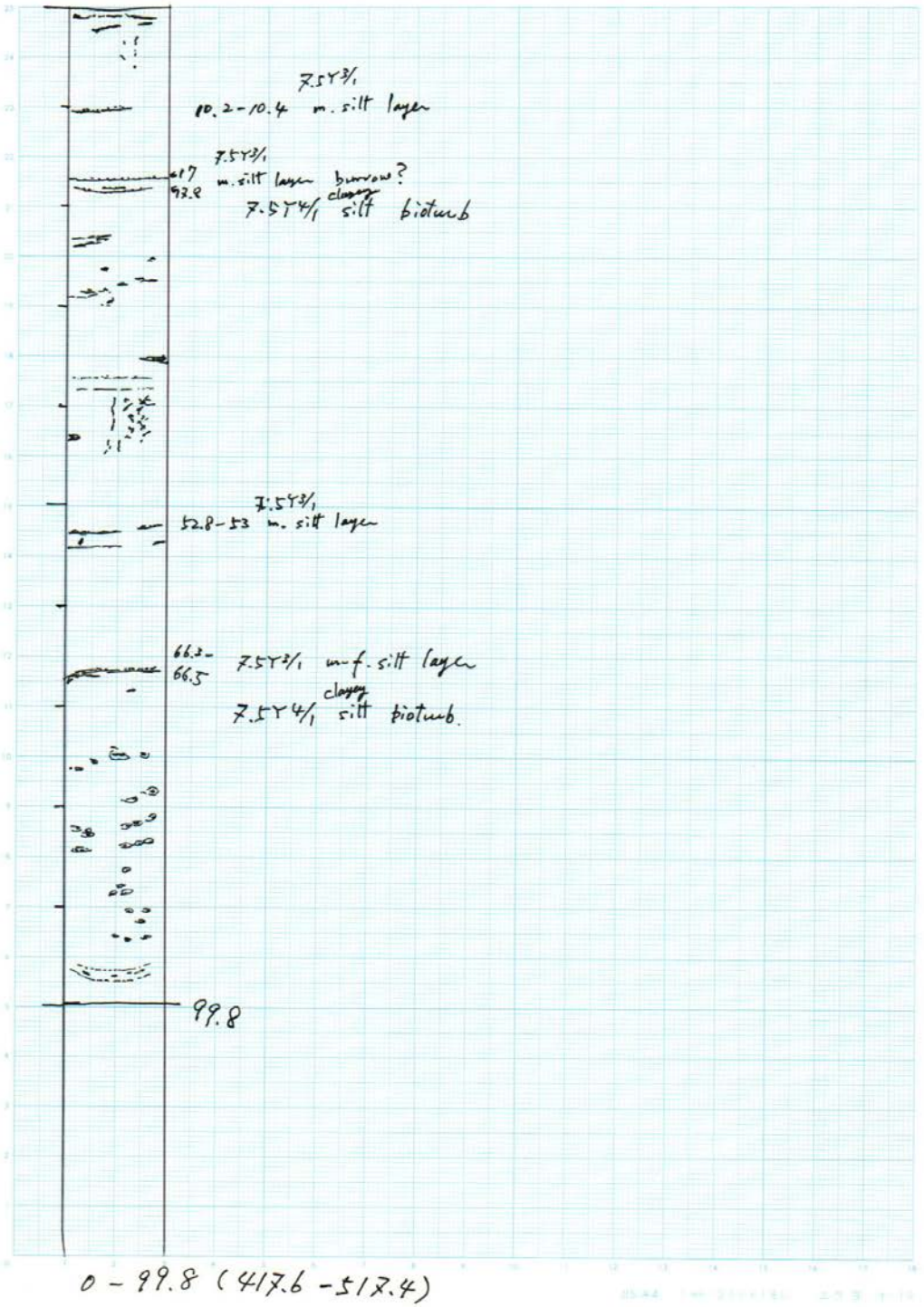
0 - 100.8 (216.3 - 317.1)

MR22-04 PC02 sec. 5 W 2022.6.20



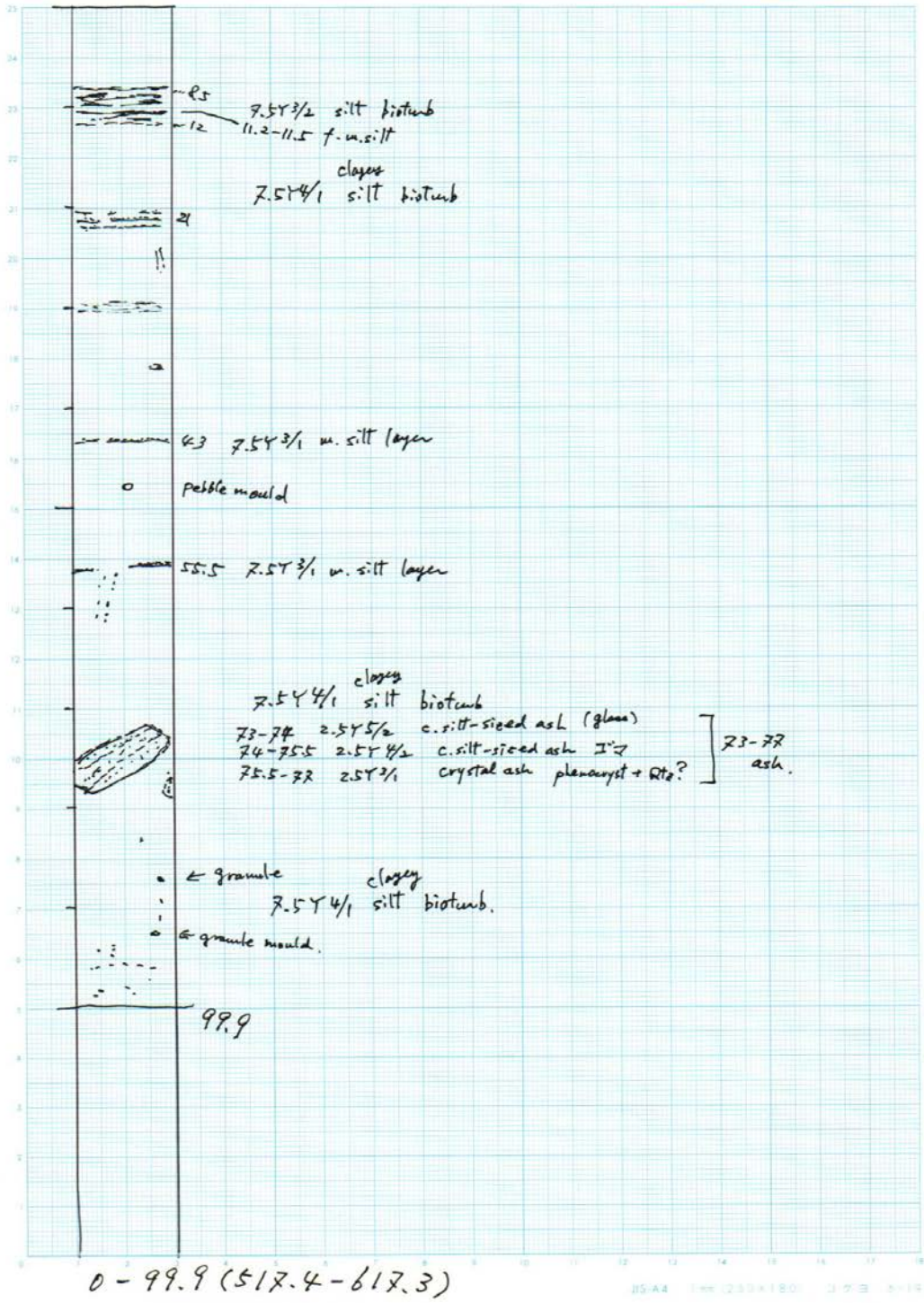
0 - 100.5 (317.1 - 417.6)

MR 22-04 PC02 sec. 6W 2022.6.21



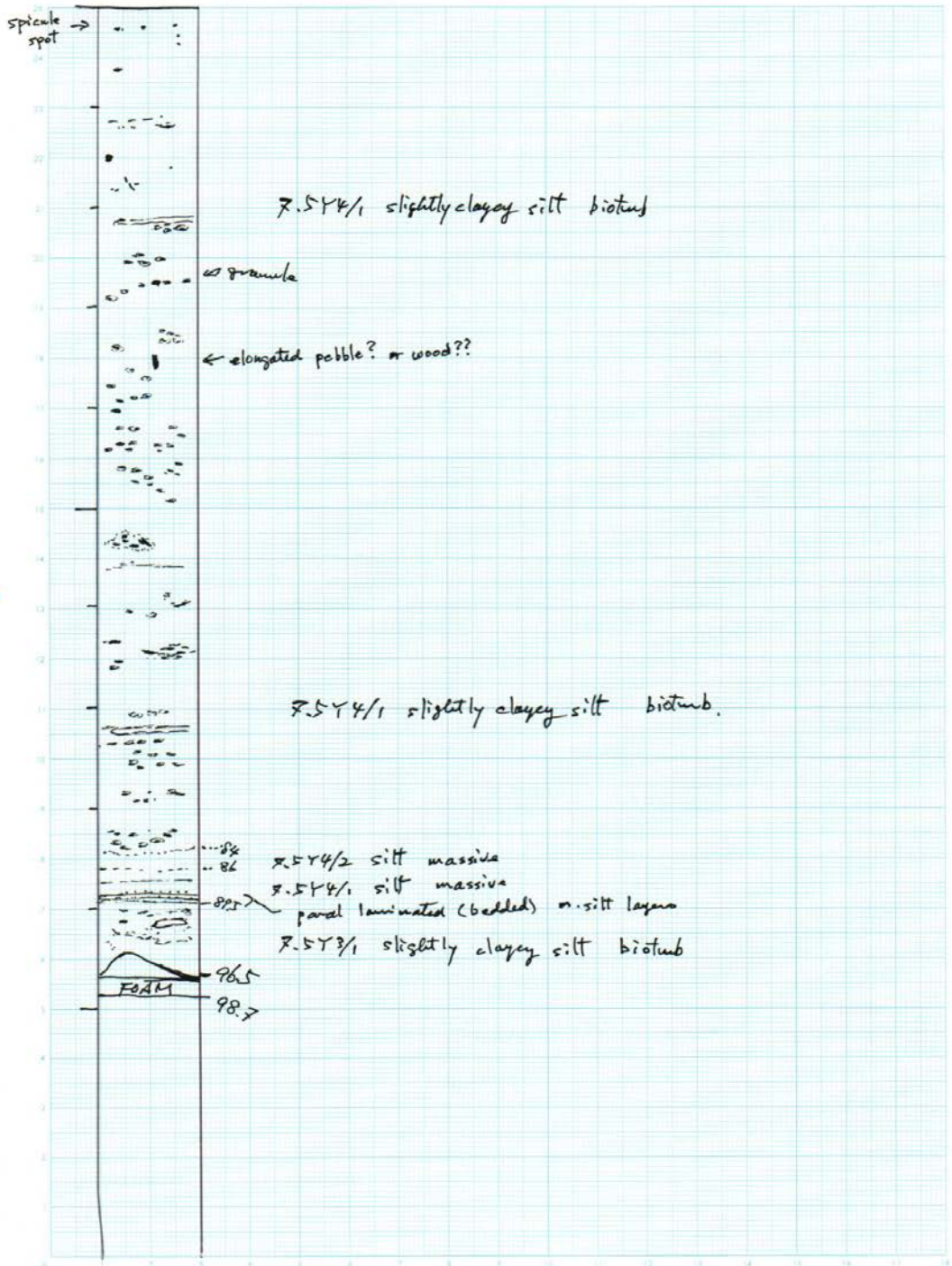
0 - 99.8 (417.6 - 517.4)

MR 22-04　　PC02　　sec. 7 w　　2022.6.21



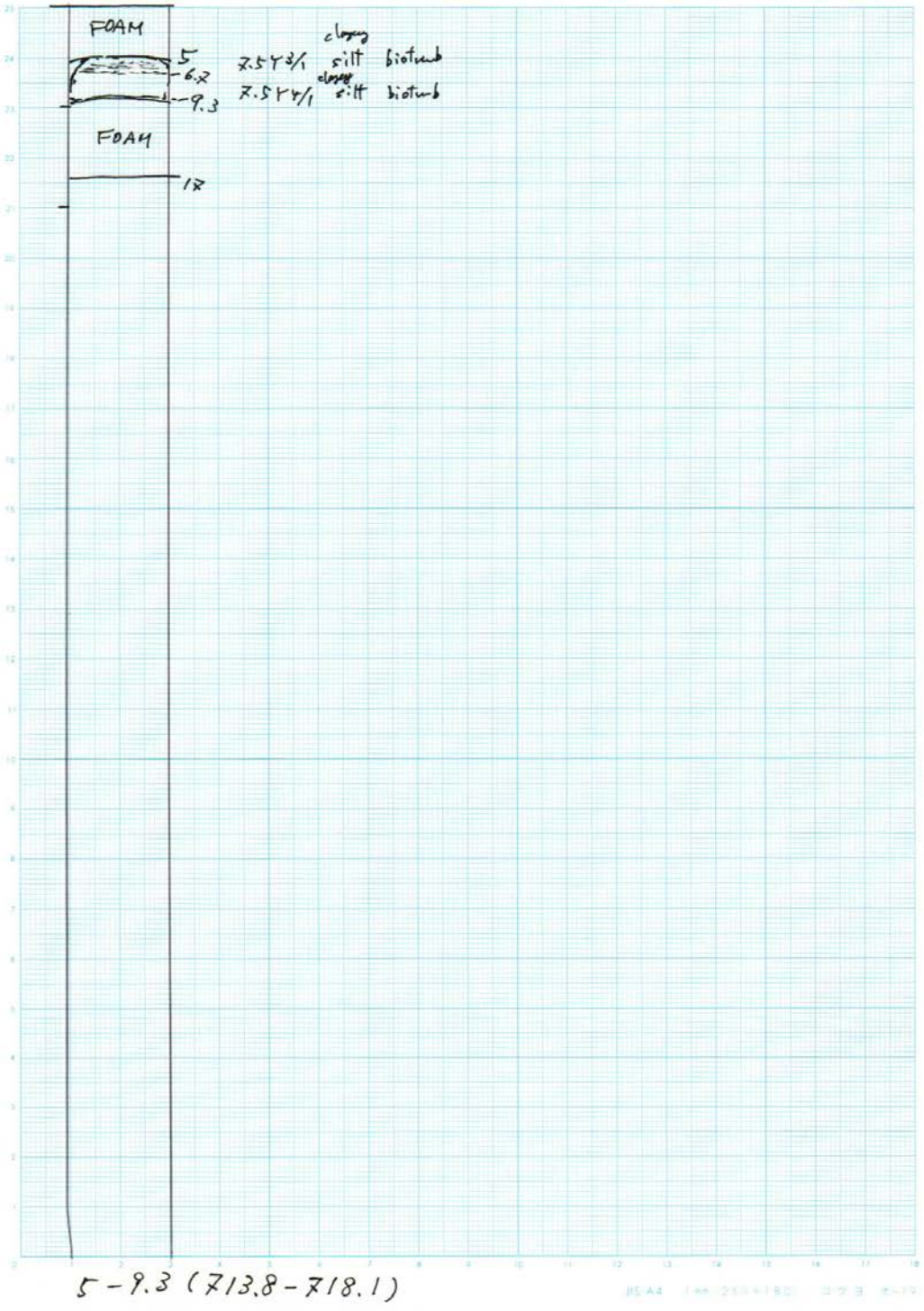
0 - 99.9 (517.4 - 617.3)

MR22-04 PC02 sec. 8W 2022.6.21



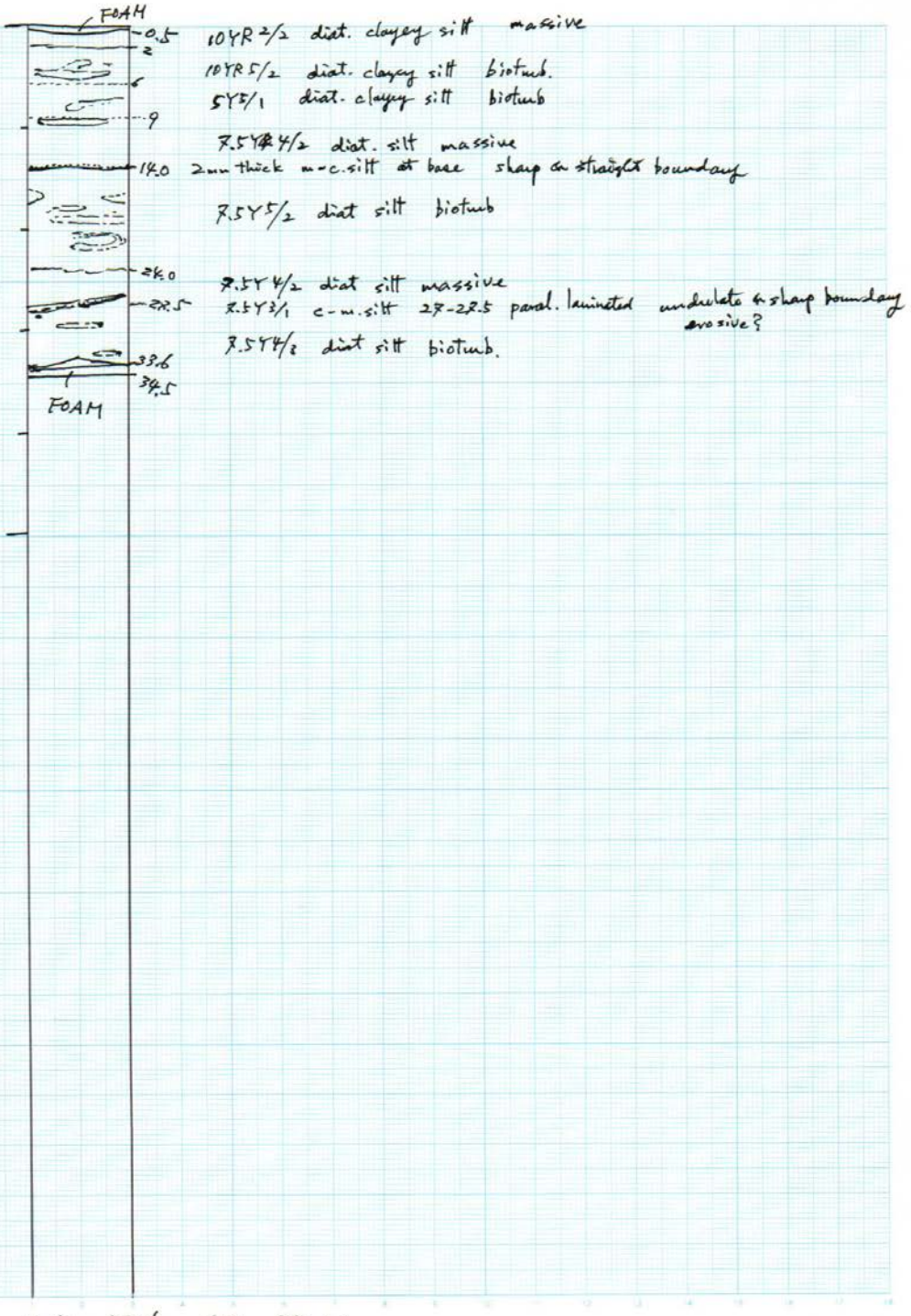
0 - 96.5 (617.3 - 713.8)

MR22-04 PC02 sec. CC w 2022.6.21



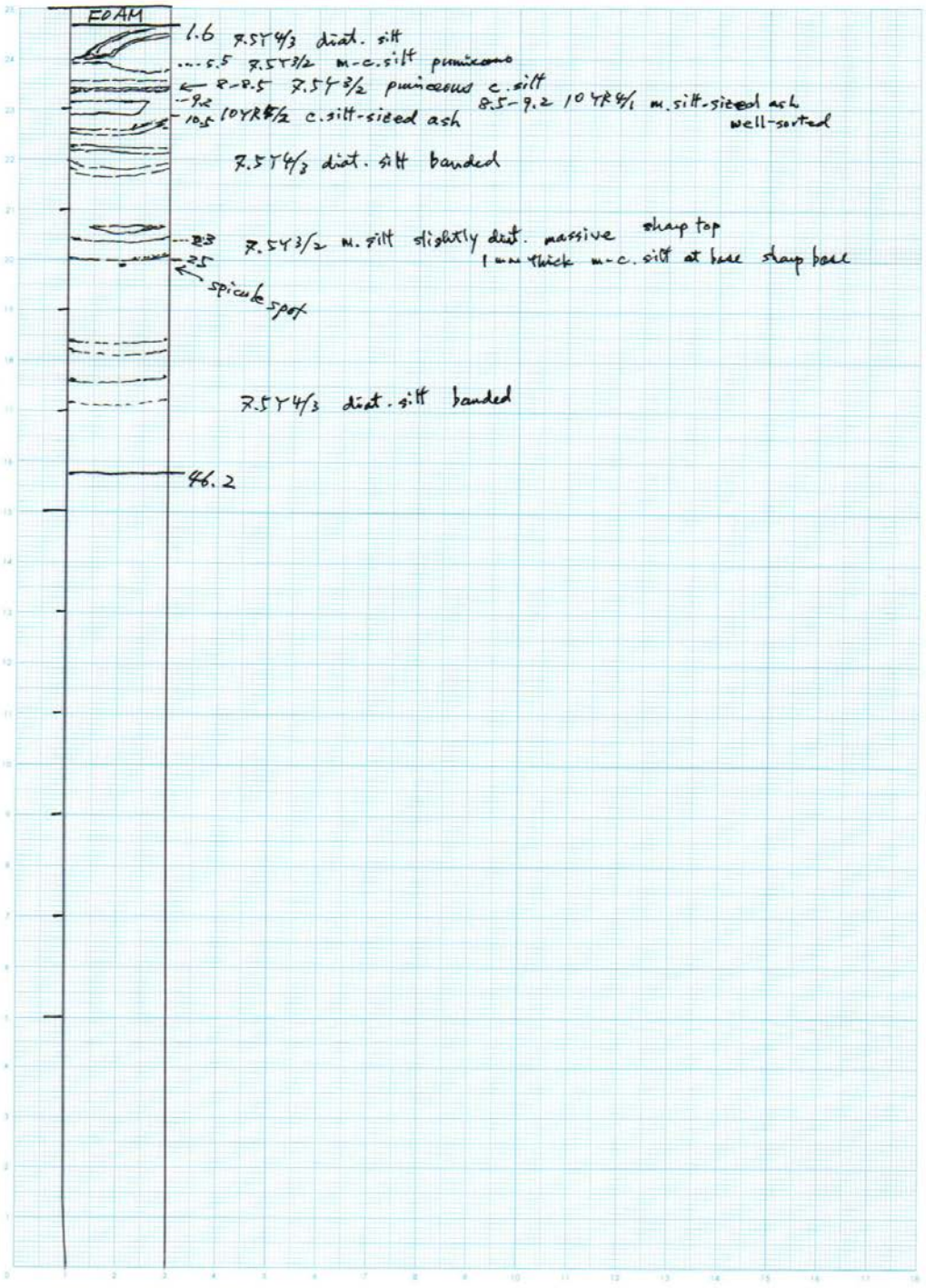
5-9.3 (718.8-718.1)

MR22-04 PL02 sec. 1 W 2022.6.20



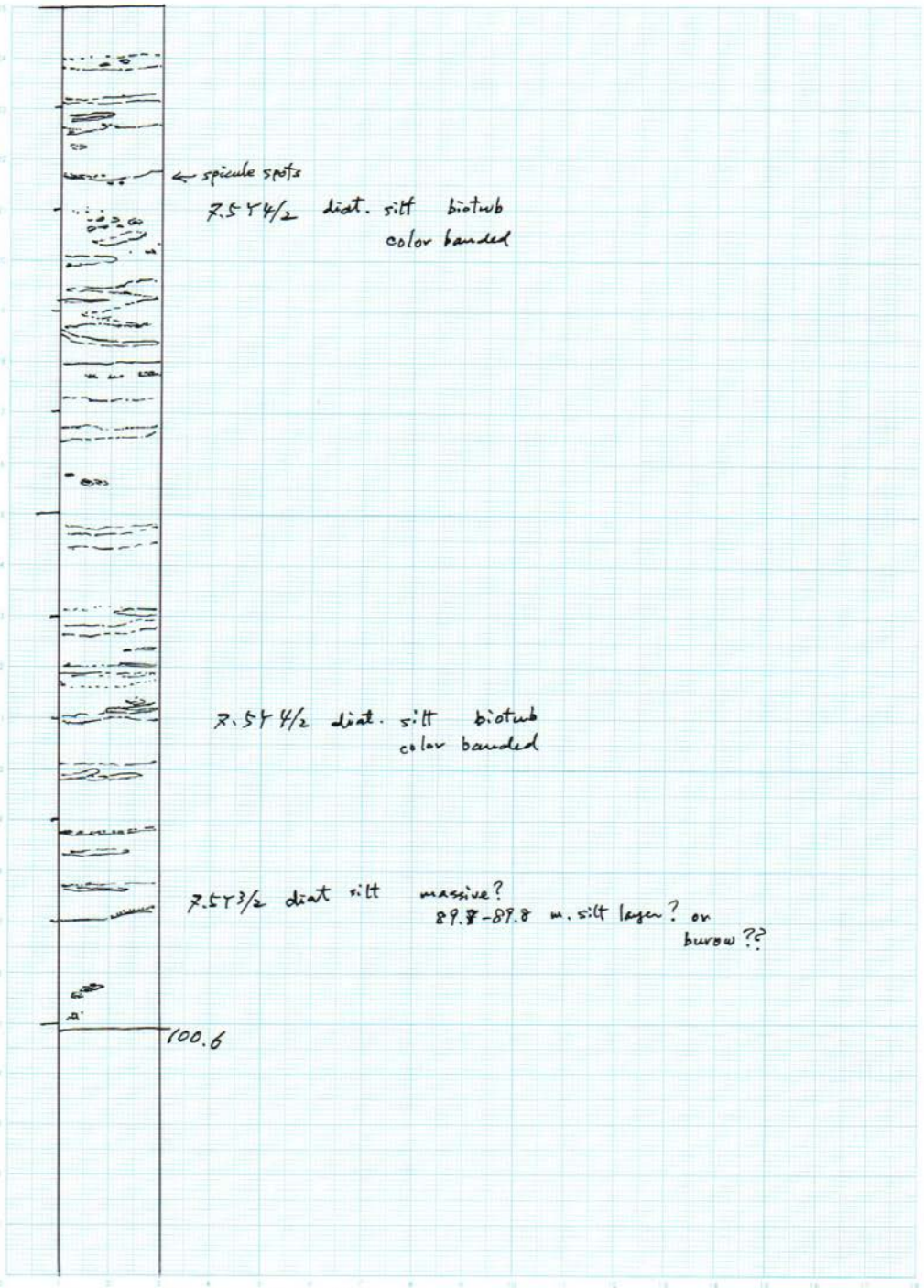
0.5 - 33.6 (0 - 33.1)

MR22-04 PC03 sec. 2w 2022.6.22



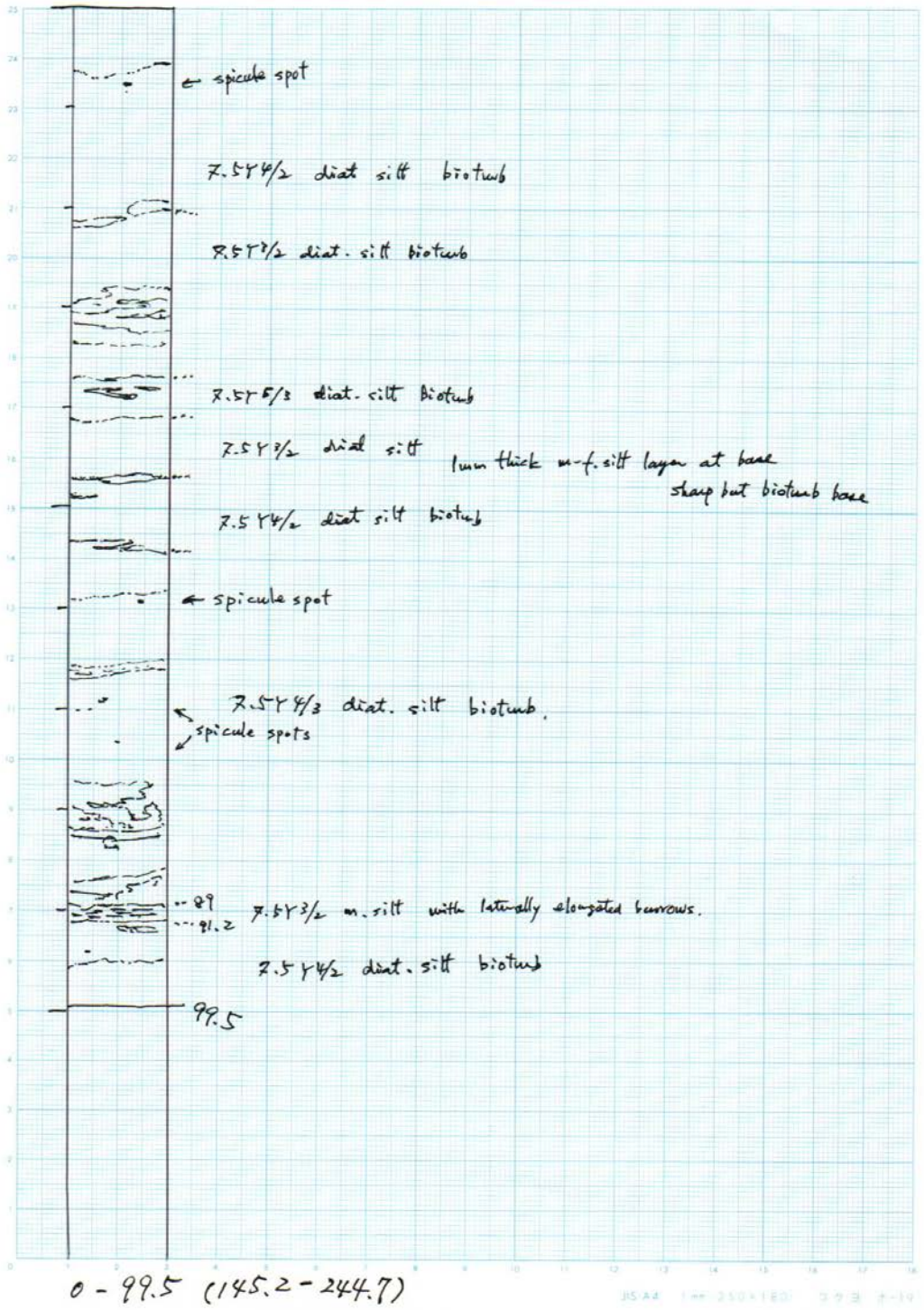
1.6 - 46.2 (0 - 44.6)

MR22-04 PC03 sec. 3w 2022.6.22



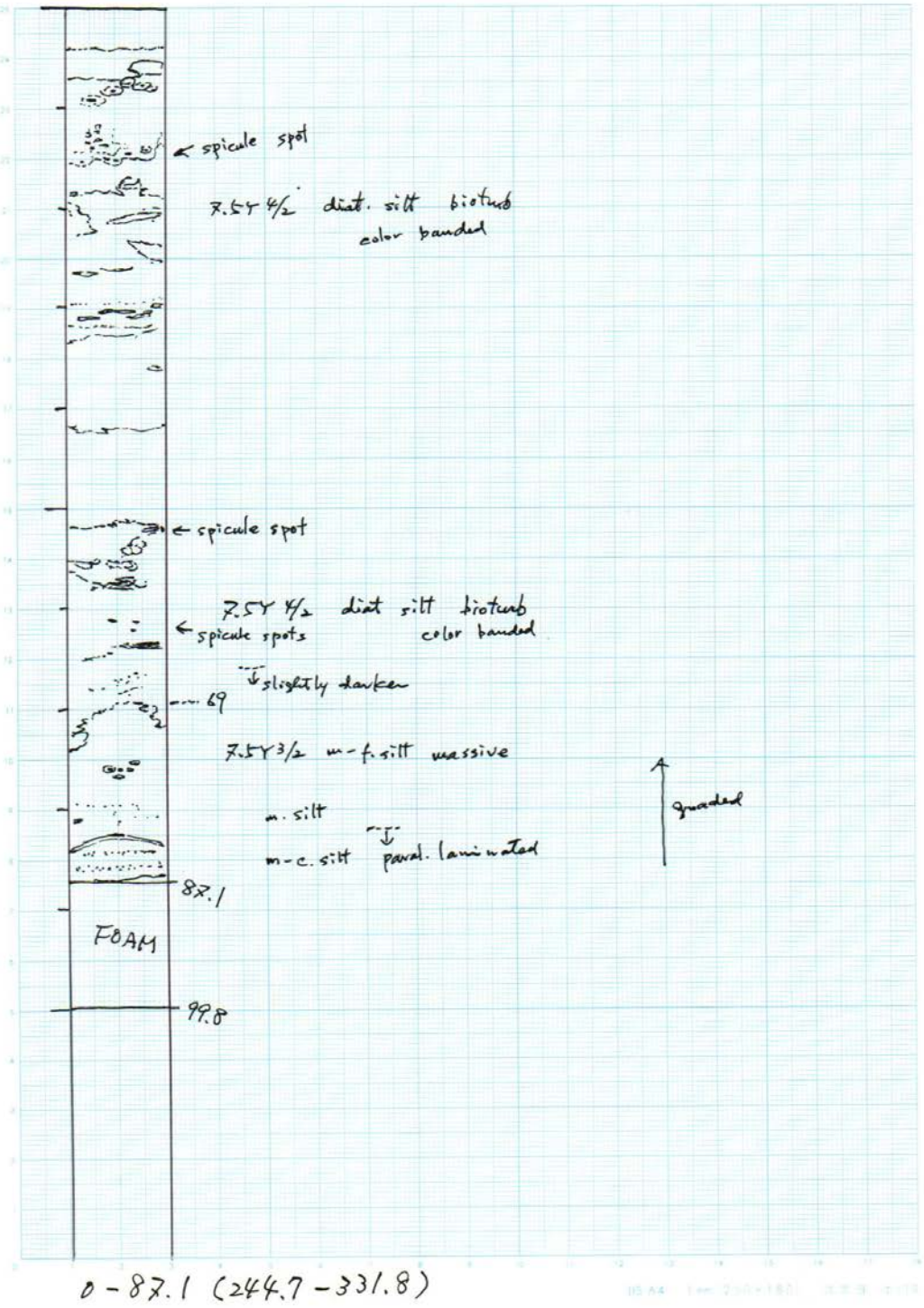
0 - 100.6 (44.6-145.2)

MR 22-04 PC03 sec. 4w 2022. 6. 22



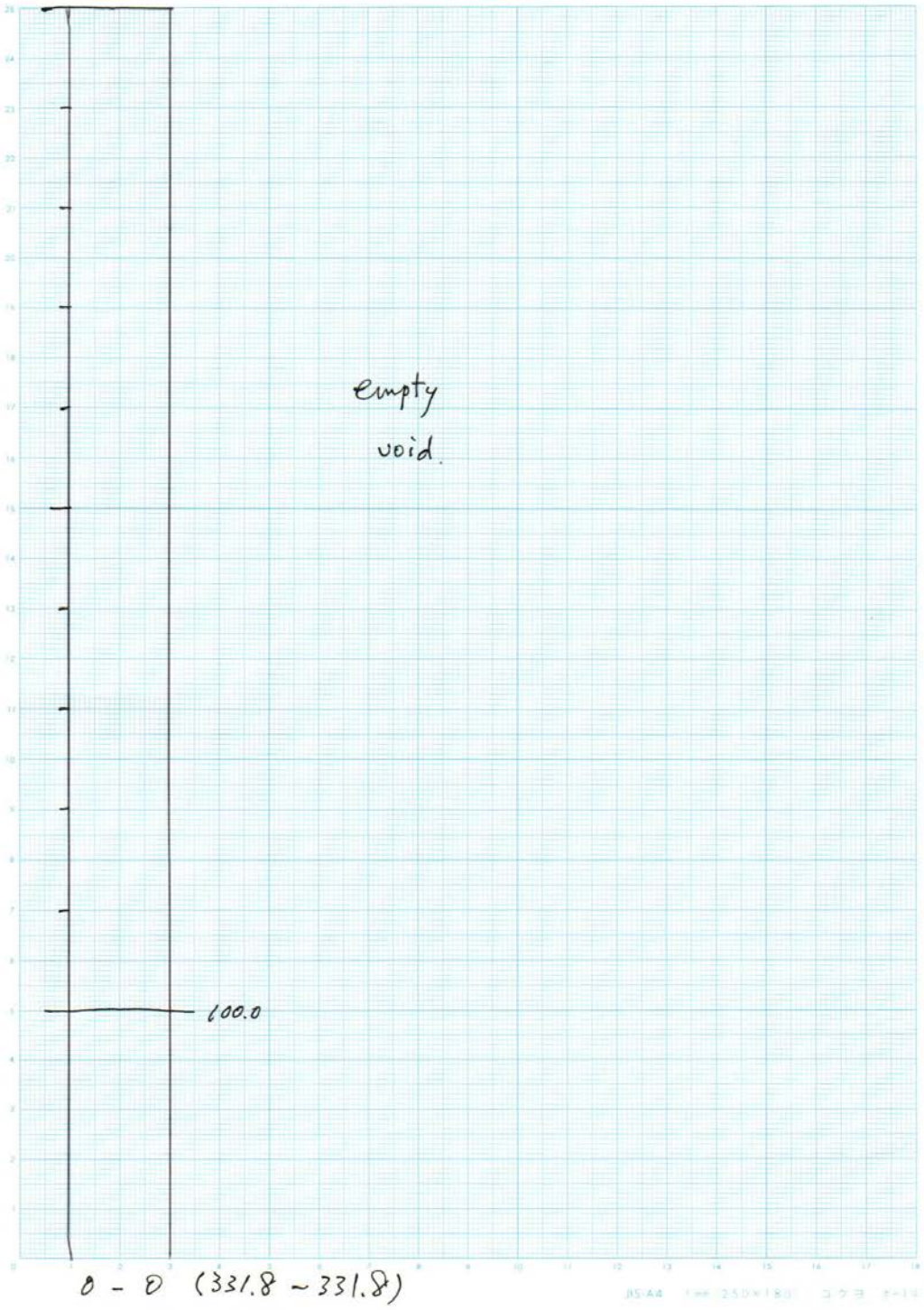
0 - 99.5 (145.2 - 244.7)

MR22-04 PC03 sec. 5 w 2022.6.22



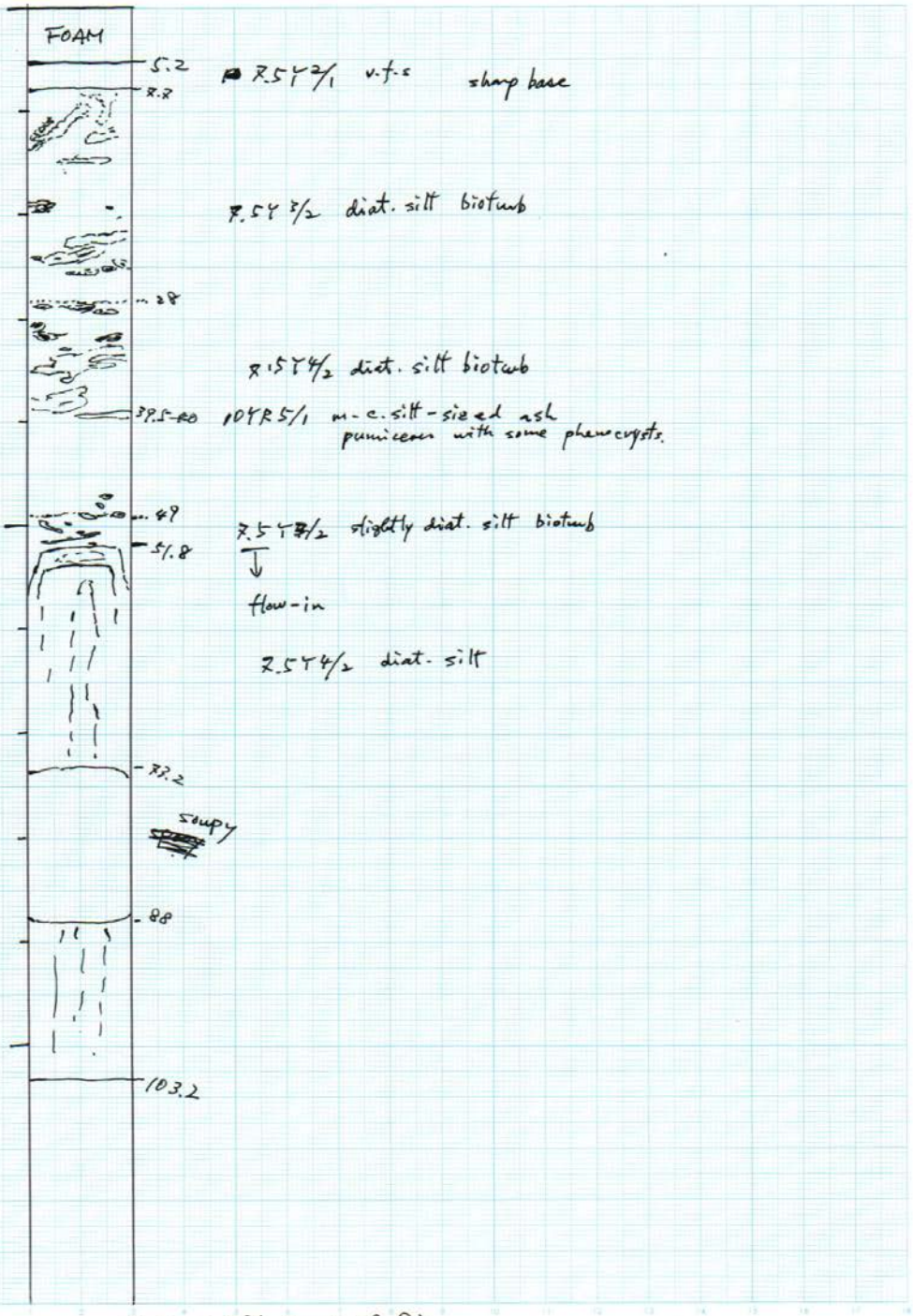
0-87.1 (244.7-331.8)

MR22-04 PC03 sec. 6 w 2022. 6. 22



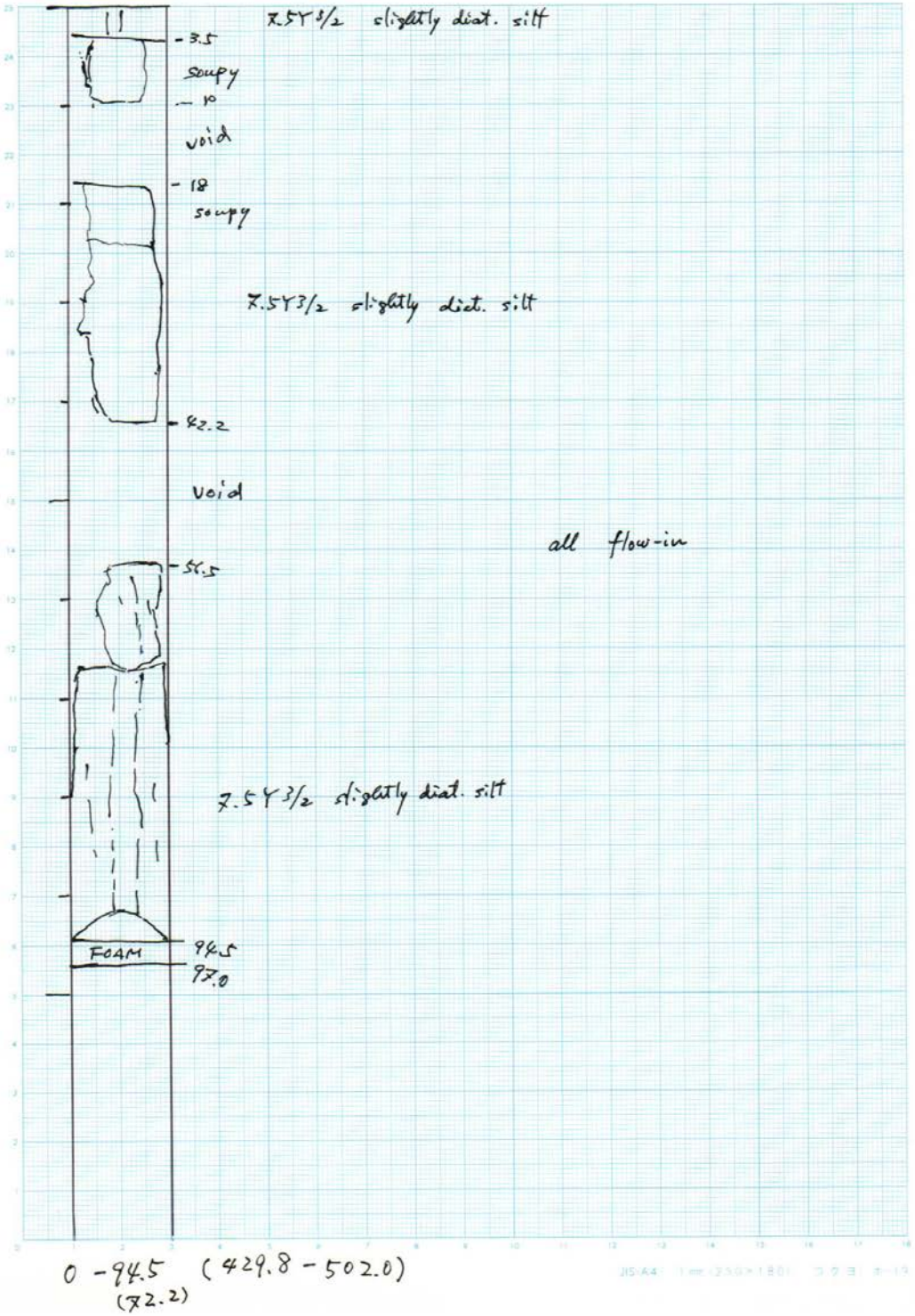
0 - 0 (331.8 ~ 331.8)

MR22-04 PC03 sec. 7 w 2022.6.22



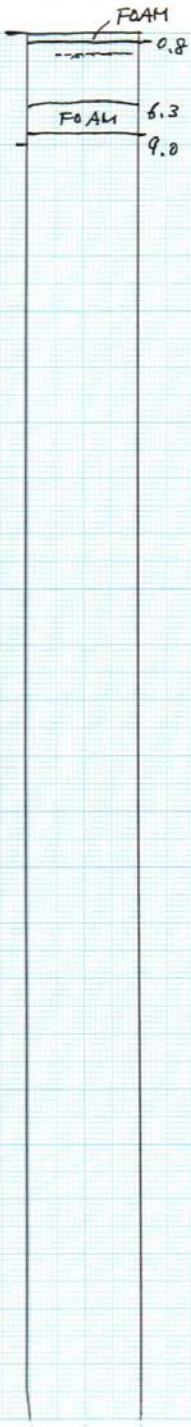
5.2 - 103.2 (331.8 - 429.8)

MR22-04 PC03 sec. 8 w 2022.6.22



0 - 94.5 (429.8 - 502.0)
(72.2)

MR22-04 PL03 sec. 1 w 2022.6.22

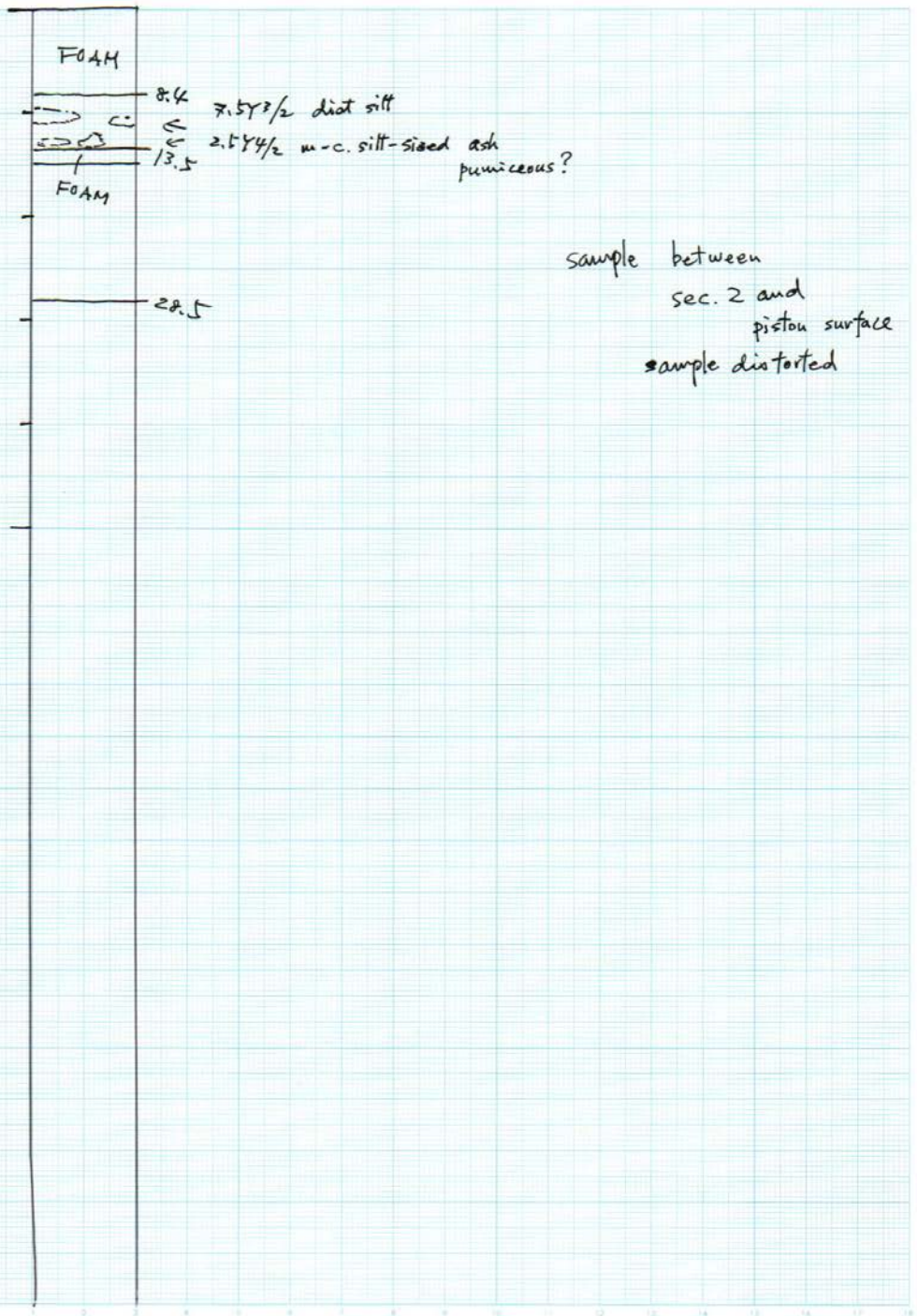


10YR 4/2 diat. silt filmed
5Y 4/2 diat. silt massive

PL03 cc in bag
7.5Y 4/3 diat. silt

0.8 - 6.3 (0 - 5.5)

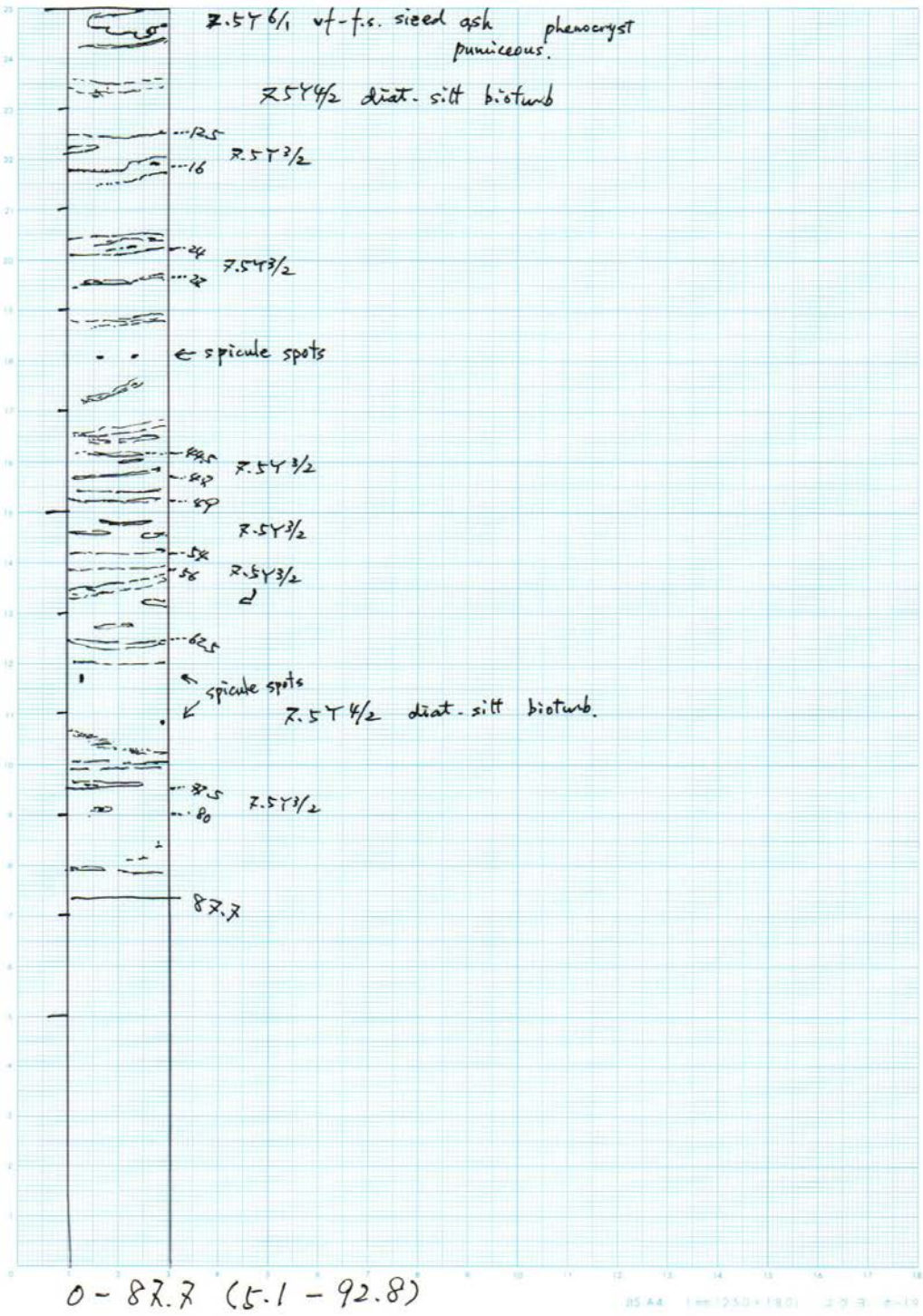
MR22-04 PC04 sec. 1 w& A 2022.6.24



sample between
sec. 2 and
piston surface
*sample distorted

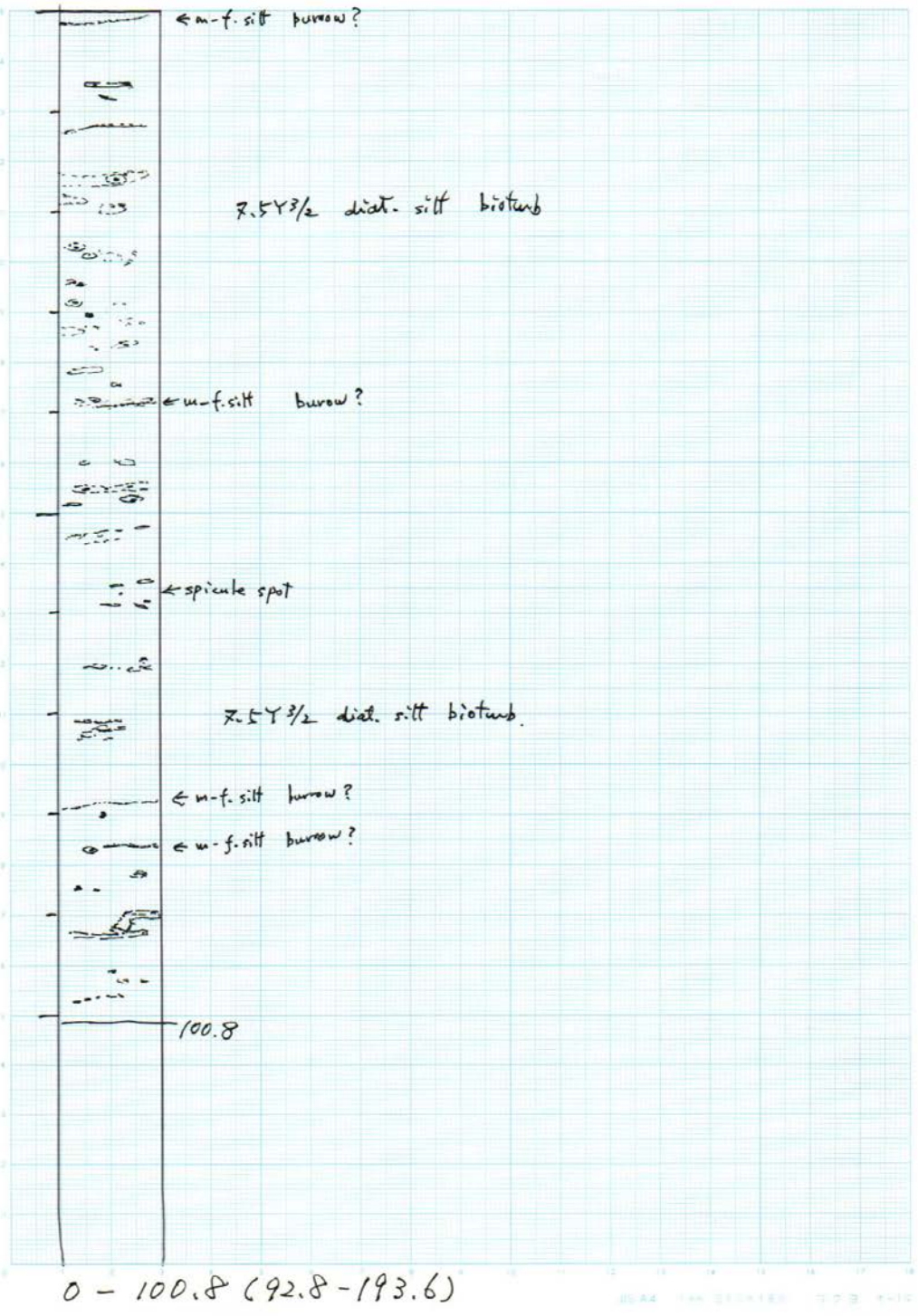
8.4 - 13.5 (0 - 5.1)

MR22-04 PC04 sec. 2 w 2022.6.24



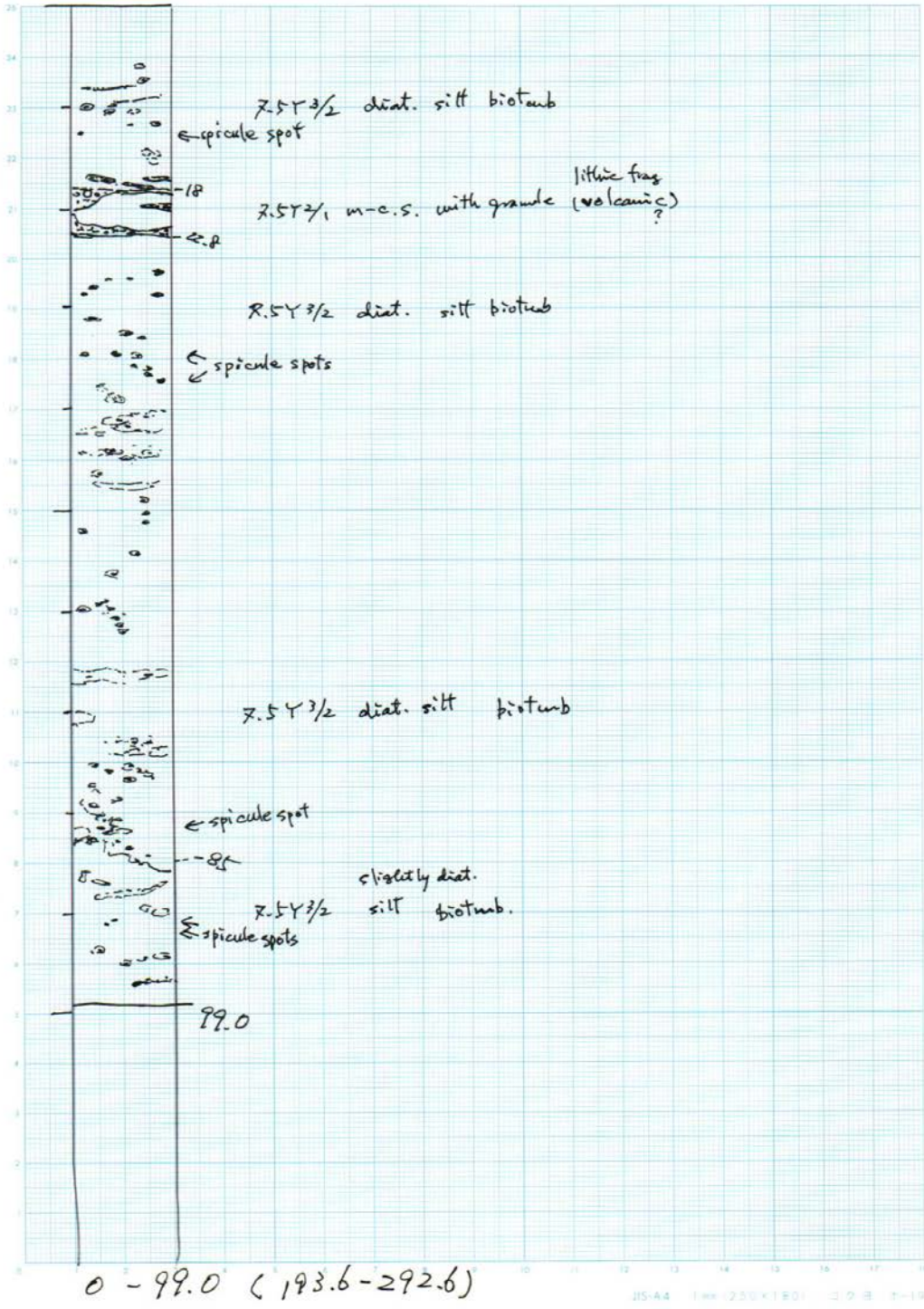
0 - 87.7 (5.1 - 92.8)

MR 22-04 PC04 sec. 3W 2022. 6.24



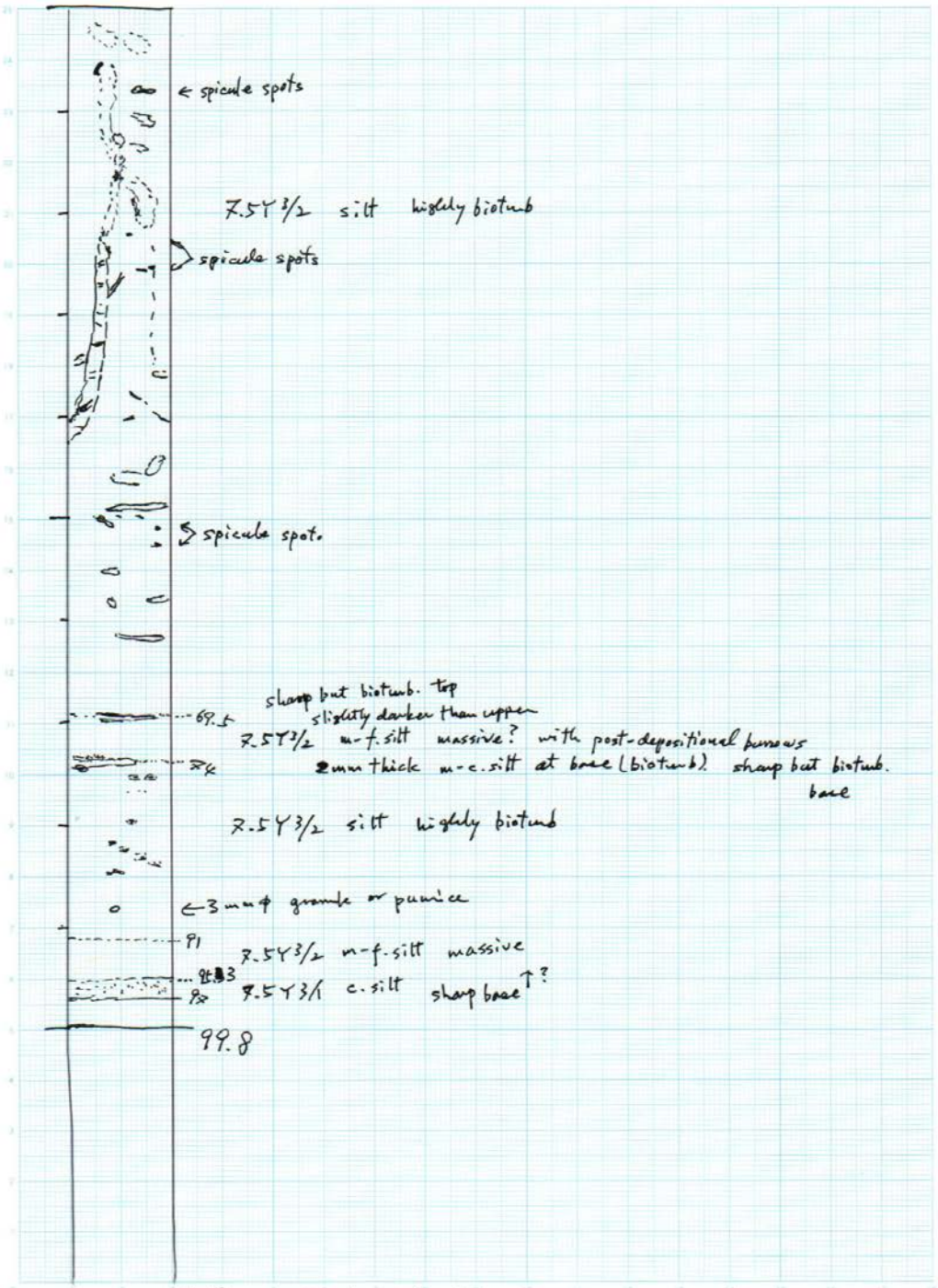
0 – 100.8 (92.8 – 193.6)

MR22-04 PC04 sec. 4 W 2022.6.24



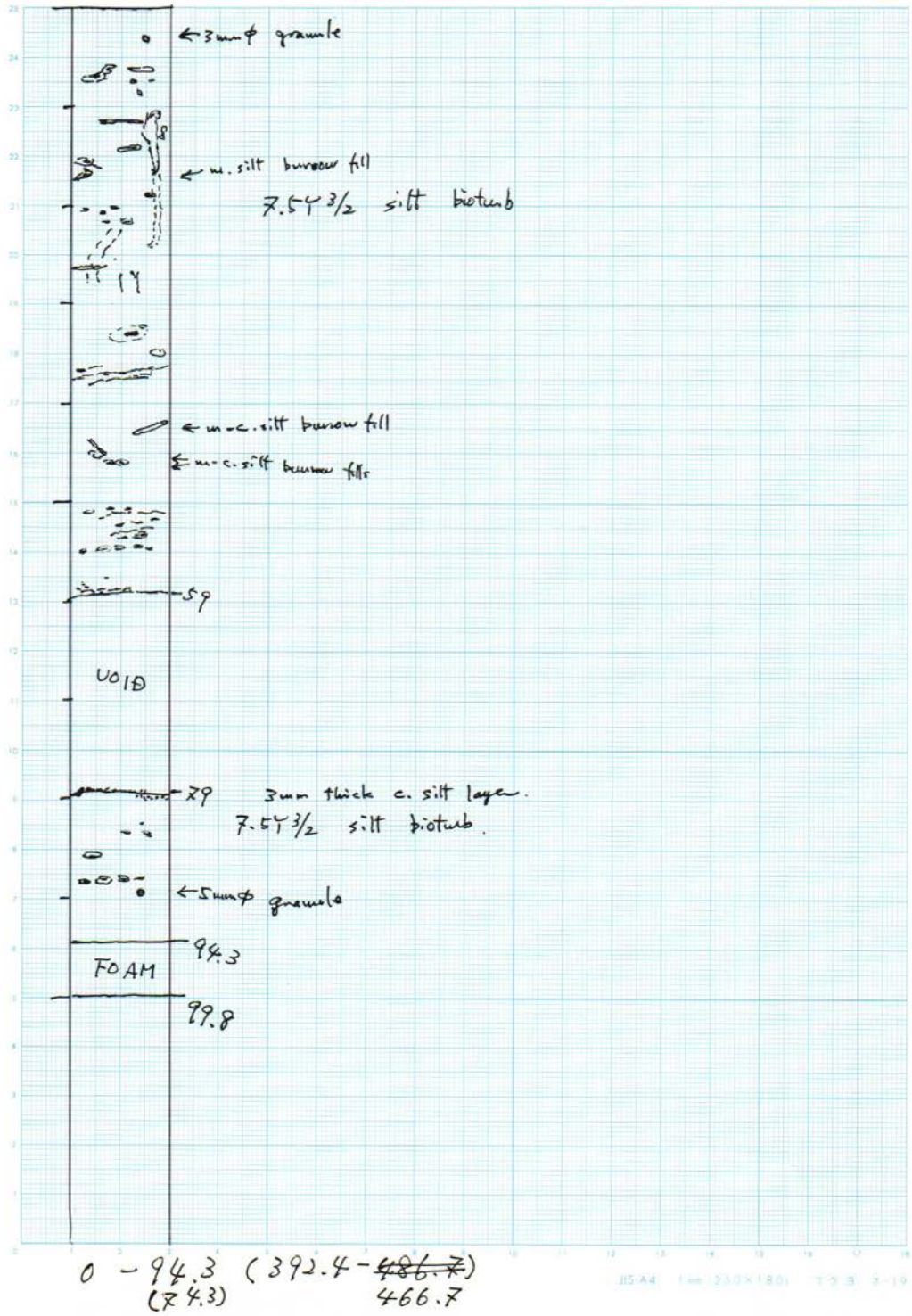
0 - 99.0 (193.6 - 292.6)

MR22-04 PC04 sec. 5w 2022.6.24



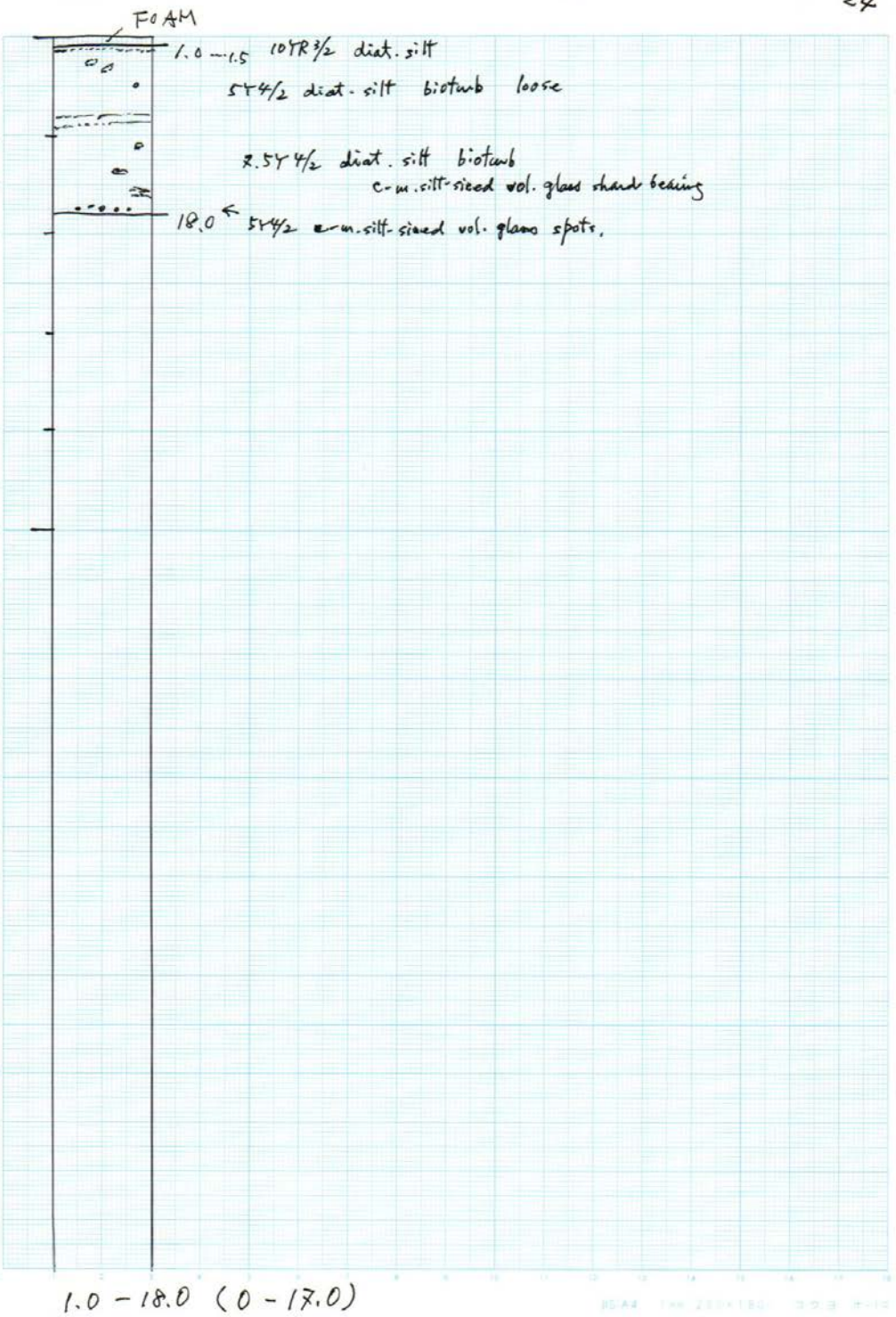
0 - 99.8 (292.6 - 392.4)

MR22-04 PC04 sec. 6w 2022.6.24



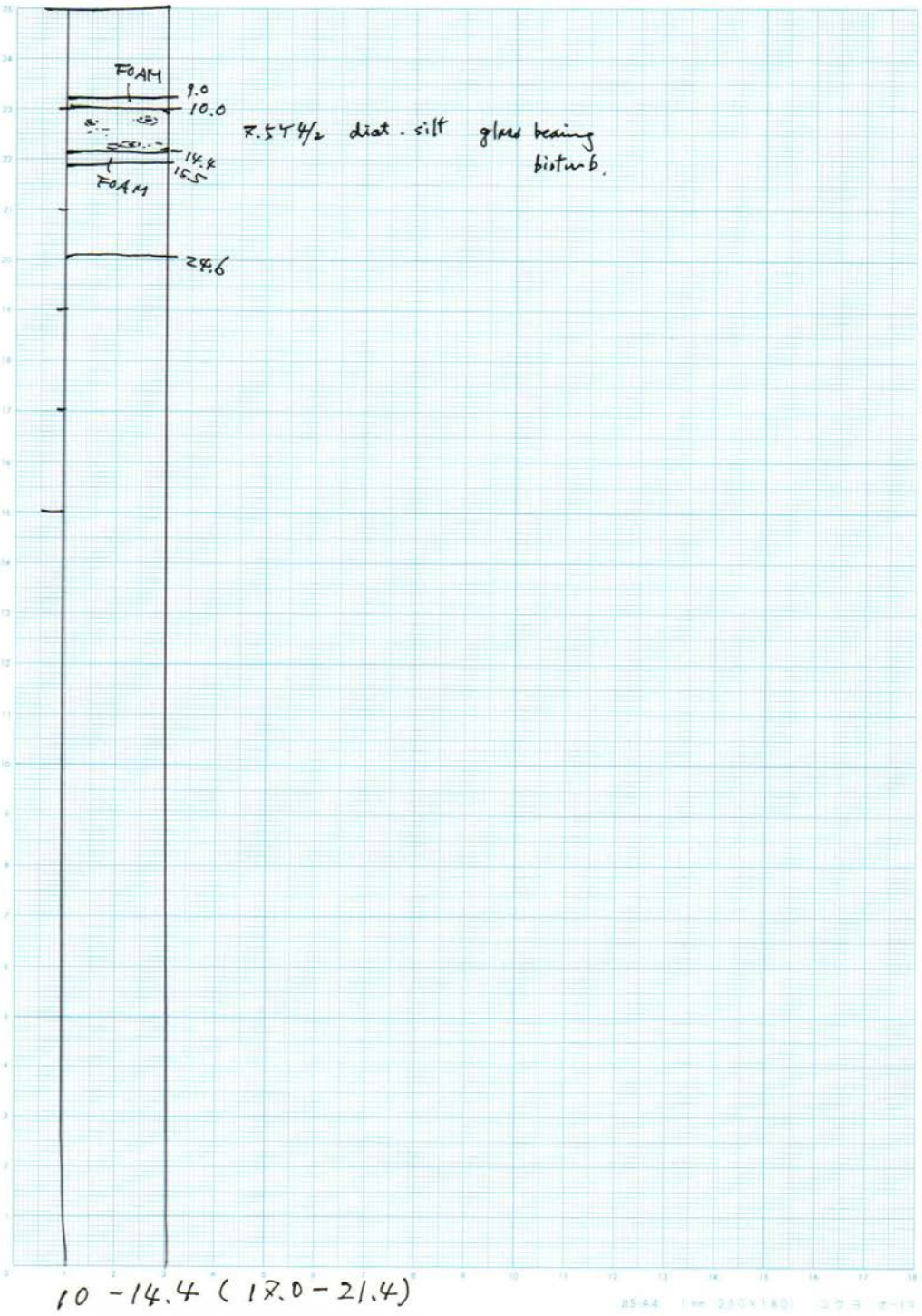
0 - 94.3 (392.4 - ~~486.7~~ 466.7)
(∑4.3)

MR22-04 PL04 sec. 1 W 2022. 6. ~~23~~ 24



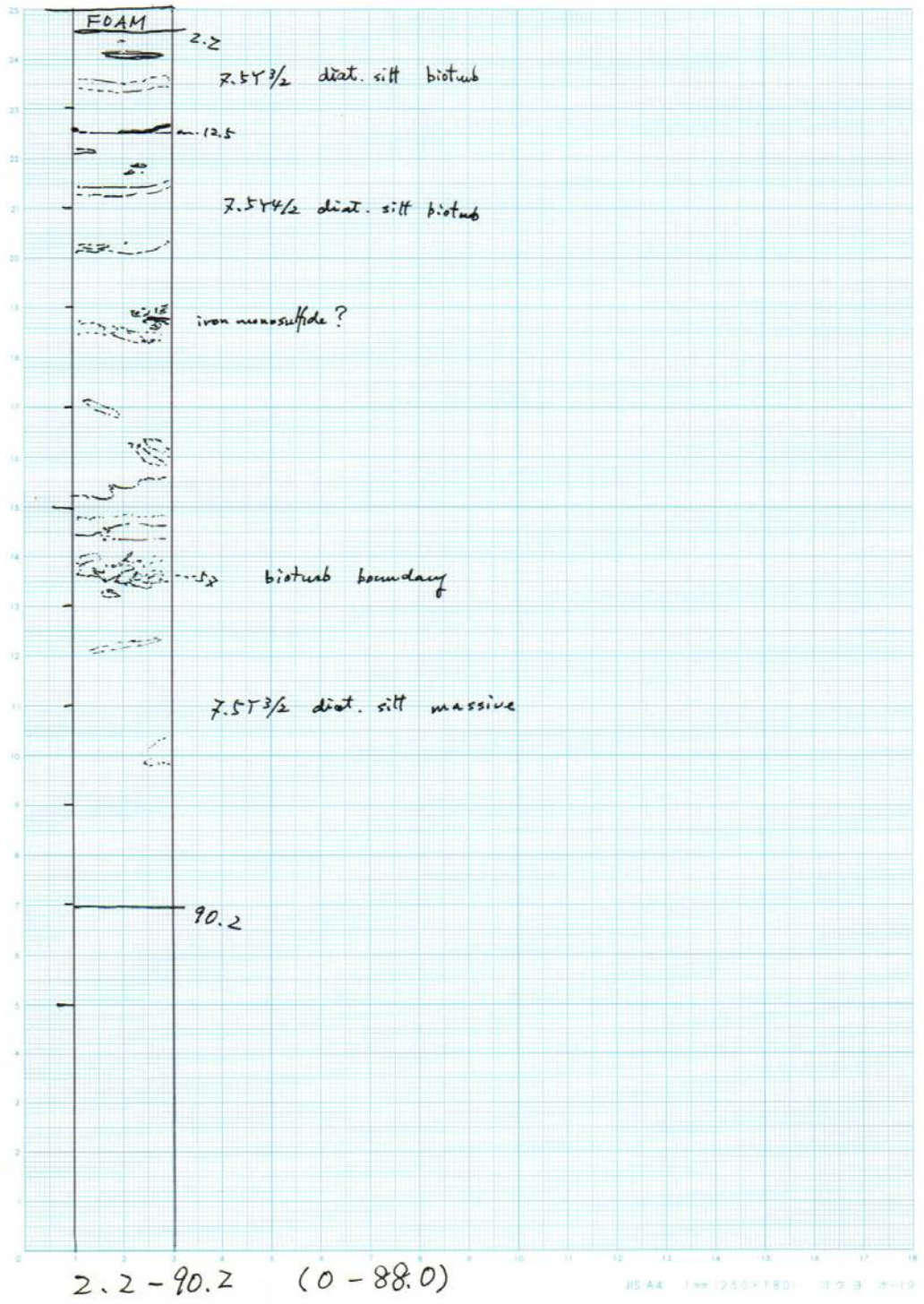
1.0 – 18.0 (0 – 17.0)

MR22-04 PL04 sec. CC w 2022.6.24



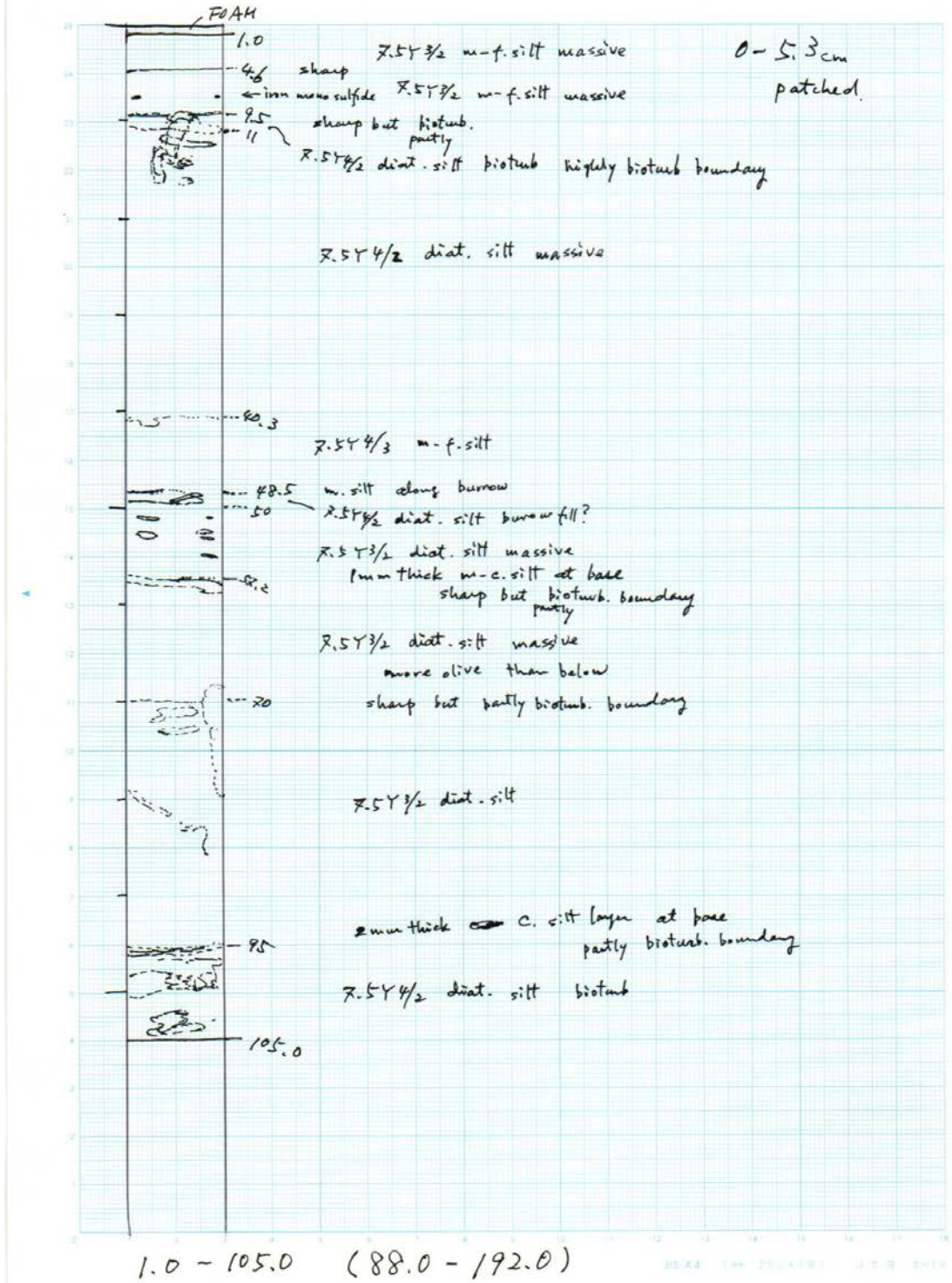
10 - 14.4 (17.0 - 21.4)

MR 22-04 PC05 sec. 2 w 2022. 6. 27



2.2 - 90.2 (0 - 88.0)

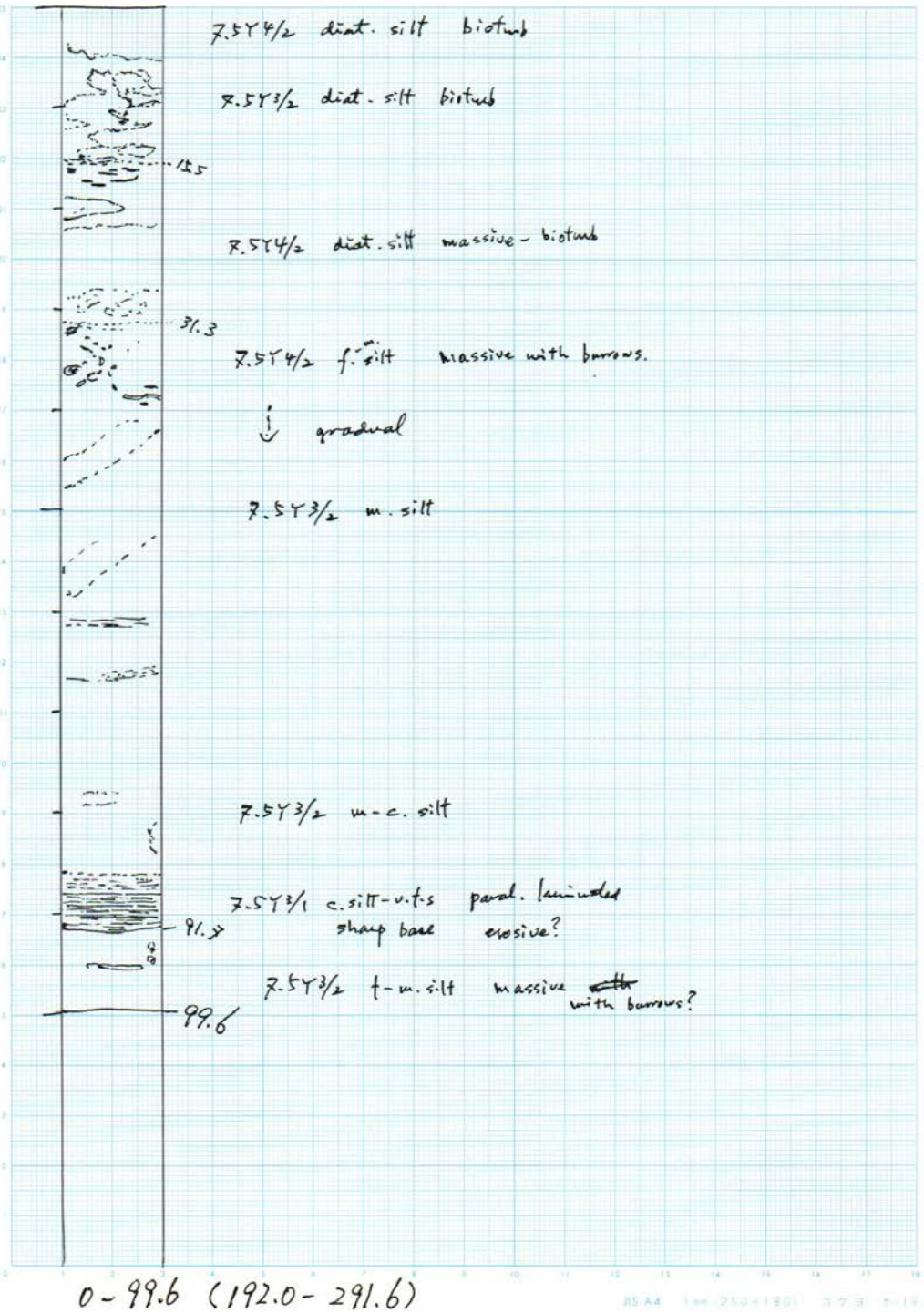
MR 22-04 PC05 sec. 3W 2022.6.27



0 - 5.3 cm
patched

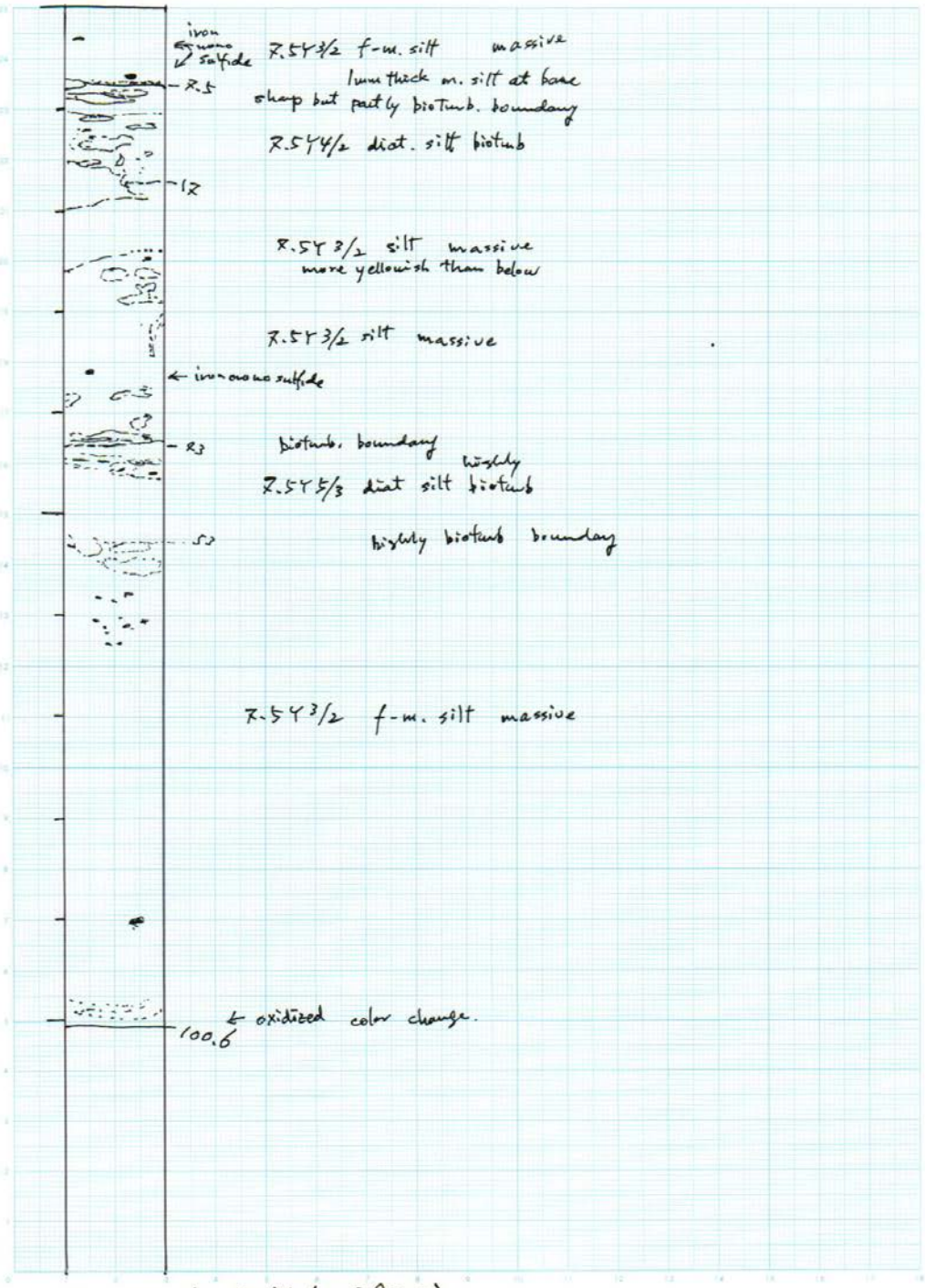
1.0 - 105.0 (88.0 - 192.0)

MR22-04 PC05 sec. 4w 2022.6.27



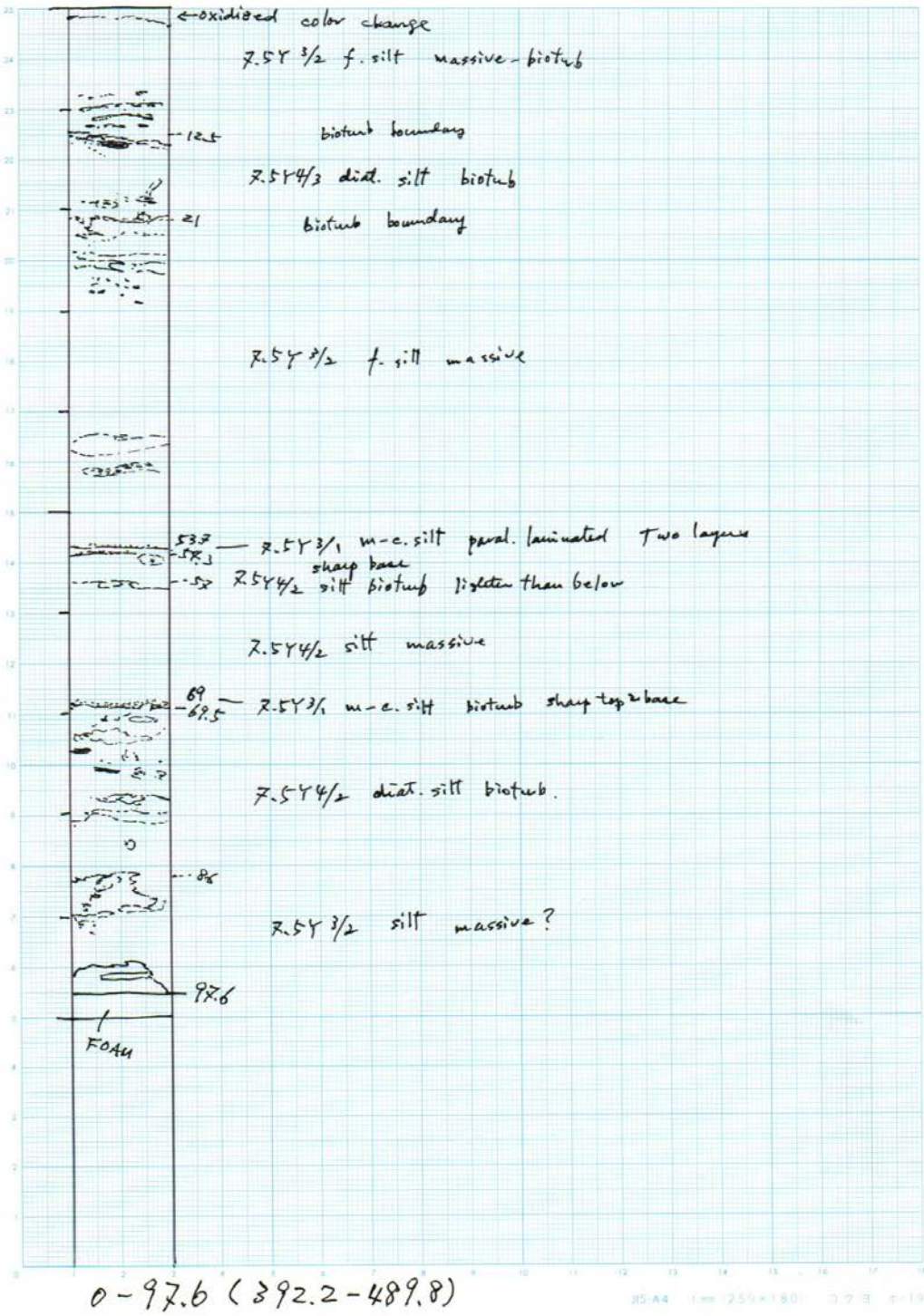
0 - 99.6 (192.0 - 291.6)

MR22-04 PC05 sec. 5W 2022.6.27

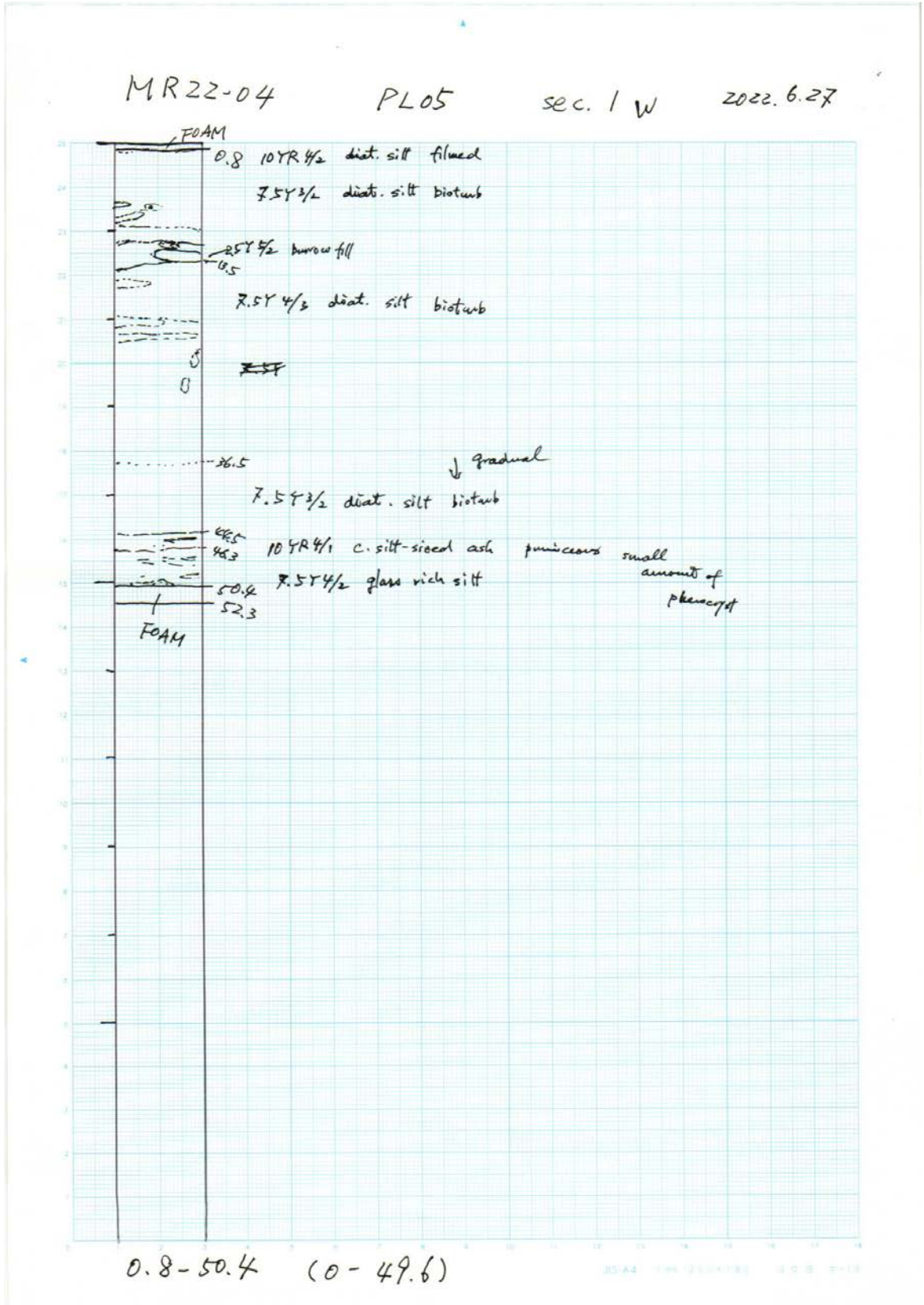


0 -100.6 (291.6-392.2)

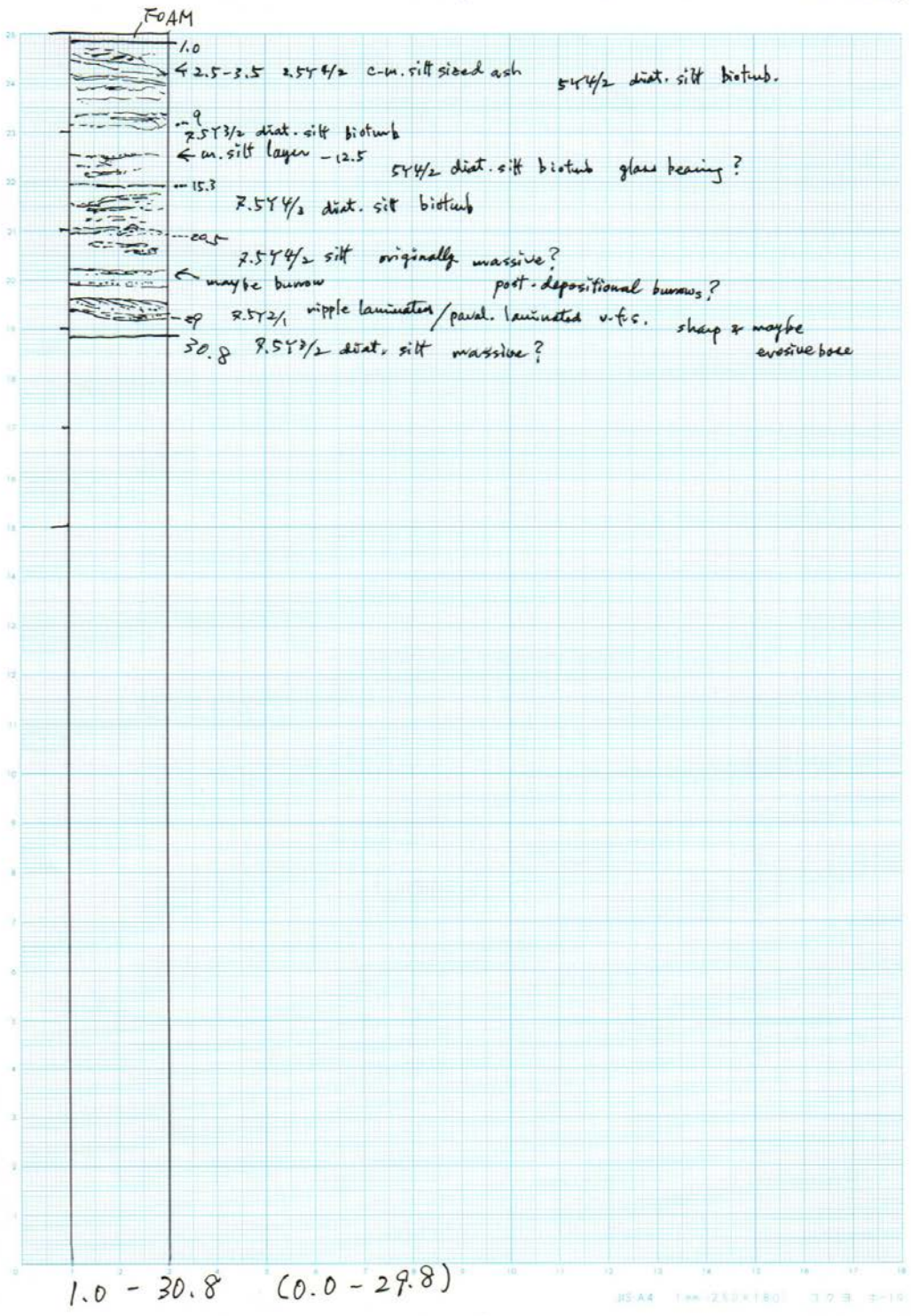
MR22-04 PC05 sec. 6W 2022.6.27



0-97.6 (392.2-489.8)

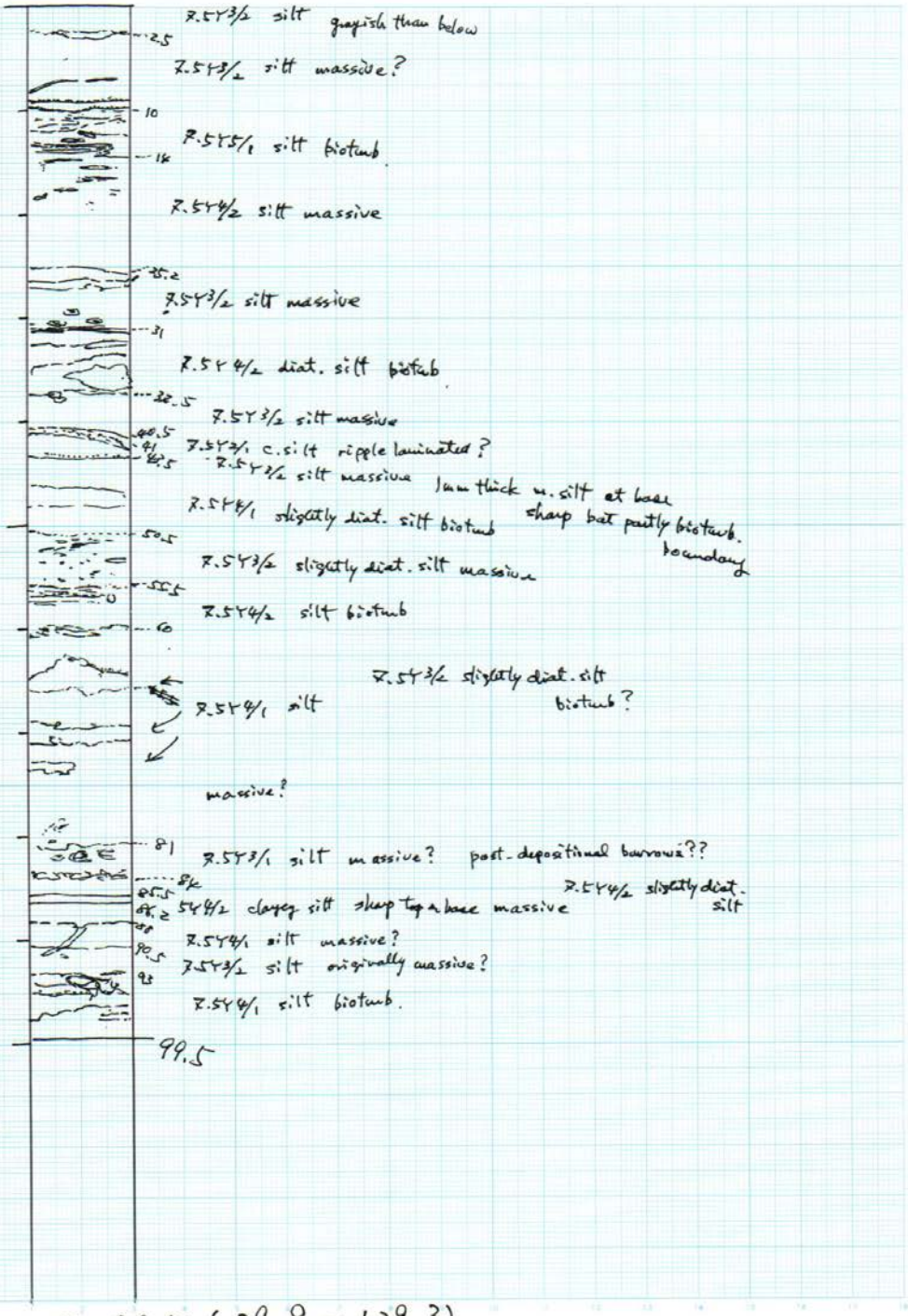

MR22-04 PL05 sec. 1 W 2022.6.27
FOAM
0.8 10YR 4/2 diat. silt filmed
7.5Y 3/2 diat. silt bioturb
2.5Y 4/2 burrow fill
0.5
7.5Y 4/3 diat. silt bioturb
36.5
gradual
7.5Y 3/2 diat. silt bioturb
46.5
46.3
10YR 4/1 c. silt-sized ash pumiceous small amount of pheneryst
7.5Y 4/2 glass rich silt
50.4
52.3
FOAM
0.8 - 50.4 (0 - 49.6)

MR 22-04 PC06 sec. 1 W 2022.6.28



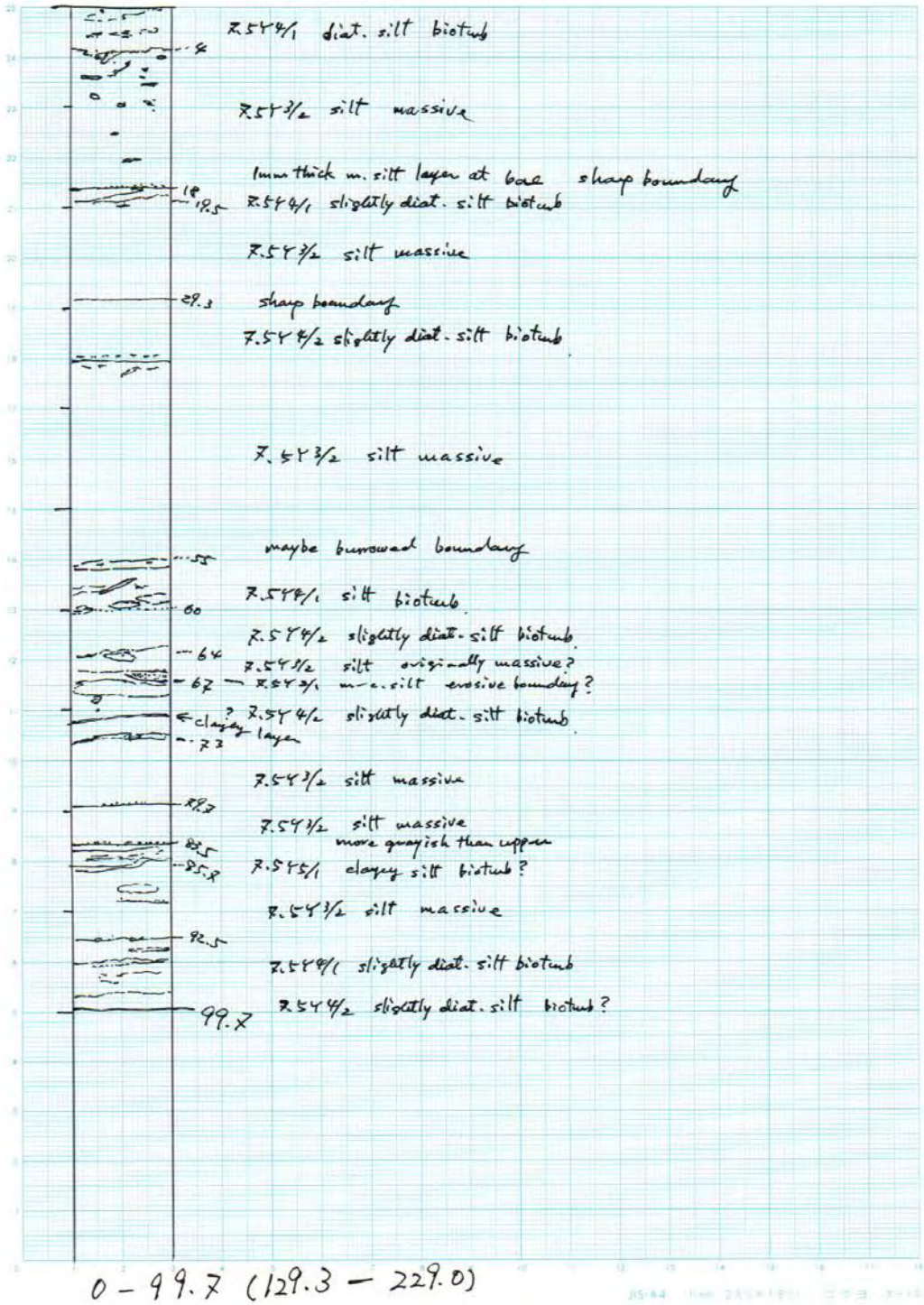
1.0 - 30.8 (0.0 - 29.8)

MR22-04 PC06 sec. 2W 2022. 6. 28



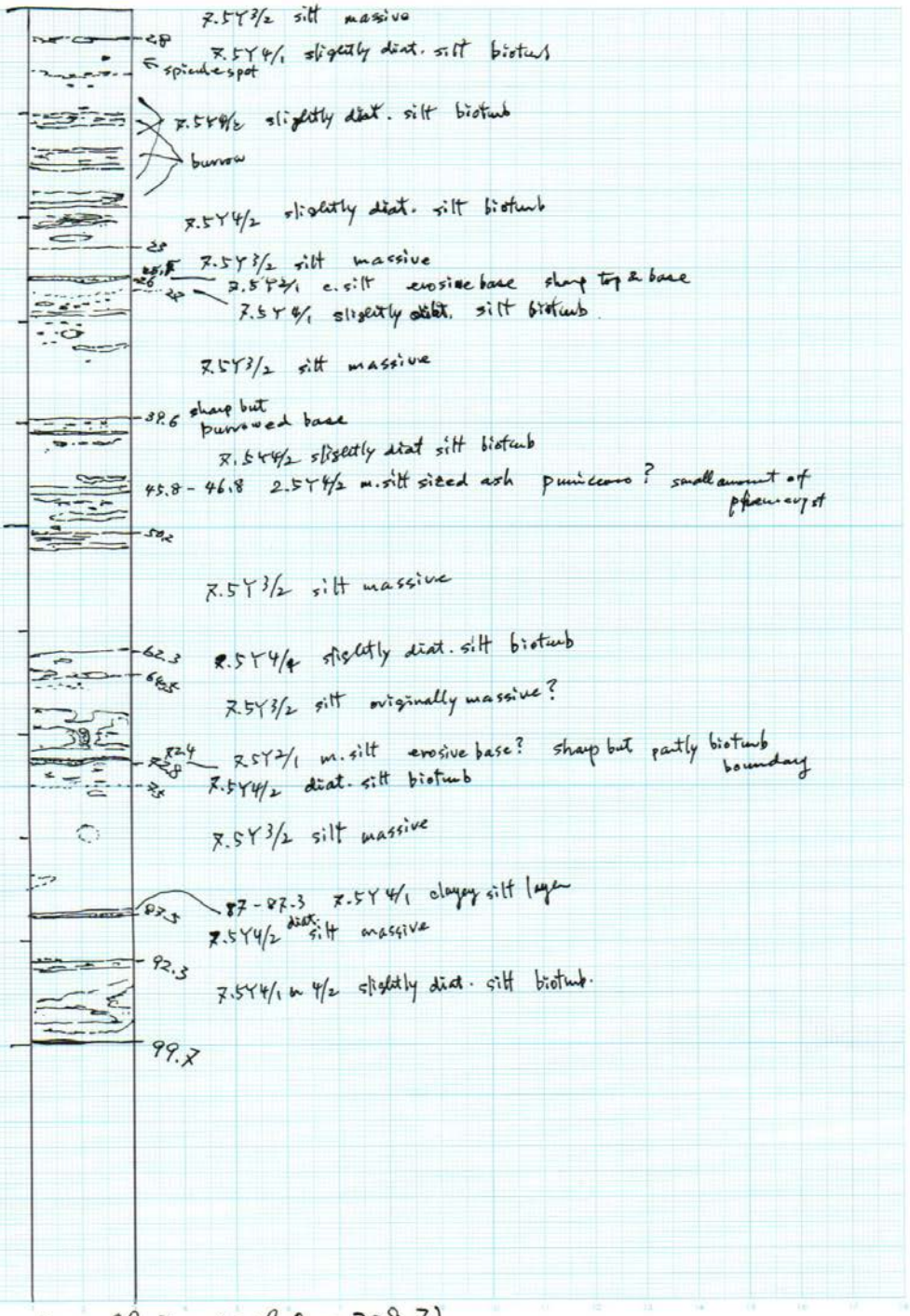
0-99.5 (29.8-129.3)

MR 22-04 PC06 sec. 3w 2022. 6. 28



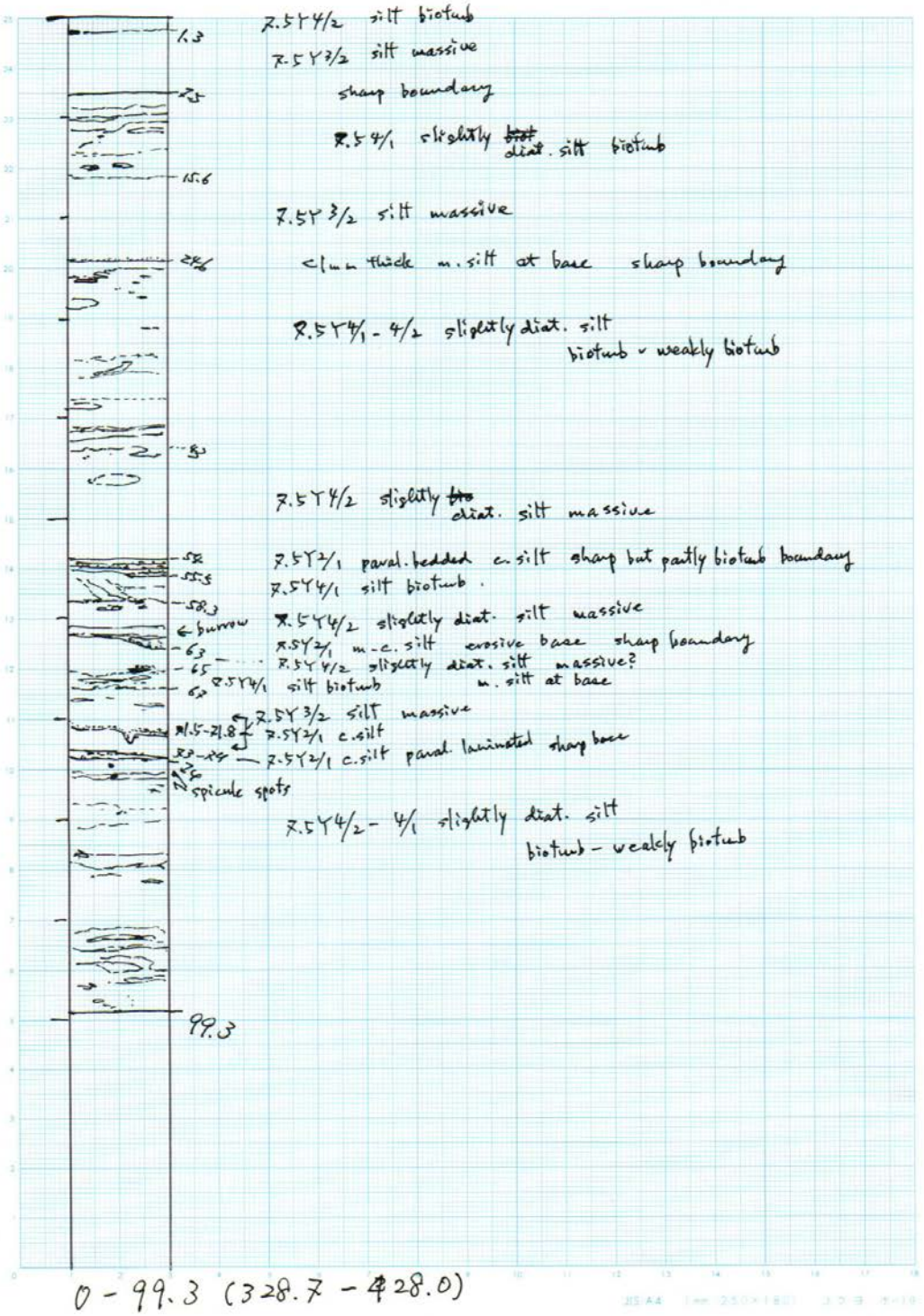
0 - 99.7 (129.3 - 229.0)

MR22-04 PC06 Sec. 4 w 2022.6.28



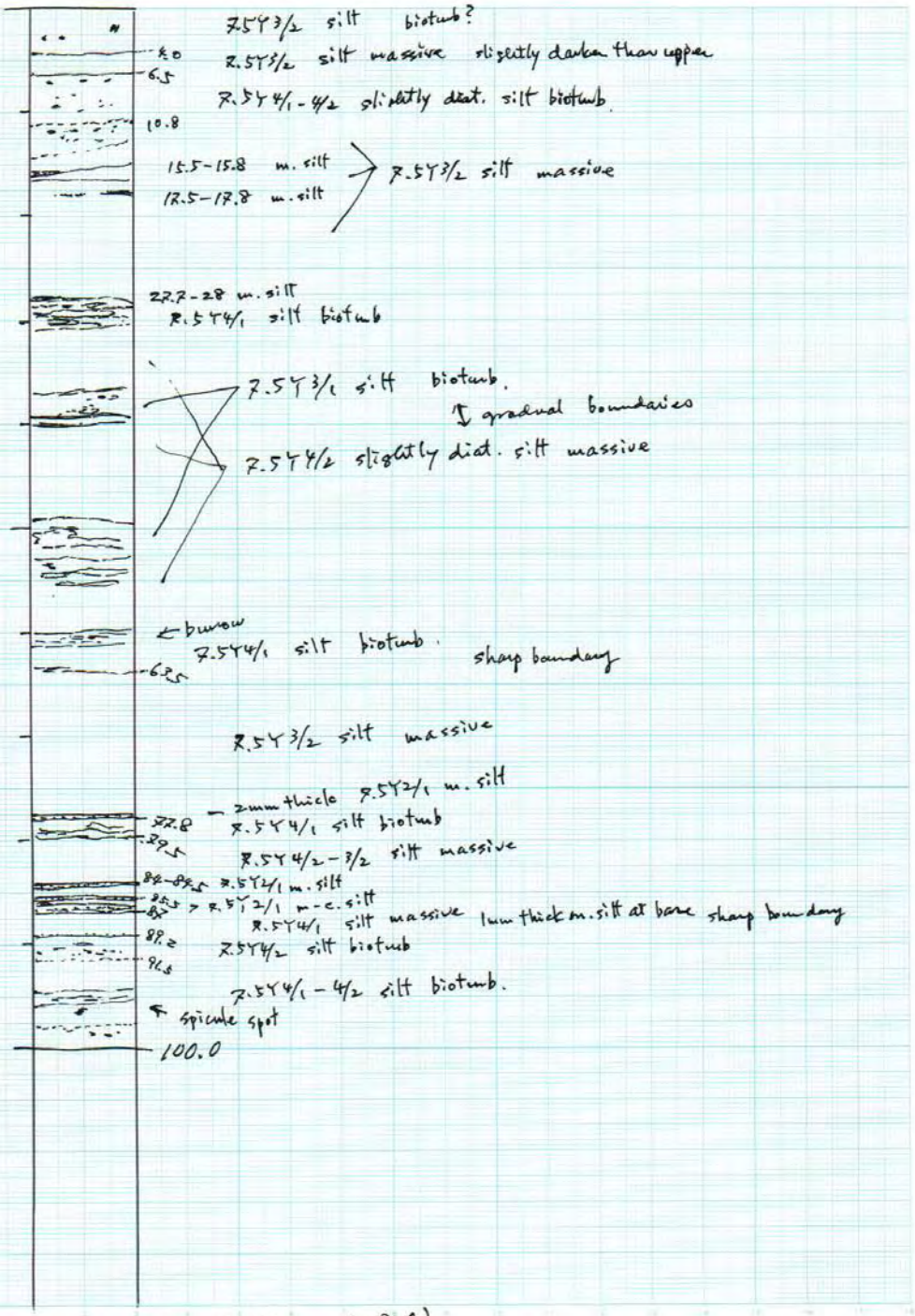
0 - 99.7 (229.0 - 328.7)

MR 22-04 PC06 Sec. ~~B~~5W 2022.6.28



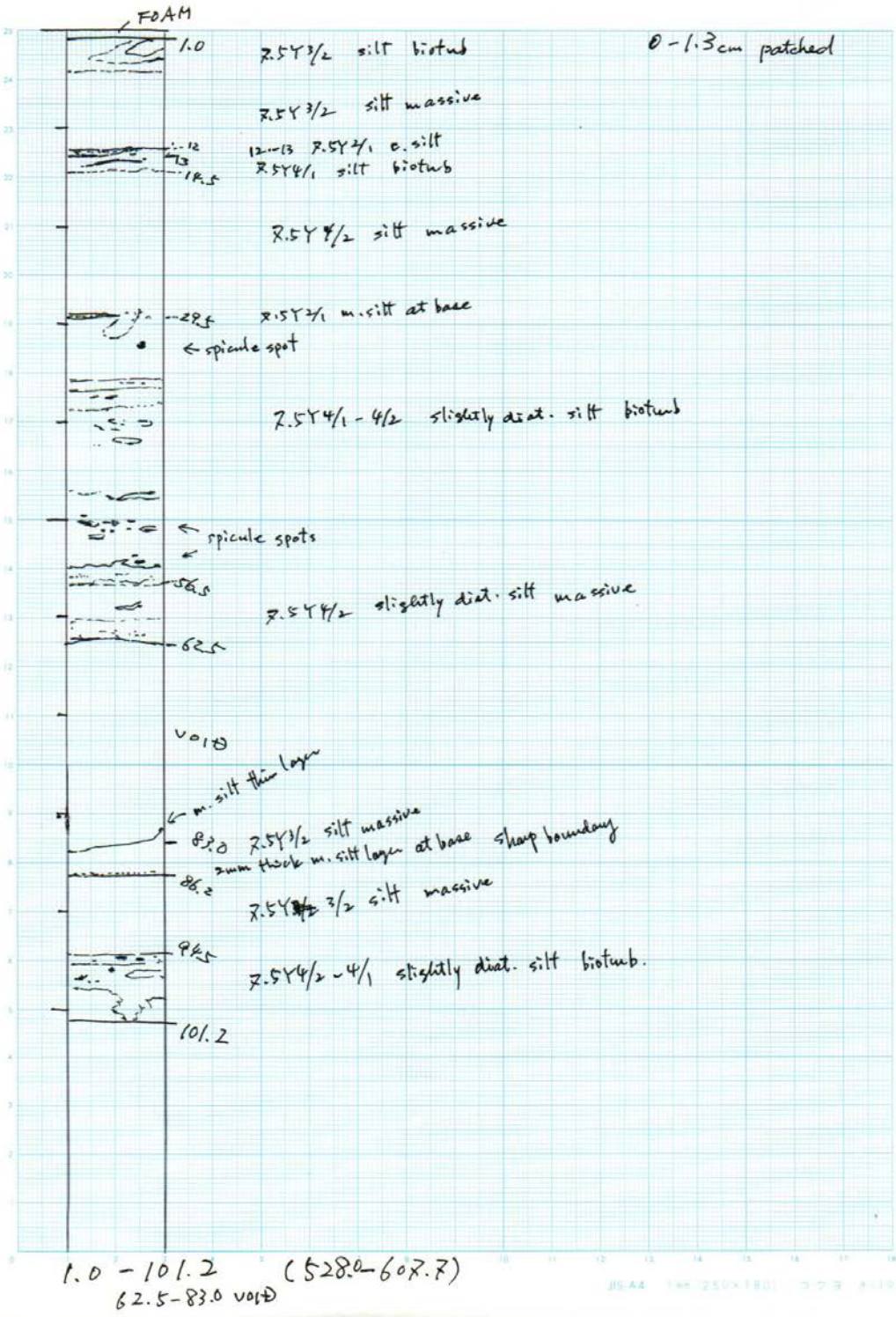
0 - 99.3 (328.7 - 428.0)

MR 22-04 PC06 sec. 6 w 2022.6.28



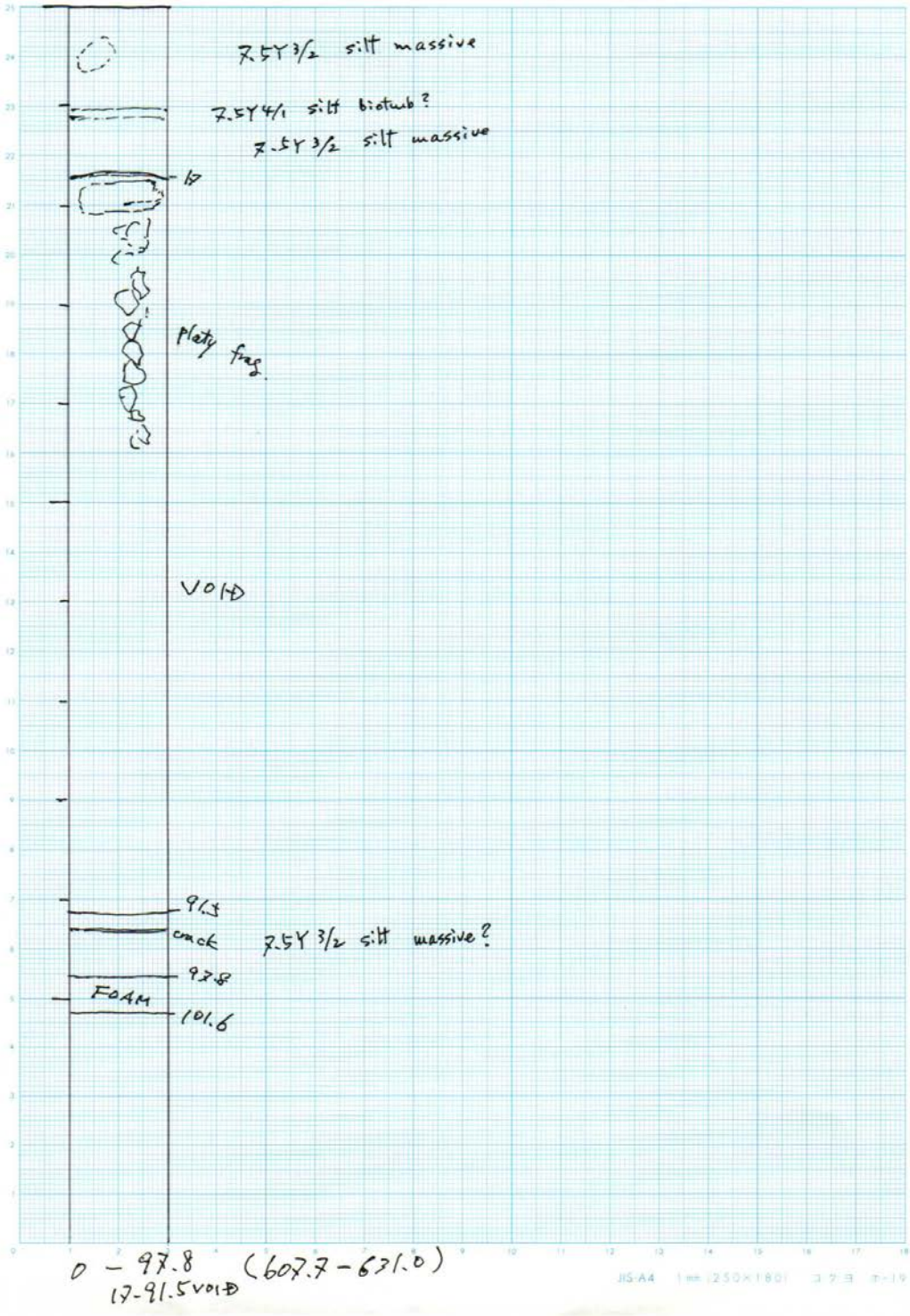
0 - 100.0 (428.0 - 528.0)

MR22-04 PC06 sec. 7W 2022.6.28



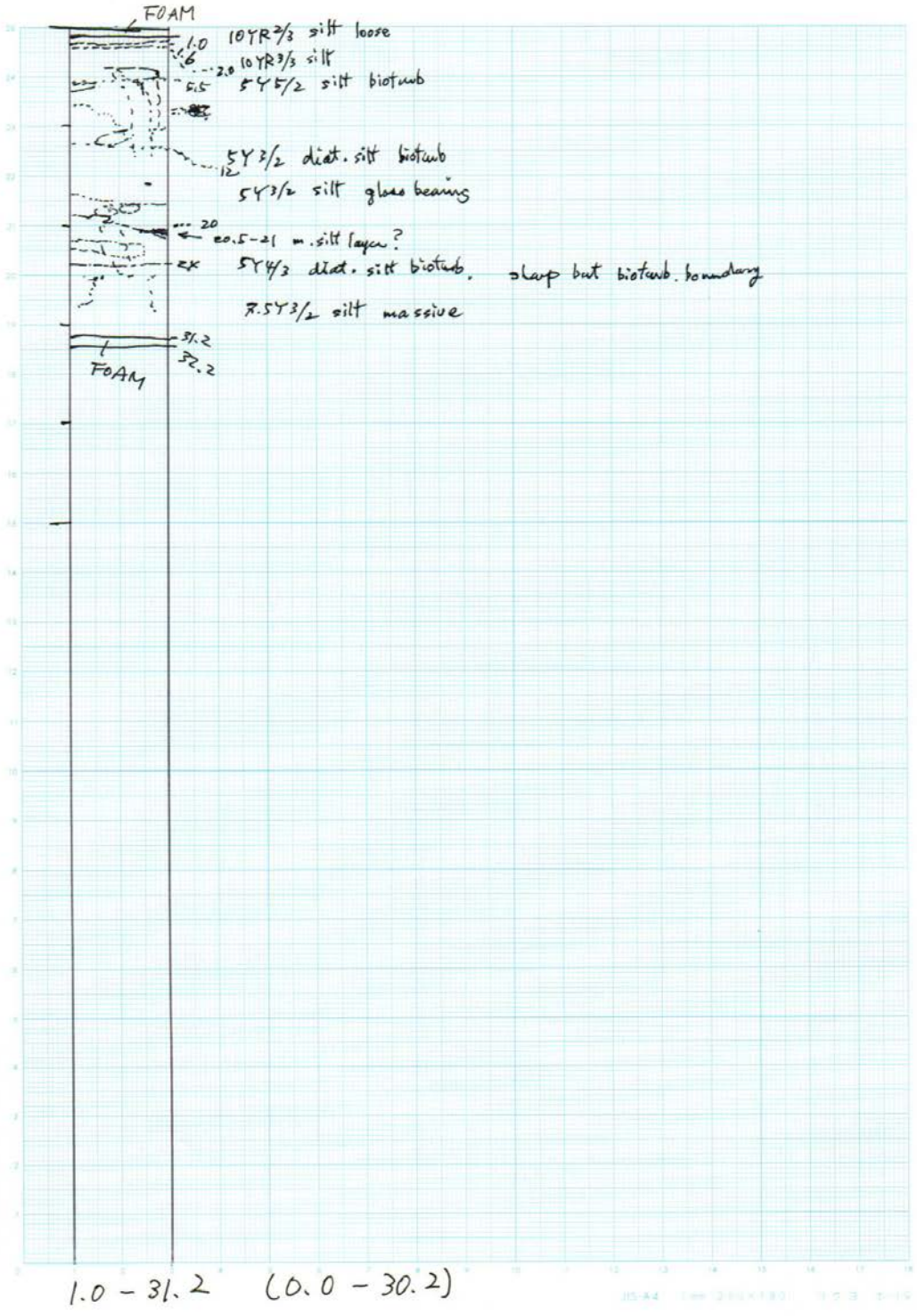
1.0 - 101.2 (528.0-607.7)
62.5-83.0 void

MR22-04 PC06 sec. 8W 2022.6.28



0 – 97.8 (607.7 – 631.0)
17-91.5 VOID

MR22-04 PL06 sec.1 W 2022.6.28



1.0 – 31.2 (0.0 – 30.2)

9-2. Piston Coring Operation Log

Coring Inventory

別紙12
PC インベントリシート

< Observation info.>

Cruise name	MR22-04	Operator	Shinomiya
Date (UTC) Y/M/D	2022 / 6 / 17	Recorded by	Uchiyama
Core Number	PC 01	Transponder (超深海トランスポンダー)	SI2-1KP
Area	Tokachi Nemuro oki	Inclinometer	APC11-USB(S/N : 0001)
Sampling Site	PC01	others	—

<Corer info.>

Corer type	Inner ・ Piston	Pilot type	74コアラー
Total Weight	660 kg	Pilot Weight	112 kg
Pipe Length	SUS 6 / (8) m	Pilot Pipe Length	0.7 ~~1.0~~ m
Main wire	φ 10 mm × 14.8 m	Pilot Wire	14.6 m
Free Fall	3.4 m		

<Condition>

Weather	Sunny	Wave height	1.6 m
Wind direction	233 deg.	Current direction	68.4 deg.
Wind speed	6.4 m/s	Current speed	0.4 knt

<Operation>

	Time	Latitude	Longitude	Depth
Start operation	1:21			
Hit the bottom	3:30:13	※(TP) 41-22.1407N	144-36.0281E	4806 m
		(Ship) 41-22.0842N	144-35.9932E	4890 m
Finish operation	5:38			

※着底時TP, Invarid 直近の値を採用

MEMO

Ping数：1384 ping

Ver.3.01(20200228)
Marine Works Japan LTD.

別紙13
PCログシート

Cruise Name: MR22-04 | Core Name: PC 01 | y m d: 2022 / 6 / 17 | Page: 1 / 2

Recorded by: Uchiyama

Time (UTC)	Water depth (m)	Wire out length (m)	Tension (t)	Wire speed (m/s)	Wire out / in (↓/↑)	Remarks
1:21	4888	-	-	-	-	作業開始
35	4888	-	-	-	-	錘吊り上げ
37	4886	-	-	-	-	注水~~完了~~ 開始
39	4886	-	-	-	-	注水完了
45	4885	-	0.6	-	-	トラポンON
46	4890	-	0.6	-	-	パイロット着水
48	4890	-	0.6	-	-	パイロットワイヤ取付
50	4887	-	0.6	-	-	安全ピン脱
51	4886	-	0.6	-	-	PC錘着水、ピロ調
58	4889	50	0.7	-	-	トラポン取付
59	4893	76	0.7	-	-	トラポン着水
2:07	4882	500	1.0	-	-	スウェルコンON
10	4886	503	1.0	0.8	↓	繰り出し再開
19	4887	1000	1.4	1.0	↓	
27	4885	1500	1.8	1.0	↓	
35	4885	2000	2.3	1.0	↓	
43	4886	2500	2.7	1.0	↓	
51	4885	3000	3.0	1.0	↓	
59	4887	3500	-			
3:08	4884	4000	3.9	1.0	↓	
3:16	4885	4500	4.4	1.0	↓	
3:19	4886	4744	4.6	1.0	↓	ワイヤ減速
3:21	4885	4786	4.7	-	-	一旦停止
3:26	~~4890~~ 4890	4788	4.7	0.3	↓	繰り出し再開
3:30:13	~~4890~~ 4890	4851	Min 3.6 ~~4.1~~	0.3	↓	着底 巻き上げ
3:31:32	4884	4831	MAX 5.5 ~~4.8~~	0.3	↑	離底確認、増速 MAX計算値 6-2七
3:38	4885	4500	4.5	1.0	↑	
45	4887	4000	4.3	1.0	↑	

※1t≒9.8kN

Ver.2.30(20140909)
Marine Works Japan LTD.

別紙13
PCログシート

Cruise Name: MR22-04 | Core Name: PC 01 | y m d: 2022 / 6 / 17 | Page: 2/2

Recorded by: Uchiyama

Time (UTC)	Water depth (m)	Wire out length (m)	Tension (t)	Wire speed (m/s)	Wire out / in (↓/↑)	Remarks
3:53	4887	3500	3.86	1.0	↑	
4:02	4885	3000	3.3	1.0	↑	
4:09	4884	2500	2.9	1.0	↑	
17	4881	2000	2.4	1.0	↑	
25	4883	1500	2.0	1.0	↑	
33	4883	1000	1.6	1.0	↑	
42	4889	500	1.1	—	—	スウェルコン停止
45	4884	489	1.1	1.0	↑	巻上再開
52	4886	45	~~0.7~~	0.1	↑	TP 水切
55	—	43	0.6	—	—	TP 取外
57	—	—	0.7	—	—	天秤 水切
5:00	—	—	0.6	—	—	パイロットワイヤ取外し
01	-	-	0.6	-	-	パイロット 水切
~~05~~ 22	-	-	0.6	-	-	パイロット オンデッキ
10	—	—	—	—	—	天秤取外し
34						PC水切り
38						PCオンデッキ

※1t ≒ 9.8kN

Ver.2.30(20140909)
Marine Works Japan LTD.

Coring Inventory

別紙12
PC インベントリシート

< Observation info.>

Cruise name	MR22-04	Operator	Katayama
Date (UTC) Y/M/D	2022 / 6 / 18-19	Recorded by	Uchiyama
Core Number	PC 02	Transponder (超深海トランスポンダー)	S12-1KP
Area	Tokachi Nemuro oki	Inclinometer	APC11-USB(S/N : 0001)
Sampling Site	PC02	others	—

<Corer info.>

Corer type	Inner ・ Piston	Pilot type	74コアラー
Total Weight	660 kg	Pilot Weight	112 kg
Pipe Length	SUS 6 /⑧ m	Pilot Pipe Length	0.7 ~~1.0~~ m
Main wire	φ 10 mm × 14.8 m	Pilot Wire	14.6 m
Free Fall	3.4 m		

<Condition>

Weather	Cloudy	Wave height	~~0.0~~ 1.1 m
Wind direction	180 deg.	Current direction	~~0.8~~ 6.0 deg.
Wind speed	3.0 m/s	Current speed	0.8 knt

<Operation>

	Time	Latitude	Longitude	Depth
Start operation	6/18 23:32			
Hit the bottom	6/19 1:48:50	(TP) 41-56.3792 N	145-52.3477 E	5639 m
		(Ship) 41-56.3281 N	145-52.3133 E	5712 m
Finish operation	4:03			

MEMO

Ping数=1444ping

Ver.3.01(20200228)
Marine Works Japan LTD.

別紙13
PCログシート

Cruise Name: MR22-04　　Core Name: PC 02　　y m d: 2022 / 6 / 18　　Page: 1 / 2

Recorded by: Uchiyama

	Time (UTC)	Water depth (m)	Wire out length (m)	Tension (t)	Wire speed (m/s)	Wire out / in (↓/↑)	Remarks
6/18	23:32	5714	-	-	-	-	作業開始
	40	5718	-	-	-	-	重錘取付 完了
	41	5718	-	-	-	-	重錘吊上げ
	44	5717	-	-	-	-	ビット着水
	47	5715	-	-	-	-	注水開始.
	47	5715	-	-	-	-	注水完了
	53	5717	-	-	-	-	パイロット着水
	57	5714	-	-	-	-	パイロット取付
	57	5711	-	-	-	-	安全ピン脱
	58	5716	-	-	-	-	天秤着水
	58	5716	-	-	-	-	ゼロ調
6/19	0:05	5714	50	0.7	-	-	トラポン取付
	05	5717	75	0.7	1.0	↓	トラポン着水
	13	5721	500	1.0	-	-	ウインチ停止
	16	5718	500	0.8	-	-	スウェルコン ON
	25	5719	1000	1.5	1.0	↓	
	33	5715	1500	1.8	1.0	↓	
	41	5719	2000	2.3	1.0	↓	
	49	5717	2500	2.7	1.0	↓	
	57	5716	3000	3.0	1.0	↓	
	1:05	5716	3500	3.4	1.0	↓	
	14	5719	4000	3.9	1.0	↓	
	22	5719	4500	4.5	1.0	↓	
	30	5718	5000	4.8	1.0	↓	
	38	5717	5500	5.2	1.0	↓	
	41	5719	5600	5.2	1.0	-	一旦停止
	44	5719	5600	5.4	0.3	↓	繰り出し再開
	1:48:50	5712	5689	MIN 4.4	0.3	↓	着底 巻上げ.

※1t ≒ 9.8kN

Ver.2.30(20140909)
Marine Works Japan LTD.

別紙13
PCログシート

Cruise Name: MR22-04　　Core Name: PC 02　　y m d: 2022 / 6 / 19　　Page: 2 /2

Recorded by: Uchiyama

	Time (UTC)	Water depth (m)	Wire out length (m)	Tension (t)	Wire speed (m/s)	Wire out / in (↓/↑)	Remarks
6/19	1:50:02	5715	5693	MAX6.2	0.3	↑	離底確認 MAX 計算値 6.9t
	2:01	5714	5000	5.1	1.0	↑	
	09	5715	4500	4.7	1.0	↑	
	17	5725	4000	4.2	1.0	↑	
	25	5715	3500	3.9	1.0	↑	
	33	5711	3000	3.3	1.0	↑	
	42	5711	2500	2.9	1.0	↑	
	49	5715	2000	2.5	1.0	↑	
	57	5717	1500	2.0	1.0	↑	
	3:05	5711	1000	1.5	1.0	↑	
	14	5717	500	1.0	0.1	–	一旦停止 スウェルコン OFF
	16	5714	498	1.1	0.9	↑	巻上再開.
	24	5717	40	0.7	0.1	↑	トラポン水切り
	26	5717	40	0.7	-	–	トラポン取外し
	27	5717	31	0.7	0.6	↑	トラポン OFF.
	29	5714	–	0.7	-	–	天秤水切り
	34	5719	–	0.6	–	–	パイロット水切り
	37	5715	–	0.6	-	–	パイロット オンデッキ.
	40	5718	-	-	–	–	荷重物動.
	59	5715	-	-	–	-	ピストン水切り.
	4:03	5715	–	-	-	–	ピストン オンデッキ.

※1t ≒ 9.8kN

Ver.2.30(20140909)
Marine Works Japan LTD.

Coring Inventory

別紙12
PC インベントリシート

< Observation info.>

Cruise name		MR22-04	Operator	Shinomiya
Date (UTC)	Y/M/D	2022 / 6 / 20 - 21	Recorded by	Uchiyama
Core Number		PC 03	Transponder (超深海トランスポンダー)	SI2-1KP
Area		Tokachi Nemuro oki	Inclinometer	APC11-USB(S/N : 0001)
Sampling Site		PC03	others	—

<Corer info.>

Corer type	Inner ・ Piston		Pilot type	74コアラー
Total Weight	660	kg	Pilot Weight	112 kg
Pipe Length	SUS 6 / 8	m	Pilot Pipe Length	0.7 ~~1.0~~ m
Main wire	φ 10 mm × 14.8	m	Pilot Wire	14.6 m
Free Fall	3.4	m		

<Condition>

Weather	Sunny		Wave height	1.6 m
Wind direction	314.2	deg.	Current direction	/ deg.
Wind speed	0.3	m/s	Current speed	6.3 knt

<Operation>

	Time	Latitude	Longitude	Depth
Start operation	6/20 23:31			
Hit the bottom	6/21 1:05:09	(TP) 42-09.2943 N	145-18.7815 E	3274 m
		(Ship) 42-09.3498 N	145-18.8055 E	3352 m
Finish operation	2:41			

MEMO

Ping数：910ping

Ver.3.01(20200228)
Marine Works Japan LTD.

別紙13
PCログシート

Cruise Name: MR22-04 | Core Name: PC 03 | y m d: 2022 / 6 / 20 | Page: 1 / 2
Recorded by: Uchiyama

	Time (UTC)	Water depth (m)	Wire out length (m)	Tension (t)	Wire speed (m/s)	Wire out / in (↓/↑)	Remarks
6/20	23:31	3351	-	-	-	-	作業開始
	40	3353	-	-	-	-	重錘吊り上げ
	45	3351	-	-	-	-	注水完了
	48	3354	-	0.6	-	-	メインワイヤ取付完了
	49	3356	-	0.6	-	-	パイロット着水.
	52	3355	-	0.7	-	-	パイロット取付け完了、安全ピン脱
	53	3352	-	0.6	-	-	トラポン ON
	54	3352	-	0.6	-	↓	~~トラポン着水~~ 天秤着水.
	56	3351	50	0.7	-	-	ウインチ一旦停止.
6/21	0:01	3353	50	0.7	-	-	トラポン取付完了.
	01	3351	75	0.7	1.0	↓	トラポン着水
	08	3351	500	1.1	-	-	ウインチ一旦停止.
	11	3355	500	1.1	-	-	スウェルコン ON
	20	3349	1000	1.5	1.0	↓	
	36	3351	2000	2.3	1.0	↓	
	44	3352	2500	2.7	1.0	↓	
	52	3351	3000	3.1	1.0	↓	
	57	3350	3250	3.4	1.0	-	一旦停止
	1:01	3352	3250	3.4	0.3	↓	繰り出し再開.
	1:05:09	3352	3330	MIN2.33	0.3	↓	着底 巻き上げ
	1:07:52	3353	3300.	MAX5.84	0.3	↑	離底確認. Max 計算値 6.5t
	28	3355	2000	2.4	1.0	↑	
	36	3358	1500	2.0	1.0	↑	
	45	3354	1000	1.6	1.0	↑	
	52	3352	534	1.2	0.75	↑	ウィンチ減速
	54	3351	500	1.1	-	-	ウインチ一旦停止
	54	3353	500	1.1	-	-	スウェルコン停止
	56	3353	496	1.1	0.2	↑	繰り出し再開.

※1t≒9.8kN

Ver.2.30(20140909)
Marine Works Japan LTD.

別紙13
PCログシート

Cruise Name: MR22-04 | Core Name: PC 03 | y m d: 2022 / 6 / 21 | Page: 2 /2

Recorded by: Uchiyama

	Time (UTC)	Water depth (m)	Wire out length (m)	Tension (t)	Wire speed (m/s)	Wire out / in (↓/↑)	Remarks
6/21	2:07	3354	46	0.7	—	—	トラポン 水切り
	09	3351	46	0.7	-	-	トラポン取外し
	10	3354	27	0.7	0.8	↑	トラポン OFF
	11	3354	-	0.7	-	-	天秤 水切り
	13	3354	-	0.6	-	-	パイロット取外し
	16	3351	-	0.5	-	-	パイロット水切り
	19	3350	-	0.6	-	-	パイロット オンデッキ
	22	3349	-	-	-	-	天秤取外し
	30	3353	-	-	-	-	ピストン水切り
	39	3352	-	-	-	-	ビット水切り
	41	3358	-	-	-	-	ピストン オンデッキ

※1t ≒ 9.8kN

Ver.2.30(20140909)
Marine Works Japan LTD

Coring Inventory

別紙12
PCインベントリシート

< Observation info.>

Cruise name	MR22-04	Operator	Shinomiya
Date (UTC) Y/M/D	2022 / 6 / 22-23	Recorded by	Kido
Core Number	PC 04	Transponder (超深海トランスポンダー)	SI2-1KP
Area	Tokachi Nemuro oki	Inclinometer	APC11-USB(S/N : 0001)
Sampling Site	PC04	others	—

<Corer info.>

Corer type	Inner ・ Piston	Pilot type	74コアラー
Total Weight	693 ~~660~~ kg	Pilot Weight	112 kg
Pipe Length	SUS ⑥/ 8 m	Pilot Pipe Length	~~1.0~~ 0.7 m
Main wire	φ 10 mm × ~~14.8~~ 12.8 m	Pilot Wire	~~14.6~~ 12.6 m
Free Fall	3.4 m		

<Condition>

Weather	Cloudy	Wave height	1.0 m
Wind direction	78 deg.	Current direction	342.6 deg.
Wind speed	5.0 m/s	Current speed	0.7 knt

<Operation>

	Time	Latitude	Longitude	Depth
Start operation	6/22 23:30			
Hit the bottom	6/23 1:17:01	(TP) 42-14.6699N	145-51.4465E	3841 m
		(Ship) 42-14.6096N	145-51.5056E	3919 m
Finish operation	3:00			

MEMO

Ping数：1070ping

Ver.3.01(20200228)
Marine Works Japan LTD.

別紙13
PCログシート

Cruise Name: MR22-04 | Core Name: PC 04 | y m d: 2022 / 6 / 22 | Page: 1 / 2
Recorded by: Kido

Time (UTC)	Water depth (m)	Wire out length (m)	Tension (t)	Wire speed (m/s)	Wire out / in (↓/↑)	Remarks
23:30	3916.0	—	—	—	—	作業開始
23:37	3916.0	—	—	—	—	天秤取り付け完了
23:39	3915.0	—	—	—	—	注水開始 コイル
23:47	3915.0	—	—	—	—	メインフィヤー ~~取付け~~ 完了
23:47	3916.0	—	—	—	—	バイロット取付開始
23:48	3916.0	—	0.52	—	—	バイロット着水
23:51	3916.0	—	0.62	—	—	バイロット取付完了
23:51	3916.0	—	0.62	—	—	海水注水開始
23:51	3915.0	—	0.64	—	—	トラポンON
23:52	3916.0	—	0.66	—	—	海水注水終了
23:54	3915.0	—	0.58	—	—	天秤着水
23:54	3915.0	±0	0.58	—	—	ゼロ調
6/23 0:01	3916.0	50.7	0.64	—	—	トラポン取付完了
0:02	3916.0	71.9	0.61	1.0	↓	トラポン着水
0:13	3917.0	502.3	1.03	—	—	スウェルコンON
0:22	3916.0	1000	1.41	1.0	↓	
0:30	3915.0	1500	1.83	1.0	↓	
0:38	3917	2000	2.2	1.0	↓	
0:46	3917	2500	2.7	1.0	↓	
0:54	3917	3000	3.1	1.0	↓	
1:02	3916	3500	3.5	1.0	↓	
1:09	3916	3800	3.9	—	—	ウィンチ停止
1:12	3917	3800	3.8	0.3	↓	繰出し
1:17:01	3917	3898	~~3.82~~ min 2.72	0.3	↓	着底
1:17:07	3917	3898	3.2	0.3	↑	巻上げ
1:18:36	~~3916~~ ~~3871~~	3871	~~4.10~~ max 5.03	0.3	↑	離底確認 max 計算値 5.7t
1:25	3916	3500	3.7	1.0	↑	
1:33	3917	3000	3.3	1.0	↑	

※1t ≒ 9.8kN

Ver.2.30(20140909)
Marine Works Japan LTD.

別紙13
PCログシート

Cruise Name: MR22-04　　Core Name: PC 04　　y m d: 2022 / 6 / 23　　Page: 2 / 2

Recorded by: Kido

Time (UTC)	Water depth (m)	Wire out length (m)	Tension (t)	Wire speed (m/s)	Wire out / in (↓/↑)	Remarks
1:41	3915	2500	2.8	1.0	↑	
1:49	3915	2000	2.3	1.0	↑	
1:57	3915	1500	2.0	1.0	↑	
2:05	3916	1000	1.6	1.0	↑	
2:15	3916	500	1.1	—	—	ウィンチ停止
2:17	3918	500	1.1	—	—	スウェルコンOFF
2:24	3915	50	0.8	0.1	↑	トラポン水切り
2:27	3915	46	0.7	—	—	トラポン取外し
2:28	3916	31	0.7	0.9	↑	トラポンOFF
2:29	3914	—	0.7	~~0.6~~ —	↑—	天秤水切り
2:33	3916	—	0.5	—	—	パイロット取外し
2:33	3914	—	0.5	—	—	パイロット水切り
2:37	3921	—	0.5	—	—	パイロットオンデッキ
2:41	3919	—	—	—	—	天秤取外し
2:49	3918	—	—	—	—	ピストン水切り
3:00	3920	—	—	—	—	ピストンオンデッキ

※1t ≒ 9.8kN

Ver.2.30(20140909)
Marine Works Japan LTD.

Coring Inventory

別紙12
PC インベントリシート

< Observation info.>

Cruise name	MR22-04	Operator	Katayama
Date (UTC) Y/M/D	2022 / 6 / 24-25	Recorded by	Takahashi (超深海トランスポンダー)
Core Number	PC05	Transponder	SI2-1KP
Area	Tokachi Nemuro oki	Inclinometer	APC11-USB(S/N : 0001)
Sampling Site	PC05	others	—

<Corer info.>

Corer type	Inner ・ Piston	Pilot type	74コアラー
Total Weight	643 ~~660~~ kg	Pilot Weight	112 kg
Pipe Length	SUS ⑥/ 8 m	Pilot Pipe Length	0.7 ~~1.0~~ m
Main wire	φ 10 mm × ~~14.8~~ 12.8 m	Pilot Wire	12.6 ~~14.6~~ m
Free Fall	3.4 m		

<Condition>

Weather	Sunny	Wave height	2.2 m
Wind direction	240 deg.	Current direction	36.1 deg.
Wind speed	7.4 m/s	Current speed	0.4 knt

<Operation>

※着底時 TP Invarid
直近の値を採用

	Time	Latitude	Longitude	Depth
Start operation	6/24 23:34			
Hit the bottom	6/25 1:28:30	※ (TP) 41-38.1188N	144-48.7313E	4768 m
		(Ship) 41-38.0658N	144-48.6581E	4845 m
Finish operation	3:23			

MEMO

Ping数 1268 pings

Ver.3.01(20200228)
Marine Works Japan LTD.

別紙13
PCログシート

Cruise Name: MR22-04 | Core Name: PC 05 | y m d: 2022 / 6 / 24-25 | Page: 1 / 2
Recorded by: Takahashi

Time (UTC)	Water depth (m)	Wire out length (m)	Tension (t)	Wire speed (m/s)	Wire out / in (↓/↑)	Remarks
6/24 23:34	4847	-	-	-	-	作業開始
23:40	4854	-	-	-	-	天秤取付完了
23:44	4846	-	0.6	-	-	ピストン着水
23:48	4841	-	0.5	-	-	メインワイヤ取付完了
23:49	4842	-	0.6	-	-	パイロット着水
23:52	4844	-	0.6	-	-	トラポン ON
23:52	4844	-	0.6	-	-	パイロット取付完了
23:53	4842	-	0.6	-	-	注水完了、安全ピン抜
23:55	4842	0	0.6	-	-	天秤着水、ゼロ調
~~0:01~~ ~~23:59~~	4845	50	0.7	-	-	トラポン取付
~~00:01~~	~~4840~~					
6/25 0:02	4840	84	0.6	1.0 #	↓	トラポン着水.
0:09	4846	500	1.1	-	-	一旦停止、スウェルコン ON
20	4841	1000	1.4	1.0	↓	
28	4844	1500	1.8	1.0	↓	
36	4841	2000	2.3	1.0	↓	
44	4843	2500	2.6	1.0	↓	
52	4845	3000	3.1	1.0	↓	
1:00	4844	3500	3.5	1.0	↓	
08	4843	4000	~~3.6~~ 4.0	1.0	↓	
17	4846	4500	4.5	1.0	↓	
21	~~4850~~ 4847	4750	4.9	1.0	-	一旦停止
24	4844	4750	4.4	0.3	↓	繰り出し再開,
1:28:30	4845	4821	Min 3.6	0.3	↓	着底、巻上
1:29:37	4844	4800	MAX 5.2	0.3	↑	離底確認 Max 計算値 5.9t
1:36	4843	4500	4.4	1.0	↑	
43	4847	4000	4.1	1.0	↑	
51	4850	3500	3.6	1.0	↑	

※1t≒9.8kN

Ver.2.30(20140909)
Marine Works Japan LTD.

別紙13
PCログシート

Cruise Name: MR22-04 | Core Name: PC 05 | y m d: 2022 / 6 / 24-25 | Page: 2 / 2
Recorded by: Takahashi

Time (UTC)	Water depth (m)	Wire out length (m)	Tension (t)	Wire speed (m/s)	Wire out / in (↓/↑)	Remarks
1:59	4847	3000	3.2	1.0	↑	
2:08	4847	2500	2.8	1.0	↑	
2:16	4846	2000	2.4	1.0	↑	
2:24	4848	1500	2.0	1.0	↑	
2:32	4850	1000	1.6	1.0	↑	
2:41	4850	500	1.1	—	—	一旦停止、スウェルコンOFF
2:43	4850	500	1.1	—	—	巻き上げ再開
51	4847	41	0.6	—	—	TP水切り
53	4847	41	0.6	—	—	TP取外し.
54	4847	13	0.6 ~~0.2~~	—	—	TP OFF
55	4847	—	0.6	—	—	天秤水切
58	4850	—	0.5	—	—	PLワイヤ取外完了
58	4850	—	0.5	—	—	PL水切り
3:01	4846	—	0.5	—	—	PL オンデッキ
04	4848	—	—	—	—	天秤取外
11	4844	—	—	—	—	PC水切り
23	4849	—	—	—	—	PC オンデッキ

※1t ≒ 9.8kN

Ver.2.30(20140909)
Marine Works Japan LTD.

Coring Inventory

別紙12
PC インベントリシート

< Observation info.>

Cruise name	MR22-04	Operator	Shinomiya
Date (UTC) Y/M/D	2022/6/26-27	Recorded by	Kido
Core Number	PC 06	Transponder (超深海トランスポンダー)	SI2-1KP
Area	Tokachi Nemuro oki	Inclinometer	APC11-USB(S/N : 0001)
Sampling Site	PC06	others	—

<Corer info.>

Corer type	Inner ・ Piston	Pilot type	74コアラー
Total Weight	660 kg	Pilot Weight	112 kg
Pipe Length	SUS 6 /(8) m	Pilot Pipe Length	0.7 ~~1.0~~ m
Main wire	φ 10 mm × 14.8 m	Pilot Wire	14.6 m
Free Fall	3.4 m		

<Condition>

Weather	Fine	Wave height	1.2 m
Wind direction	221 deg.	Current direction	36 deg.
Wind speed	6.3 m/s	Current speed	0.7 knt

<Operation>

	Time	Latitude	Longitude	Depth
Start operation	6/26 23:30			
Hit the bottom	6/27 1:36:18	(TP) 41-42.8301 N	145-10.7052 E	5159 m
		(Ship) 41-42.7785 N	145-10.6387 E	5237 m
Finish operation	3:51			

MEMO

Ping数：1402 pings

Ver.3.01(20200228)
Marine Works Japan LTD.

別紙13
PCログシート

Cruise Name: MR22-04　Core Name: PC 06　y m d: 2022 / 6 / 26-27　Page: 1 / 2
Recorded by: Kido

Time (UTC)	Water depth (m)	Wire out length (m)	Tension (t)	Wire speed (m/s)	Wire out / in (↓/↑)	Remarks
23:34	5238	—	—	—	—	作業開始
23:39	~~5238~~ 5237	—	—	—	—	天秤取付け
23:42	~~5240~~ 5239	—	0.6	—	—	PC着水
23:44	5240	—	0.6	—	—	注水完了
23:49	5240	—	0.6	—	—	メインワイヤー取付け
23:50	5237	—	0.6	—	—	~~PC~~ PC着水
23:53	5241	—	0.7	—	—	トラポンON
23:55	5242	—	0.6	—	—	錘着水、ゼロ調
23:57	5237	50	0.7	—	—	トラポン取付け
6/27 0:01	5235	50	0.7	—	—	トラポン取付け完了
0:01	5234	70	0.7	~~1.0~~	↓	トラポン着水
0:12	5236	500	1.1	—	—	スウェルコンON
0:21	5239	1000	1.5	1.0	↓	
0:29	5238	1500	1.9	1.0	↓	
0:37	5239	2000	2.3	1.0	↓	
0:45	5239	2500	2.7	1.0	↓	
0:53	5238	3000	3.1	1.0	↓	
1:01	5237	3500	3.6	1.0	↓	
1:09	5237	4000	3.9	1.0	↓	
1:17	5234	4500	4.4	1.0	↓	
1:25	5240	5000	4.8	1.0	↓	
1:29	5241	5140	5.0	—	—	一旦停止
1:32	5239	5142	5.0	0.3	↓	繰り出し
1:36:18	5237	5211	min 4.0	0.3	↑	着底、巻き上げ
1:37:31	5237	5175	max ~~6.1~~ ~~5.7~~	0.3	↑	離底確認 max計算値 6.8t
1:41	5236	5000	5.0	1.0	↑	
1:49	5236	4500	4.6	1.0	↑	
1:57	5238	4000	4.2	1.0	↑	

※1t ≒ 9.8kN

Ver.2.30(20140909)
Marine Works Japan LTD.

別紙13
PCログシート

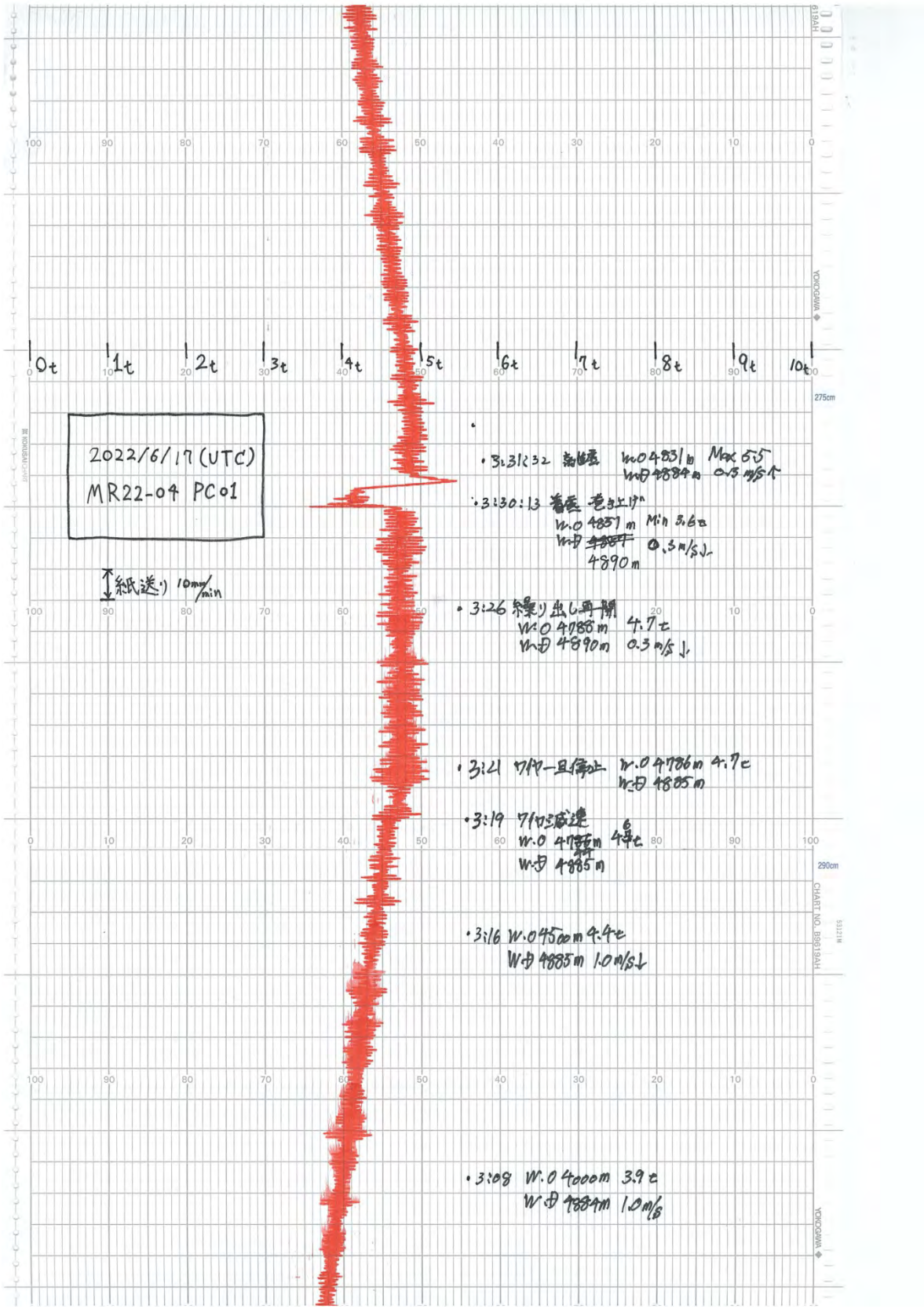
Cruise Name: MR22-04　Core Name: PC 06　y m d: 2022 / 6 / 26 27　Page: 2 / 2
Recorded by: Kido

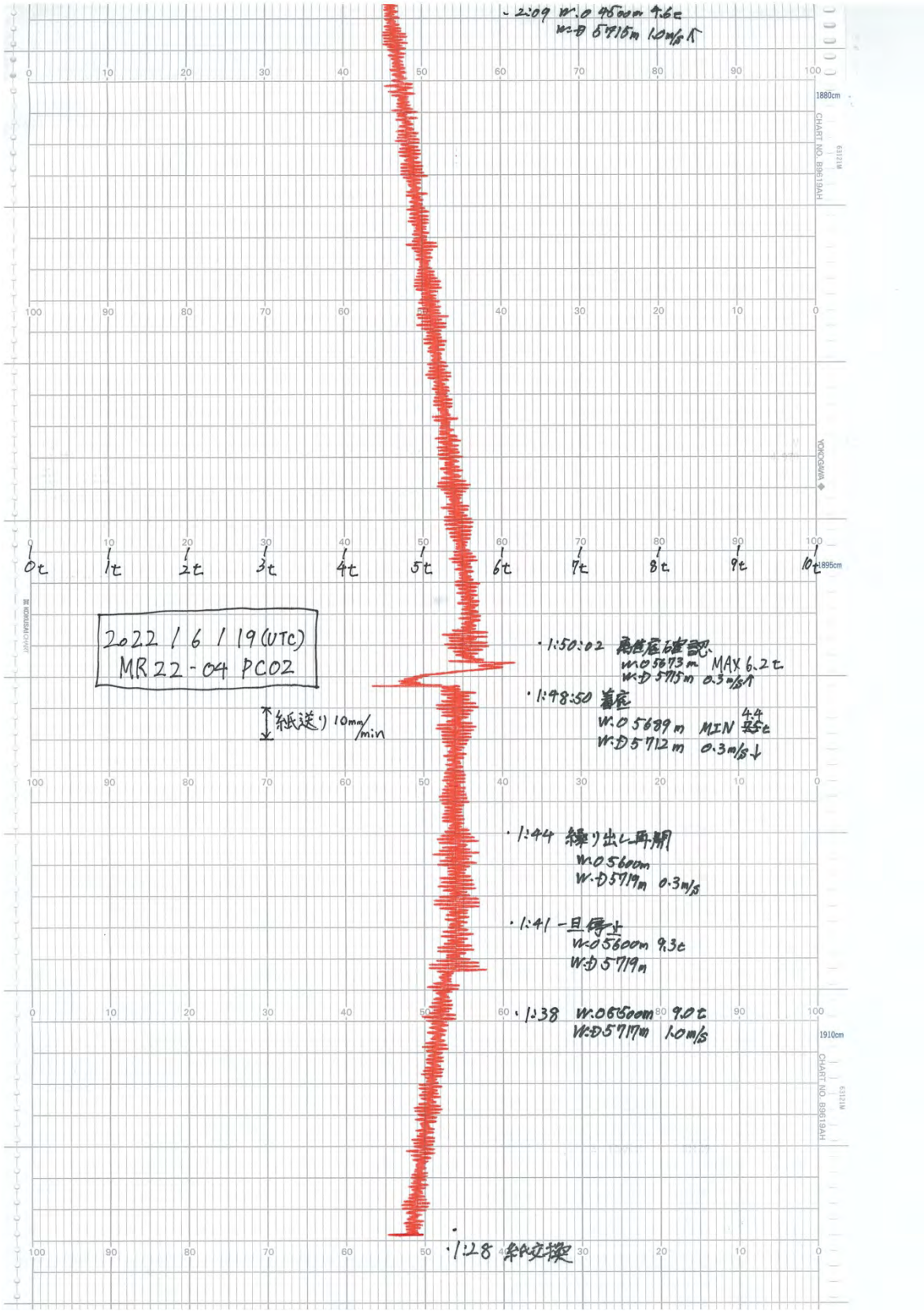
Time (UTC)	Water depth (m)	Wire out length (m)	Tension (t)	Wire speed (m/s)	Wire out / in (↓/↑)	Remarks
2:05	5234	3500	3.8	1.0	↑	
2:13	5239	3000	3.3	1.0	↑	
2:21	5237	2500	2.9	1.0	↑	
2:29	5236	2000	2.5	1.0	↑	2500~2000 m の間に張力が少し抜けた.
2:38	5235	1500	2.0	1.0	↑	
2:46	5235	1000	1.6	1.0	↑	一旦停止(記録しない)
2:56	5235	500	1.1	—	—	スウェルコンOFF
2:57	5235	500	1.1	0.2	↑	巻き上げ
3:14	5235	47	0.7	0.1	↑	TD水切り
3:17	5239	—	0.7	0.6	↑	トラポン取外し、巻上げ
3:17	5236	—	0.7	0.6	↑	トラポンOFF
3:18	5236	—	0.7	0.1	↑	天秤水切り
3:22	5234	—	0.6	—	—	PL水切り
3:25	5235	—	0.6	—	—	サンプル取外し
3:26	5239	—	0.6	—	—	PLオンデッキ
3:31	5242	—	—	—	—	天秤取外し
3:38	5242	—	—	—	—	錘水切り
3:48	5237	—	—	—	—	PC水切り
3:51	5234	—	—	—	—	PCオンデッキ

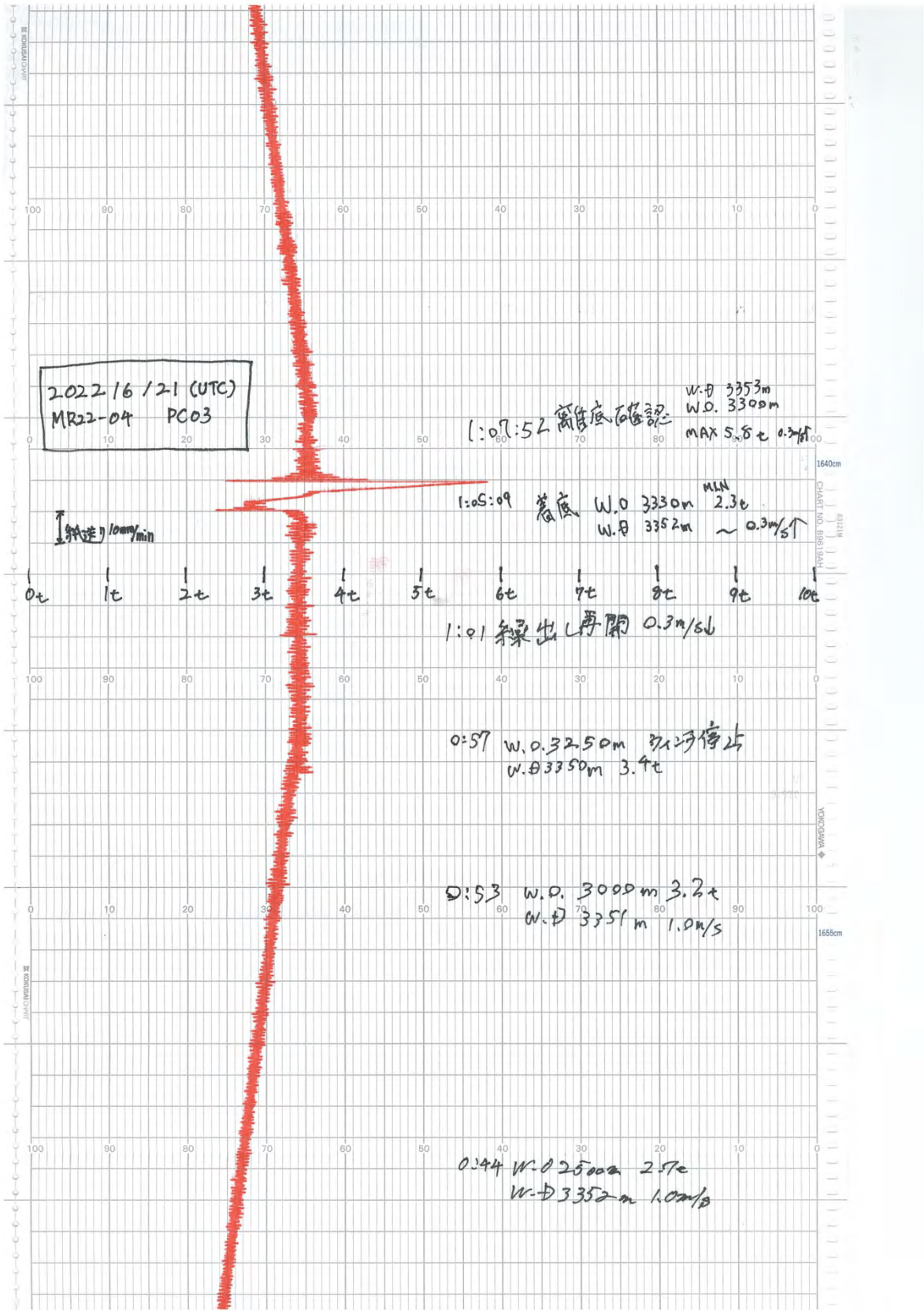
※1t ≒ 9.8kN

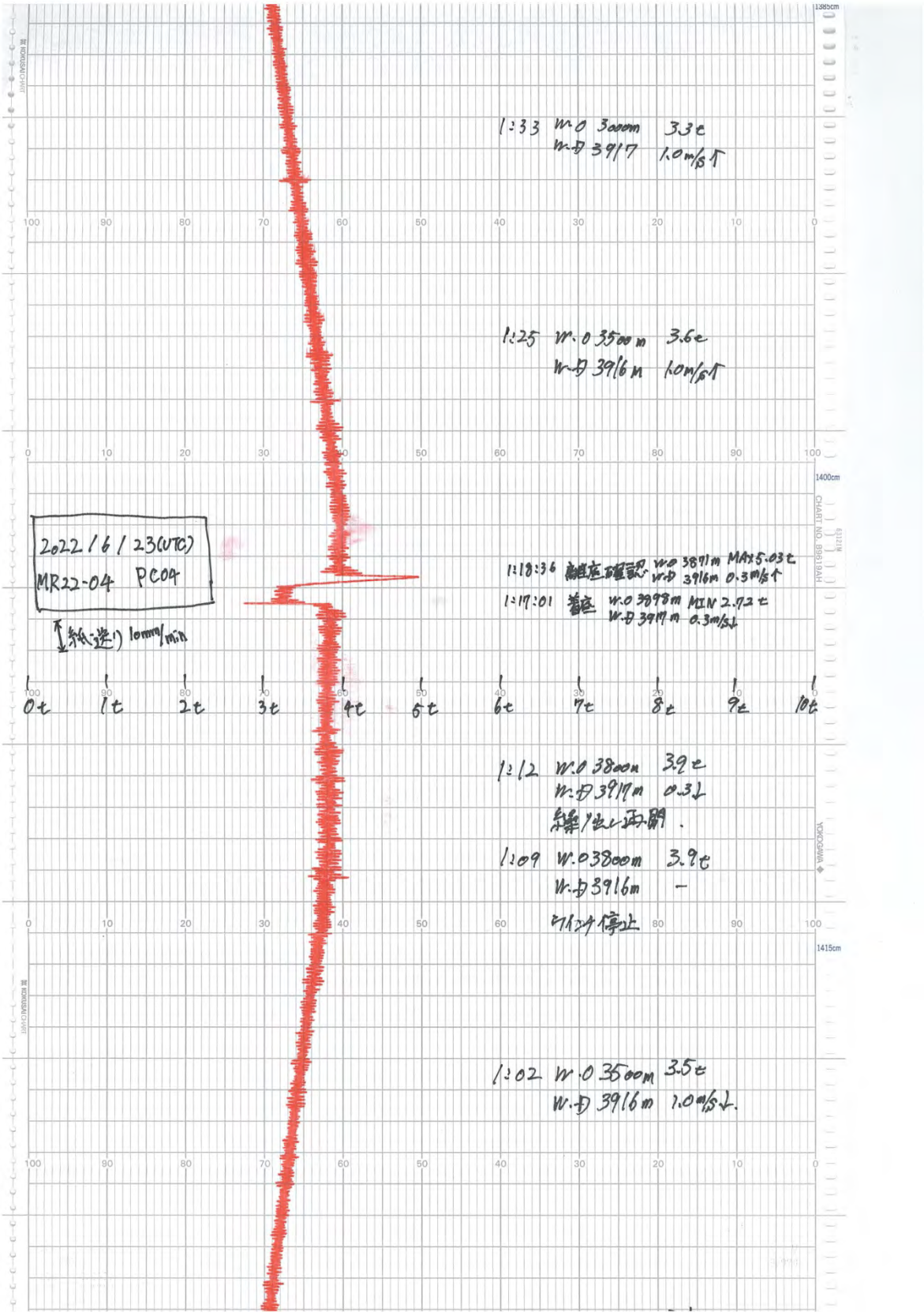
Ver.2.30(20140909)
Marine Works Japan LTD.

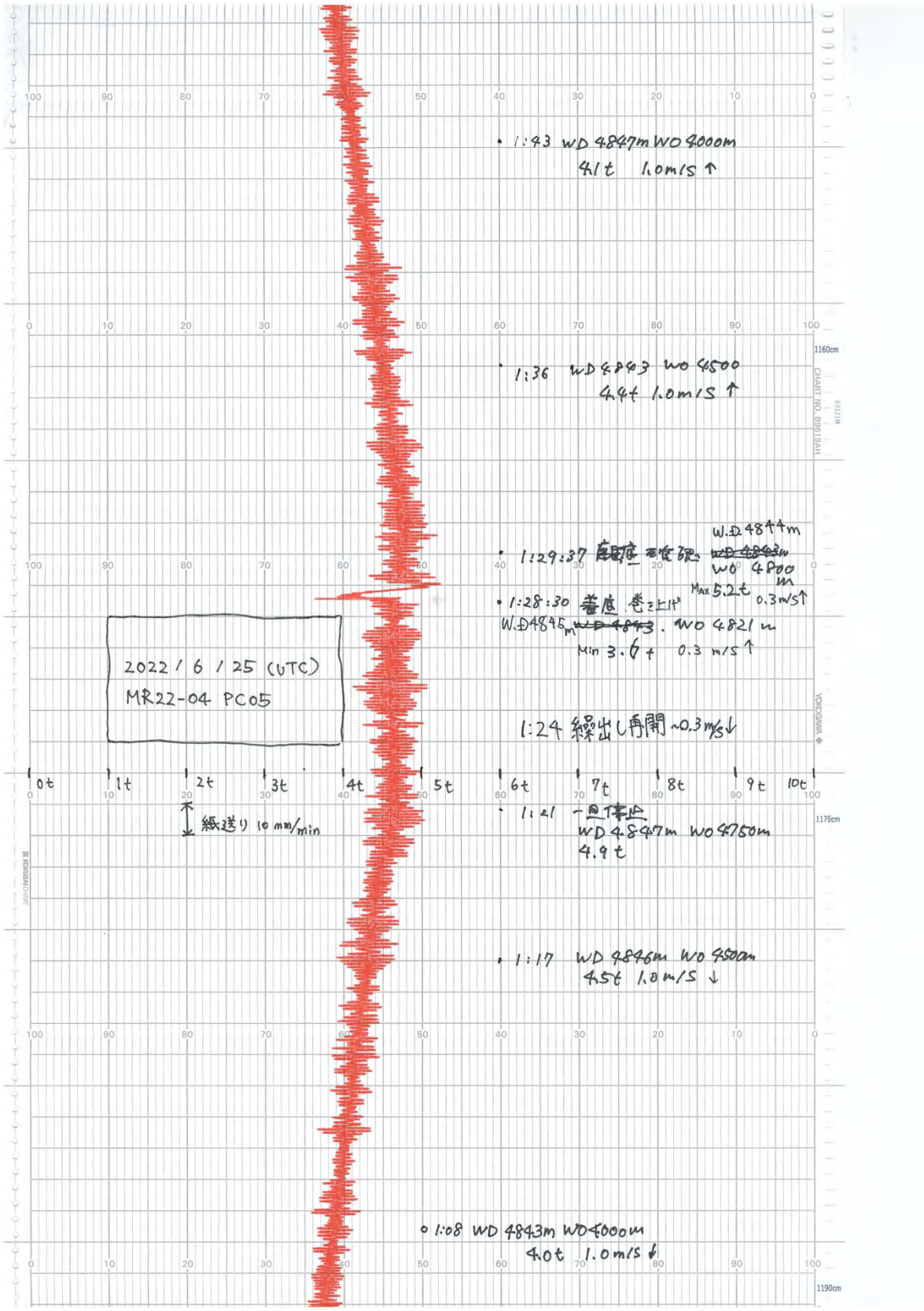
9-3. Tension Record of PC Operation

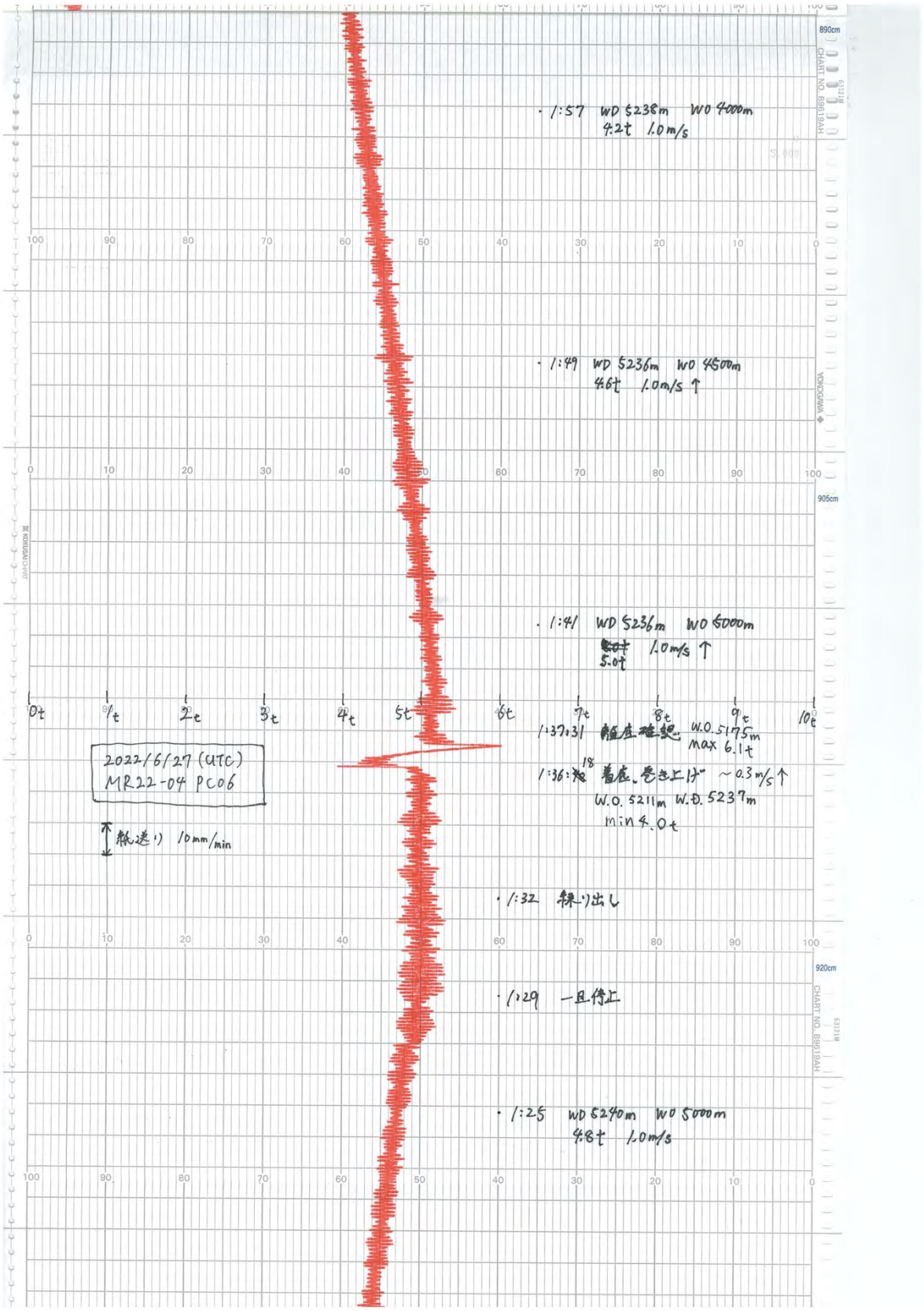



2022/6/19(UTC)
MR22-04 PC02
紙送り 10mm/min
0t
1t
2t
3t
4t
5t
6t
7t
8t
9t
10t
・2:09 W:0 4850m 9.6t
W:D 5715m 1.0m/s ↑
・1:50:02 底質確認
W:0 5673m MAX 6.2t
W:D 5715m 0.3m/s ↑
・1:48:50 着底
W:0 5689m MIN 4.4t
W:D 5712m 0.3m/s ↓
・1:44 繰り出し再開
W:0 5600m
W:D 5719m 0.3m/s
・1:41 一旦停止
W:0 5600m 9.3t
W:D 5719m
・1:38 W:0 5550m 9.0t
W:D 5717m 1.0m/s
・1:28 船交換
1880cm
1895cm
1910cm
CHART NO. B9619AH
YOKOGAWA


2022/6/21 (UTC)
MR22-04 PC03
1:07:52 離底確認
W.D 3353m
W.O. 3300m
MAX 5.8t 0.3m/s
1:05:09 着底 W.O 3330m MIN 2.3t
W.D 3352m ～ 0.3m/s↑
斜進り 10mm/min
0t 1t 2t 3t 4t 5t 6t 7t 8t 9t 10t
1:01 繰出し再開 0.3m/s↓
0:57 W.O.3250m 3.4t 巻上停止
W.D3350m
0:53 W.O. 3000m 3.2t
W.D 3351m 1.0m/s
0:44 W.O 2500m 2.5t
W.D 3352m 1.0m/s


1:33 W.D 3000m 3.3t
W-D 3917 1.0m/s↑
1:25 W.D 3500m 3.6t
W-D 3916m 1.0m/s↑
2022/6/23(UTC)
MR22-04 PC04
紙送り 10mm/min
1:18:36 離底確認 W.D 3871m MAX 5.03t
W-D 3916m 0.3m/s↑
1:17:01 着底 W.D 3898m MIN 2.72t
W-D 3917m 0.3m/s↓
0t 1t 2t 3t 4t 5t 6t 7t 8t 9t 10t
1:12 W.D 3800m 3.9t
W-D 3917m 0.3↓
繰り出し再開.
1:09 W.D 3800m 3.9t
W-D 3916m -
ﾗｲﾝ停止
1:02 W.D 3500m 3.5t
W-D 3916m 1.0m/s↓.


2022 / 6 / 25 (UTC)
MR22-04 PC05
0t
1t
2t
3t
4t
5t
6t
7t
8t
9t
10t
繰送り 10 mm/min
1:43 WD 4847m WO 4000m
4.1t 1.0m/s ↑
1:36 WD 4843 WO 4500
4.4t 1.0m/s ↑
1:29:37 着底 巻上げ
W.D 4844m
WO 4800 m
1:28:30 着底 巻上げ
Max 5.2t 0.3m/s↑
W.D 4845m WO 4821 m
Min 3.6t 0.3 m/s ↑
1:24 繰出し再開 ~0.3m/s↓
1:21 一旦停止
WD 4847m WO 4750m
4.9t
1:17 WD 4846m WO 4500m
4.5t 1.0m/s ↓
1:08 WD 4843m WO 4000m
4.0t 1.0m/s ↓


・1:57 WD 5238m WO 4000m
4.2t 1.0m/s
・1:49 WD 5236m WO 4500m
4.6t 1.0m/s ↑
・1:41 WD 5236m WO 5000m
~~5.0t~~
5.0t 1.0m/s ↑
1:37:31 離底確認 W.O. 5175m
max 6.1t
1:36:18 着底、巻き上げ ~0.3m/s ↑
W.O. 5211m W.D. 5239m
min 4.0t
・1:32 繰り出し
・1:29 一旦停止
・1:25 WD 5240m WO 5000m
4.8t 1.0m/s
0t 1t 2t 3t 4t 5t 6t 7t 8t 9t 10t
2022/6/27 (UTC)
MR22-04 PC06
↓ 航送り 10mm/min
890cm
905cm
920cm
CHART NO. B9619AH
YOKOGAWA