



R/V *Kaimei* Cruise Report
KM24-12

Seismic survey to image plate boundary faults
in the subduction zone

Nankai Trough

Oct. 19, 2024 - Nov. 10, 2024

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

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Acknowledgements

1. Cruise Information

- Cruise ID KM24-12
- Name of vessel R/V *Kaimei*
- Title of cruise Seismic survey for investigation of offshore seismogenic faults
- Chief Scientist Kazuya Shiraishi [IMG, JAMSTEC]
- Cruise period Oct. 19, 2024 -Nov. 10, 2024
- Ports of departure / arrival Yokosuka (JAMSTEC) - Yokosuka (JAMSTEC)
- Research area Nankai Trough
- Research map Track chart is shown in Figure 1

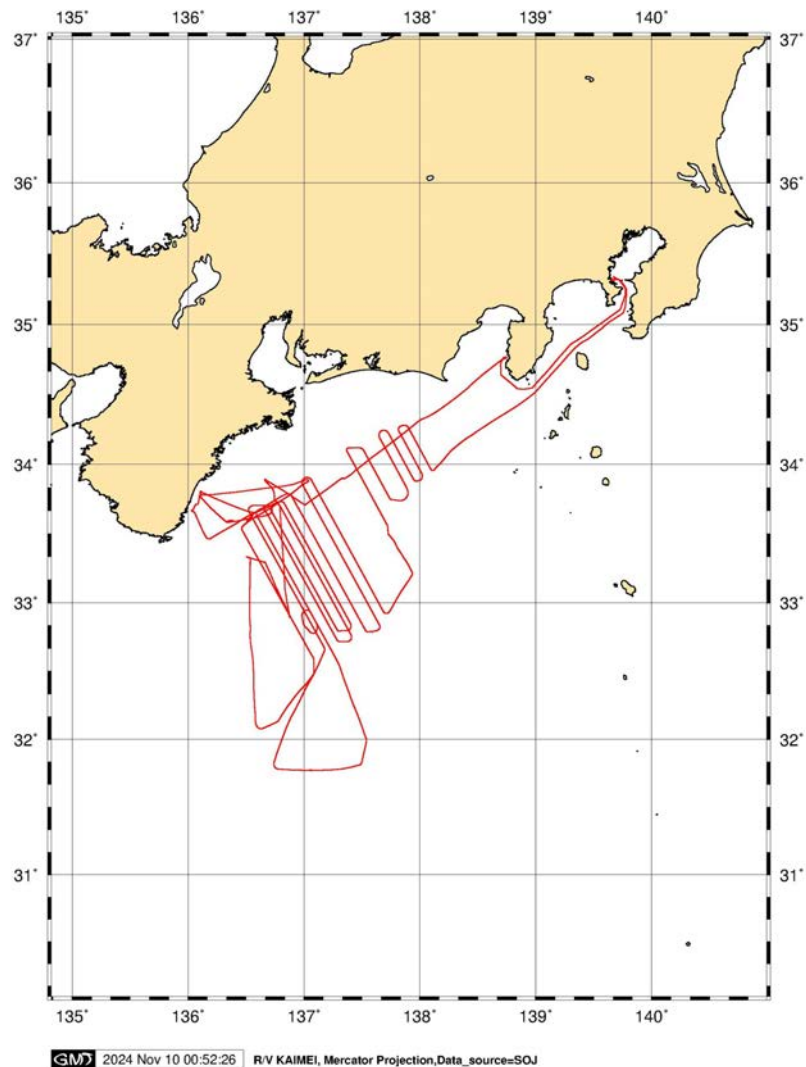


Figure 1: Track chart during the KM24-12 cruise

2. Research Proposal and Science Party

- Title of proposal
Detailed investigation of the offshore seismogenic faults: seismic surveys and observations for crustal deformation

- Representative of Science Party
Gou Fujie [IMG, JAMSTEC]

- Science Party

Kazuya Shiraishi	IMG, JAMSTEC	Onboard chief scientist
Ryo Miura	IMG, JAMSTEC	Onboard vice-chief scientist
Hiroshi Ichihara	Nagoya University	Onboard scientist
Manaka Kuroda	Nagoya University	Onboard scientist
Seiichi Miura	IMG, JAMSTEC	Lead proponent, onshore support
Yasuyuki Nakamura	IMG, JAMSTEC	Proponent, onshore support
Itaru Kawama	MarE3, JAMSTEC	Onshore support
Fujio Yamamoto	MarE3, JAMSTEC	Onshore support
Takafumi Kasaya	MRU, JAMSTEC	Onshore support
Noriko Tada	IMG, JAMSTEC	Onshore support
Gou Fujie	IMG, JAMSTEC	Proponent, no boarding
Koichiro Obana	IMG, JAMSTEC	Proponent, no boarding
Ayako Nakanishi	IMG, JAMSTEC	Proponent, no boarding
Tetsuo No	IMG, JAMSTEC	Proponent, no boarding
Ryuta Arai	IMG, JAMSTEC	Proponent, no boarding
Qin Yanfang	IMG, JAMSTEC	Proponent, no boarding
Ryoichiro Agata	IMG, JAMSTEC	Proponent, no boarding
Yuka Kaiho	IMG, JAMSTEC	Proponent, no boarding
Takashi Tonegawa	IMG, JAMSTEC	Proponent, no boarding
Tsutomu Takahashi	IMG, JAMSTEC	Proponent, no boarding
Takane Hori	IMG, JAMSTEC	Proponent, no boarding
Yojiro Yamamoto	IMG, JAMSTEC	Proponent, no boarding
Yasushi Ishihara	IMG, JAMSTEC	Proponent, no boarding
Shuichi Kodaira	IMG, JAMSTEC	Proponent, no boarding
Tetsuro Tsuru	TUMSAT	Proponent, no boarding
Jin-Oh Park	AORI, Univ. Tokyo	Proponent, no boarding

- Marine technician team

Yuki Ohwatari	NME	Chief marine technician
Hikaru Iwamaru	NME	Marine technician
Yoshiki Horiuchi	NME	Marine technician
Kenya Yamanaka	NME	Marine technician
Natsune Iho	NME	Marine technician
Toshikatsu Nasu	NME	Marine technician
Masayuki Toizumi	NME	Marine technician
Toshinori Saijo	NME	Marine technician
Naoto Noguchi	NME	Marine technician
Makoto Ito	NME	Marine technician
Kimiko Serizawa	NME	Marine technician
Masanori Yokoi	NME	Marine technician
Tatsuya Sugiyama	NME	Marine technician
Takehiro Higashi	NME	Marine technician
Michiyasu Katagiri	NME	Marine technician/3rd electronic operator

● Ship crew

Naoto Kimura	NME	Captain
Akira Suzuki	NME	Chief officer
Takeshi Muramatsu	NME	1st officer
Yasuhito Iida	NME	2nd officer
Aoi Tsurumaki	NME	3rd officer
Hiroki Sarashina	NME	Jr.3rd officer
Koji Funae	NME	Chief engineer
Takahiro Mori	NME	1st engineer
Keito Shimada	NME	2nd engineer
Daito Sato	NME	3rd engineer
Tokinori Nasu	NME	Chief electronic operator
Kohei Maeda	NME	2nd electronic operator
Masanori Ohata	NME	Boat Swain
Saikan Hirai	NME	Able seaman
Takuya Miyashita	NME	Able seaman
Akira Kurihara	NME	Able seaman
Kenta Nasu	NME	Able seaman
Taisuke Yokoyama	NME	Sailor
Yuta Kiyota	NME	Sailor
Hiroyuki Oishi	NME	No.1 oiler
Masayuki Fujiwara	NME	Oiler
Makoto Kozaki	NME	Oiler
Riku Mizuno	NME	Assistant oiler
Kiyoyuki Kubo	NME	Assistant oiler
Yukihide Chikuba	NME	Chief steward
Takehiro Nojiri	NME	Steward
Kazuma Sonoda	NME	Steward
Tsugumi Tanaka	NME	Steward

3. Research/Development Activities

Background and objectives

The cruise KM24-12 aims at revealing three-dimensional geometry and physical properties of seismogenic faults in the Nankai Trough region as described in the mid-term to long-term research plan of JAMSTEC. The survey area ranging from the Kumano-nada to Enshu-nada is known to have generated the Showa Tonankai earthquake in 1944 and host slow earthquakes including tremor and very low frequency earthquakes on the updip area of the seismogenic zone. In 2004, earthquakes with a magnitude of 7 occurred inside the subducting Philippine Sea plate.

To obtain high-resolution seismic reflection profiles of subsurface geological structures down to the top of the oceanic crust, we conducted the multi-channel seismic (MCS) reflection survey using a large volume airgun array and a long hydrophone streamer cable. Before starting the MCS survey, we checked the condition of repaired hydrophone streamer cables. We retrieved ocean-bottom electromagnetmeters (OBEM) based on an additional proposal.

Activities, observations

(1) Retrieval of OBEM

We retrieved five OBEM that had deployed during the YK24-08S cruise in June 2024 (Figure 2).

(2) Condition check of repaired streamer cables

We checked the condition of the hydrophone streamer cable, which have been repaired at the production factory to be used as the primary MCS system on R/V *Kaimei* with a total of 6-km streamer cable. However, we still faced many issues with the cable system, such as electric leakage, parity error, connection error, system down, and so on). Because we were not able to continue the data acquisition with the primary MCS system, we changed to the spare system with a total of 5.5-km streamer cable that had been moved from R/V *Kairei* as a backup system (Table 1).

(3) MCS reflection survey

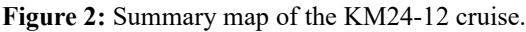
To acquire multi-channel seismic data, a single streamer cable was towed at 25 m in depth, and an air gun array formed by four strings of air gun clusters (10,600 inch³ volume in total) was towed at 10 m and fired at every 50 m along survey lines (Figure 2, Table 1, Table 2). The acquired data were quickly processed onboard for data quality control and preliminary investigation of geological structures.

(4) XCTD (expendable conductivity, temperature, and depth profile)

To obtain accurate velocity profile in the water column, XCTD casts were conducted at three points during the cruise, which were possible only when airgun subarrays were not towed (Figure 2, Table 3).

(5) Bathymetry, magnetometry, and gravimetry

The bathymetry and three-component magnetic field and shipboard gravity data were continuously recorded during the cruise. The bathymetry data observed during the cruise are shown in Figure 3.



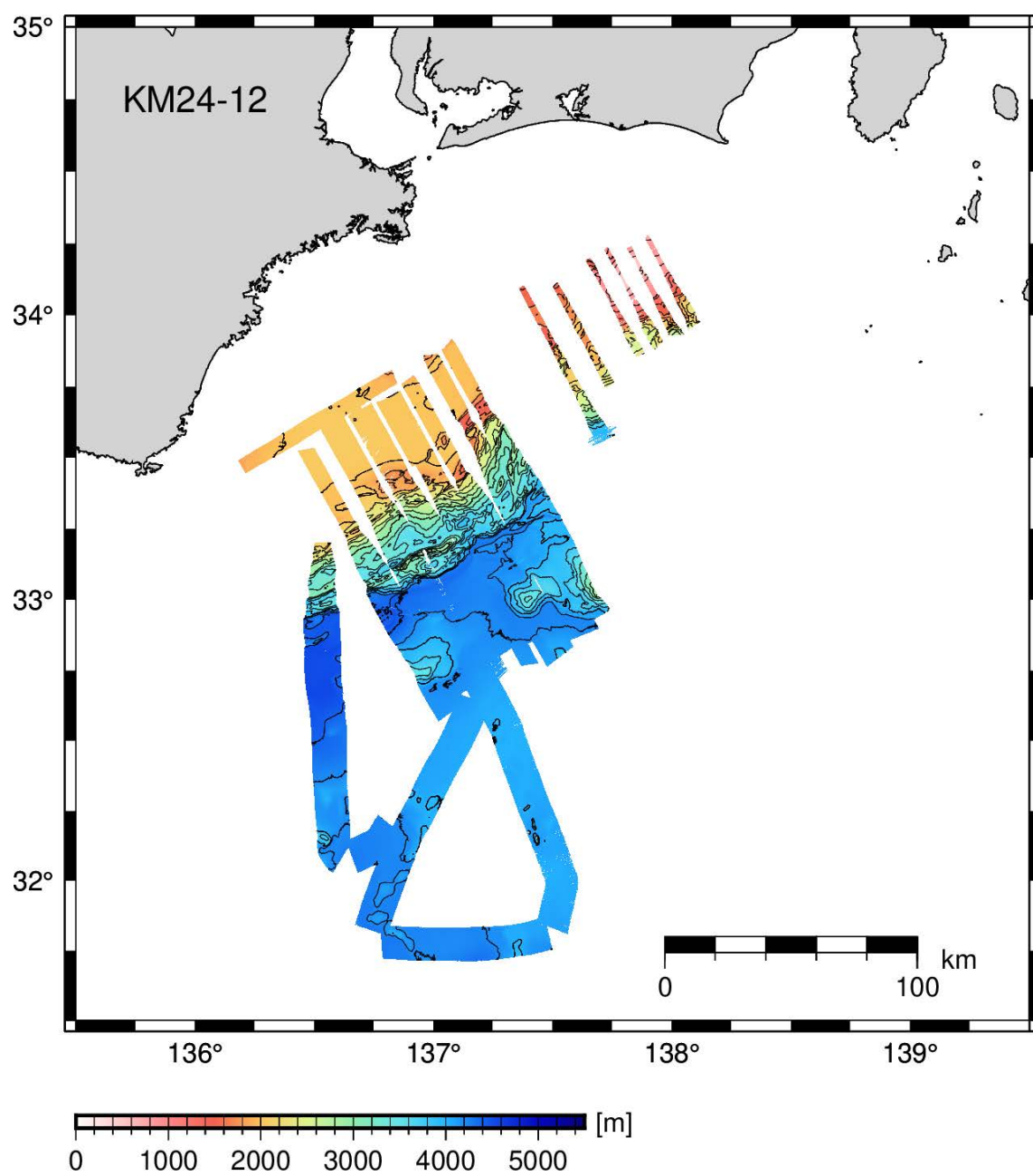


Figure 3: Bathymetry map observed during the cruise.

Table 1: Basic specifications of the MCS survey

Source		
Total airgun volume	10,600 in ³ (173.7 liters), 7,850 in ³ (128.6 liters) *	
Towing depth	10 m	
Shot interval	50 m (MCS reflection survey) 200 m (OBS refraction survey)	
Control system	GunLink 2500	
Receiver		
(1) SEAMAP NTRS2		NTN4048 (streamer cable test)
Cable length	2.9 km	
Number of channels	936 ch → 840 ch	
Group interval	3.125 m	
(2) SerCEL SEAL		NTN4054, NTN4056, NTN4060, NTN4062, NTN4066, NTN4068, NTN4072, NTN4078, NTN4082, NTN4100 *, NTN6106 *, NTN6114 *, NTN6118 *, NTN6122 *, NTN6126 *
Cable length	5.5 km, 5.4 km *	
Number of channels	444 ch, 432ch *	
Group interval	12.5 m	
Towing depth (common)	25 m	
Recording		
Record length	14 s	
Sampling rate	2 ms	
Data format	SEG-D 8058 Rev.1	
Navigation		
Navigation system	ORCA system	
Positioning	Differential Global Positioning System	

Remarks: * Basic specifications were changed due to issues on the airgun array and the streamer cable.

Table 2: List of MCS survey lines. F.S.P./L.S.P.: first or last shot point, F.G.S.P./L.G.S.P.: first or last good shot point.

Line name	Date (UTC)	Time (UTC)	F.S.P.	Vessel position		Length (FGSP – LGSP) (km)	DIRECTION (°)
			F.G.S.P.				
			L.G.S.P.	Latitude (deg_mm.mm)	Longitude (deg_mm.mm)		
			L.S.P.				
NTN4048-1001	2024/10/24	08:44:09	1001	32_39.71208°N	137_02.19876°E	109.7	330.0°
	2024/10/24	08:44:09	1001	32_39.71208°N	137_02.19876°E		
	2024/10/24	20:37:38	3195	33_31.59732°N	136_27.96078°E		
	2024/10/24	20:37:38	3195	33_31.59732°N	136_27.96078°E		
NTN4054-1002	2024/10/27	11:52:42	3445	33_39.45918°N	136_31.59204°E	122.2	150.0°
	2024/10/27	11:52:42	3445	33_39.45918°N	136_31.59204°E		
	2024/10/28	02:26:36	1001	32_41.63010°N	137_09.69132°E		
	2024/10/28	02:26:36	1001	32_41.63010°N	137_09.69132°E		
NTN4056-1003	2024/10/29	17:18:16	1001	32_42.50118°N	137_12.03726°E	26.3	330°
	2024/10/29	17:18:16	1001	32_42.50118°N	137_12.03726°E		
	2024/10/29	20:24:16	1527	32_54.96396°N	137_03.90948°E		
	2024/10/29	20:38:53	1565	32_55.86390°N	137_03.32100°E		
	2024/10/30	02:16:28	1401	32_51.98112°N	137_05.86350°E	96.95	330°

NTN4056-2004	2024/10/30	02:16:28	1401	32_51.98112°N	137_05.86350°E		
	2024/10/30	12:19:59	3340	33_37.85256°N	136_35.59458°E		
	2024/10/30	12:19:59	3340	33_37.85256°N	136_35.59458°E		
NTN4060-1005	2024/10/30	14:00:56	3330	33_38.83728°N	136_40.74978°E	116.45	150°
	2024/10/30	14:00:56	3330	33_38.83728°N	136_40.74978°E		
	2024/10/31	03:23:22	1001	32_43.73310°N	137_17.06154°E		
	2024/10/31	03:23:22	1001	32_43.73310°N	137_17.06154°E		
NTN4066-1006	2024/10/31	05:36:27	1001	32_45.99792°N	137_24.31998°E	118.65	330°
	2024/10/31	05:36:27	1001	32_45.99792°N	137_24.31998°E		
	2024/10/31	18:17:32	3374	33_42.21240°N	136_47.46126°E		
	2024/10/31	18:17:32	3374	33_42.21240°N	136_47.46126°E		
NTN4062-1007	2024/10/31	19:37:25	3360	33_40.31088°N	136_42.84804°E	109.9	150°
	2024/10/31	19:37:25	3360	33_40.31088°N	136_42.84804°E		
	2024/11/01	08:00:16	1162	32_48.26238°N	137_17.04024°E		
	2024/11/01	08:00:16	1162	32_48.26238°N	137_17.04024°E		
NTN4068-1008	2024/11/01	09:57:04	1190	32_51.16584°N	137_23.87082°E	109.65	330°
	2024/11/01	09:57:04	1190	32_51.16584°N	137_23.87082°E		
	2024/11/01	21:40:09	3383	33_43.13394°N	136_49.82838°E		
	2024/11/01	21:40:09	3383	33_43.13394°N	136_49.82838°E		
NTN4072-1009	2024/11/04	08:19:49	3461	33_46.23180°N	136_53.64258°E	122.9	150°
	2024/11/04	08:20:33	3459	33_46.18572°N	136_53.67672°E		
	2024/11/04	21:32:16	1001	32_47.93496°N	137_31.81866°E		
	2024/11/04	21:32:16	1001	32_47.93496°N	137_31.81866°E		
NTN4078-1010	2024/11/04	23:30:03	1001	32_50.18868°N	137_39.09132°E	128.35	330°
	2024/11/04	23:30:03	1001	32_50.18868°N	137_39.09132°E		
	2024/11/05	13:50:06	3568	33_51.07152°N	136_59.34744°E		
	2024/11/05	13:50:06	3568	33_51.07152°N	136_59.34744°E		
NTN4082-1011	2024/11/05	15:25:47	3620	33_53.57892°N	137_03.57366°E	121	150°
	2024/11/05	15:25:47	3620	33_53.57892°N	137_03.57366°E		
	2024/11/06	05:08:16	1200	32_56.17938°N	137_41.05968°E		
	2024/11/06	05:08:16	1200	32_56.17938°N	137_41.05968°E		
NTN4100-1012	2024/11/06	16:48:58	2270	33_32.73283°N	137_43.35266°E	17.3125	330°
	2024/11/06	16:48:58	2270	33_32.73283°N	137_43.35266°E		
	2024/11/07	02:00:07	3655	34_05.75800°N	137_22.19380°E		
	2024/11/07	02:00:07	3655	34_05.75800°N	137_22.19380°E		
NTN6106-1013	2024/11/07	04:04:03	3523	34_06.27228°N	137_30.68214°E	44.15	150°
	2024/11/07	04:04:03	3523	34_06.27228°N	137_30.68214°E		
	2024/11/07	09:39:13	2640	33_45.31206°N	137_44.39418°E		
	2024/11/07	09:39:13	2640	33_45.31206°N	137_44.39418°E		
NTN6114-1014	2024/11/07	13:21:00	2690	33_51.73134°N	137_52.00590°E	42	330°
	2024/11/07	13:21:00	2690	33_51.73134°N	137_52.00590°E		
	2024/11/07	18:41:27	3530	34_11.69706°N	137_39.01032°E		
	2024/11/07	18:41:27	3530	34_11.69706°N	137_39.01032°E		
NTN6118-1015	2024/11/07	20:06:07	3500	34_13.37532°N	137_43.79220°E	41.4	150°
	2024/11/07	20:06:07	3500	34_13.37532°N	137_43.79220°E		

	2024/11/08	00:32:23	2672	33_53.69454'N	137_56.60478'E		
	2024/11/08	00:32:23	2672	33_53.69454'N	137_56.60478'E		
NTN6122-1016	2024/11/08	02:04:55	2655	33_55.95114'N	138_01.03236'E	9.5	330°
	2024/11/08	02:04:55	2655	33_55.95114'N	138_01.03236'E		
	2024/11/08	05:50:30	3415	34_14.03262'N	137_49.30998'E		
	2024/11/08	05:50:30	3415	34_14.03262'N	137_49.30998'E		
NTN6126-1017	2024/11/08	07:13:10	3400	34_16.06176'N	137_53.90616'E	9.55	150°
	2024/11/08	07:13:10	3400	34_16.06176'N	137_53.90616'E		
	2024/11/08	11:19:53	2636	33_57.87714'N	138_05.67402'E		
	2024/11/08	11:19:53	2636	33_57.87714'N	138_05.67402'E		

Table 3: Location list of XCTD.

No.	Latitude (dd, mm.mmmm)			Longitude (dd, mm.mmmm)			Date (UTC)	Time (UTC)
1	33	42.5132	N	137	00.2967	E	2024/10/22	02:34
2	32	18.8812	N	136	34.1695	E	2024/10/23	19:00
3	33	03.8797	N	137	49.5614	E	2024/11/06	08:22
4	34	06.4853	N	138	17.0434	E	2024/11/08	14:58

4. Cruise Log

Date		Remarks
Oct. 19	Sat	Departure from JAMSTEC Yokosuka port, Sailing to Suruga Bay
Oct. 20	Sun	Wait on weather in Suruga Bay
Oct. 21	Mon	Wait on weather in Suruga Bay
Oct. 22	Tue	OBEM retrieval (EMK10, EMK9, EMK8), XCTD
Oct. 23	Wed	OBEM retrieval (EMK12, EMK11), Paravane deployment, MCS cable preparation
Oct. 24	Thu	XCTD , Paravane and MCS cable set up, Airgun array deployment, NTN4048 (KM streamer cable test) [17:40 - cont.]
Oct. 25	Fri	NTN4048 [cont. - 05:37], Retrieval of MCS system, maintenance
Oct. 26	Sat	Wait on weather off Shingu, MCS system change from KM to KR.
Oct. 27	Sun	Deployment of MCS system, NTN4054 [20:49 - cont.]
Oct. 28	Mon	NTN4054 [cont. - 11:26], Wait on Weather far off Kumano
Oct. 29	Tue	Wait on Weather far off Kumano
Oct. 30	Wed	NTN4056 (interrupted) [02:14 - 05:39], Airgun fixing, NTN4056 (continued) [11:13 - 21:19], NTN4060 [22:57 - cont.]
Oct. 31	Thu	NTN4060 [cont. - 12:23], NTN4066 [14:33 - cont.]
Nov. 1	Fri	NTN4066 [cont. - 03:17], NTN4062 [04:23 - 17:00], NTN4068 [18:54 - cont.]
Nov. 2	Sat	NTN4068 [cont. - 06:40], Retrieval of MCS system, Wait on Weather off Shingu
Nov. 3	Sun	Wait on Weather off Shingu, Maintenance of MCS system
Nov. 4	Mon	Deployment of MCS system, NTN4072 [17:16 - cont.],
Nov. 5	Tue	NTN4072 [cont. - 06:32], NTN4078 [08:26 - 22:50]
Nov. 6	Wed	NTN4082 [0:21 - 14:08], Maintenance of MCS system, XCTD
Nov. 7	Thu	NTN4100 [01:44 - 11:00], NTN6106 [13:00 - 18:39], NTN 6114 [22:16 - cont.]
Nov. 8	Fri	NTN 6114 [cont. - 03:41], NTN 6118 [05:02 - 09:32], NTN 6122 [11:01 - 14:50], NTN 6126 [16:09 - 20:19], Retrieval of MCS system, XCTD
Nov. 9	Sat	Retrieval of MCS system, Sailing to Yokosuka
Nov. 10	Sun	Arrival at JAMSTEC Yokosuka port

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

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