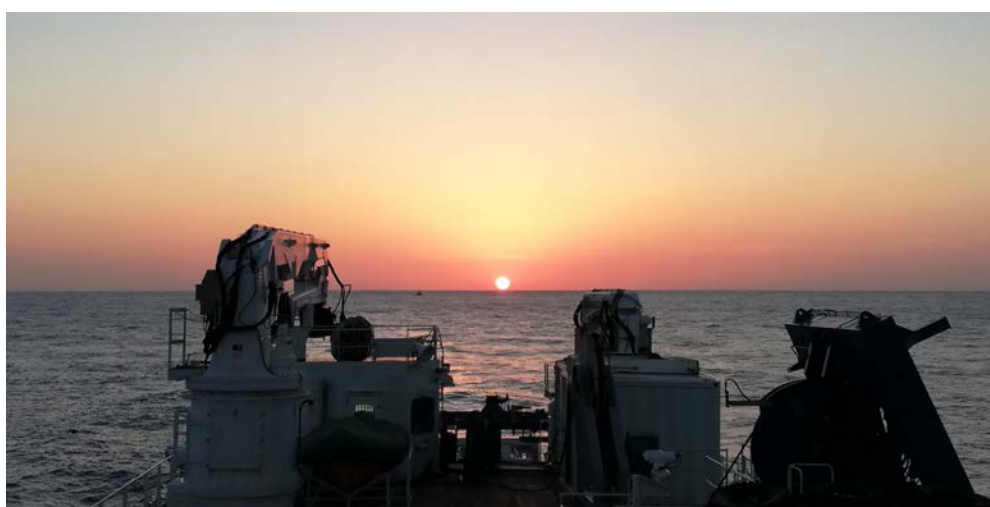




R/V *Kaimei* Cruise Report KM 21-07



3D seismic survey to image plate boundary faults
in the subduction zone

Nankai Trough, Hyuga-nada

Sep. 12, 2021 - Oct. 5, 2021

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

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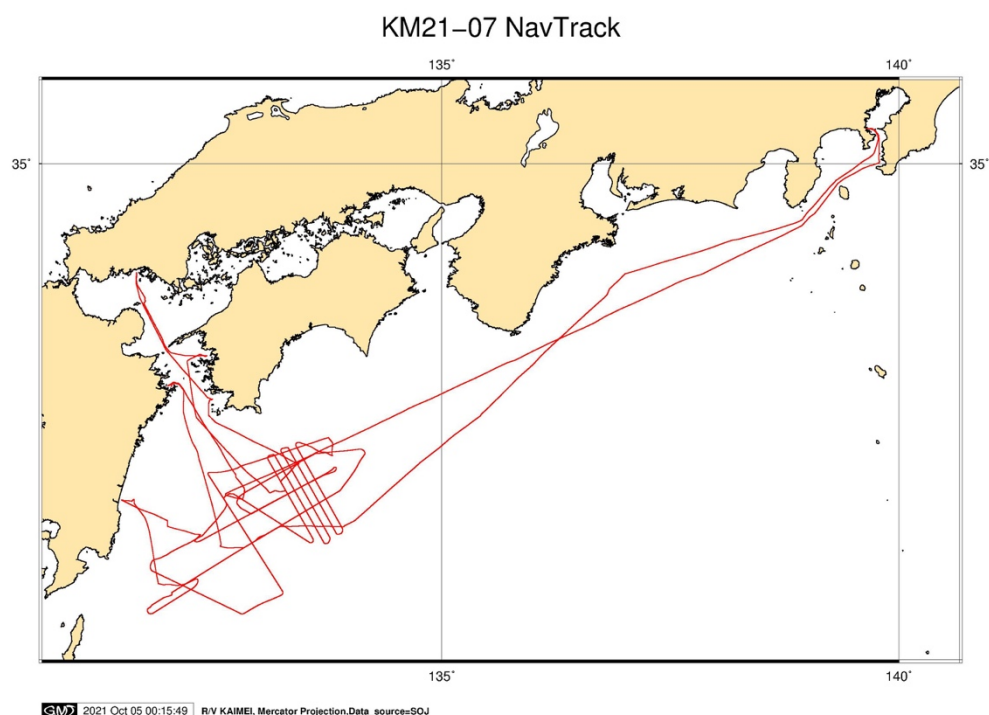
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Acknowledgements

1. Cruise Information

- Cruise ID KM21-07 Leg 2
- Name of vessel R/V *Kaimei*
- Title of cruise 3D seismic survey to image plate boundary faults in the subduction zone
- Chief Scientist Kazuya Shiraishi [IMG, JAMSTEC] (Leg 2)
- Cruise period Leg 1: Sep. 7, 2021 - Oct. 12, 2021
Leg 2: Sep. 12, 2021 - Oct. 5, 2021
- Ports of departure / arrival Yokosuka (JAMSTEC) – Yokosuka (JAMSTEC)
- Research area Nankai Trough ~ Hyuga-nada
- Research map



2. Research Proposal and Science Party

- Title of proposals
 - A. Detailed investigation of the offshore seismogenic faults: seismic surveys and observations for crustal deformation
 - B. Structural survey of the ridge subduction zone at Hyuga-nada: Towards the elucidation of the deformation and thermal structural history associated with seamount subduction
- Representative of Science Party Shuichi Kodaira [IMG, JAMSTEC]
- Science Party
 - Proponents for A
 - Shuichi Kodaira [IMG, JAMSTEC]
 - Yasushi Ishihara [IMG, JAMSTEC]
 - Koichiro Obana [IMG, JAMSTEC]
 - Seiichi Miura [IMG, JAMSTEC]
 - Gou Fujie [IMG, JAMSTEC]
 - Yasuyuki Nakamura [IMG, JAMSTEC]
 - Ryuta Arai [IMG, JAMSTEC]
 - Yuka Kaiho [IMG, JAMSTEC]
 - Ayako Nakanishi [IMG, JAMSTEC]
 - Tetsuo No [IMG, JAMSTEC]

Kazuya Shiraishi [IMG, JAMSTEC]
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 Toshinori Saijo [IMG, JAMSTEC, presently NME]
 Yanfang Qin [IMG, JAMSTEC]
 Tsutomu Takahashi [IMG, JAMSTEC]
 Yojiro Yamamoto [IMG, JAMSTEC]
 Takashi Tonegawa [IMG, JAMSTEC]
 Eiichiro Araki [IMG, JAMSTEC]
 Takashi Yokobiki [IMG, JAMSTEC]
 Hiroyuki Matsumoto [IMG, JAMSTEC]
 Toshinori Kimura [IMG, JAMSTEC]
 Noriko Tada [IMG, JAMSTEC]
 Hiroshi Ichihara [Nagoya University]
 Hayato Nakamura [Nagoya University]
 Yanxue Ma [ERI, University of Tokyo]

Proponents for B Yohei Hamada [KCC, JAMSTEC]
 Masataka Kinoshita [ERI, University of Tokyo]
 Rie Nakata [ERI, University of Tokyo]
 Yoshitaka Hashimoto [Kochi University]

● Onboard Science Party

Kazuya Shiraishi [IMG, JAMSTEC] Chief scientist
 Ryo Miura [IMG, JAMSTEC] Associate chief scientist
 Yohei Hamada [KCC, JAMSTEC] Scientist
 Yanxue Ma [ERI, University of Tokyo] Scientist
 Fujio Yamamoto [MarE3, JAMSTEC] Scientist
 Yuki Owatari [NME] Chief marine technician
 Hikaru Iwamaru [NME] Marine technician
 Keita Suzuki [NME] Marine technician
 Yoshiki Horiuchi [NME] Marine technician
 Kenya Yamanaka [NME] Marine technician
 Haruki Doi [NME] Marine technician
 Kimiko Serizawa [NME] Marine technician
 Misaki Horiuchi [NME] Marine technician
 Ikumasa Terada [NME] Marine technician
 Hideki Shibata [NME] Marine technician
 Toshinori Saijo [NME] Marine technician
 Takehiro Higashi [NME] Marine technician
 Shoya Onishi [NME] Marine technician

3. Research Activities

3.1 Background and objectives

This research cruise was planned to conduct large-scale and high-resolution investigation of fault systems and real-time observation of crustal deformation in seismogenic zones. To better understand the nature of seismogenic zone composed of several rupture segments in the Nankai Trough, we had carried out seismic surveys to explore three-dimensional fault distributions and physical properties around the faults and deformations caused by the plate subduction. In this cruise, we acquired two-dimensional multichannel seismic survey data along densely distributed survey lines in the offshore area of the Cape Ashizuri and shot air guns for wide-angle seismic data acquisition with ocean bottom seismographs deployed prior to the cruise (Proposal A). To elucidate deformation and thermal structural history associated with seamount subduction, we acquired multichannel seismic survey data and sub-bottom profiler data in the Hyuganada area (Proposal B). Additionally, datasets of XCTD, bathymetry and shipboard magnetometer along seismic survey lines were collected during the cruise.

3.2 Observations

(1) Refraction seismic survey

To acquire refraction and wide-angle reflection seismic data, an air gun array formed by four strings of air gun clusters (10,600 inch³ volume in total) was towed at 10 m depth and fired every 200 m along the survey lines HYU3 and HYU4 where ocean-bottom seismograms (OBSs) were deployed during the YK21-14 cruise in August 2021. A 5.5 km streamer cable was also towed at 25 m depth to record seismic reflection data along part of the line HYU4.

(2) Reflection seismic survey

To acquire multi-channel seismic data, a 5.5-km streamer cable was towed at 25 m or 12 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.

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

To obtain accurate velocity profile in the water column, XCTD casts were conducted at four points during the cruise.

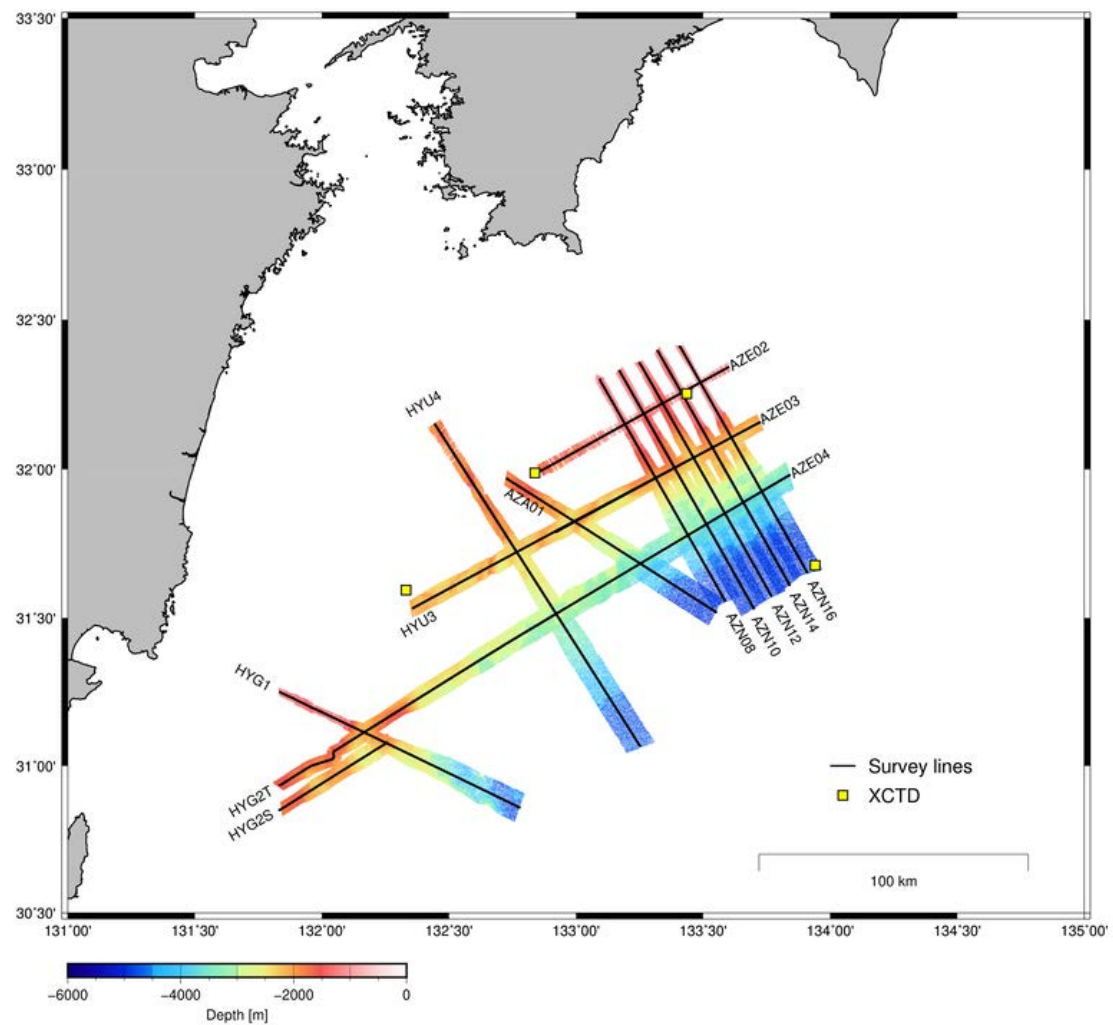
(4) Bathymetry, magnetic, and sub-bottom profiler

Bathymetry and three-component magnetic field data were recorded during the cruise. Sub-bottom profiler was conducted along HYG1, HYG2T, and HYG2S.

3.3 Observation equipments

- Multi-channel seismic survey system
- expendable conductivity, temperature, and depth profiler XCTD-4
- Multibeam echo sounder EM122
- Sub-bottom profiler TOPAS PS18
- Three component magnetometer SFG-2015

3.4 Survey line map with bathymetry



3.5 Survey line list

No.	Line name		Date	Time	Latitude [deg-min]	Longitude [deg-min]	Shot point (SP)	No. of SP	Line Length [km]	Shot interval [m]	Gun depth [m]	Channel interval [m]	No. of Channels	Cable depth [m]	Record length [ms]
1	AZA01	Start	02-Oct	22:05	31-31.1	133-33.1	1001	1855	92.7	50	10	12.5	444	25	14000
		End	03-Oct	10:00	31-58.2	132-43.4	2855								
2	AZE02	Start	14-Sep	10:43	31-59.6	132-51.6	1001	1593	79.6	50	10	12.5	444	25	14000
		End	14-Sep	18:51	32-20.6	133-36.2	2593								
3	AZE03	Start	13-Sep	13:34	32-09.5	133-43.6	2725	1725	86.2	50	10	12.5	444	25	14000
		End	14-Sep	5:52	31-47.3	132-55.1	1001								
4	AZE04	Start	15-Sep	10:01	31-58.9	133-50.5	2625	2206	110.25	50	10	12.5	444	25	14000
		End	16-Sep	2:58	31-28.2	132-50.3	420								
5	AZN08_1	Start	25-Sep	7:37	32-18.2	133-05.6	3058	718	35.85	50	10	12.5	444	25	14000
		End	25-Sep	12:02	32-01.0	133-16.9	2341								
6	AZN08_2	Start	02-Oct	14:15	32-04.1	133-14.8	2461	1301	65	50	10	12.5	444	25	14000
		End	02-Oct	21:04	31-33.2	133-35.3	1161								

7	AZN10	Start	24-Sep	16:03	31-31.7	133-42.0	1001	2035	101.7	50	10	12.5	444	25	14000
		End	25-Sep	5:56	32-19.9	133-10.1	3035								
8	AZN12	Start	24-Sep	2:47	32-21.6	133-14.7	3004	2004	100.15	50	10	12.5	444	25	14000
		End	24-Sep	14:25	31-34.2	133-46.2	1001								
9	AZN14	Start	23-Sep	12:29	31-36.5	133-50.4	1001	2002	100.05	50	10	12.5	444	25	14000
		End	24-Sep	0:57	32-23.9	133-19.1	3002								
10	AZN16	Start	22-Sep	22:53	32-24.7	133-24.4	2930	1930	96.45	50	10	12.5	444	25	14000
		End	23-Sep	10:44	31-39.0	133-54.6	1001								
11	HYG1	Start	20-Sep	15:05	30-51.4	132-46.8	1001	2001	100	50	10	12.5	444	25	14000
		End	21-Sep	3:53	31-15.0	131-49.9	3001								
12	HYG2S	Start	11-Sep	1:17	30-50.9	131-49.7	1001	964	48.15	50	10	3.125	1776 (1536)	25	14000
		End	11-Sep	6:03	31-04.8	132-15.6	1964								
13	HYG2T	Start	09-Sep	21:39	31-32.0	132-57.5	3520	2520	125.95	50	10	3.125	1776	12	16000
		End	10-Sep	21:06	30-55.9	131-49.9	1001								

14	HYU3	Start	12-Sep	18:30	31-31.9	132-21.3	1001	599	119.6	200	10	N/A	N/A	N/A	N/A
		End	13-Sep	6:19	32-02.5	133-28.2	3393								
15	HYU4_1	Start	19-Sep	17:04	31-55.5	132-37.0	3267	567	113.2	200	10	12.5	444	25	1400
		End	20-Sep	7:34	31-03.7	133-15.2	1003								
16	HYU4_2	Start	21-Sep	13:38	31-54.2	132-37.8	3215	164	32.6	200	10	N/A	N/A	N/A	N/A
		End	21-Sep	18:19	32-09.1	132-26.5	3867								
								24184	1407.45						

4. Cruise Log

	Date	Time	Contents
Leg 1	9/7	09:30	Departure from JAMSTEC Yokosuka port Trip to survey area
	9/8	16:33	Trip XCTD Deploy streamer
	9/9	21:39	Streamer test Deploy airgun array HYG2T start
	9/10	21:06	HYG2T end
	9/11	01:17 06:03	HYG2S start HYG2S end Retrieve airgun array and streamer
Leg 2	9/12	13:05 18:33	XCTD Deploy airgun HYU3 start (OBS line shooting w/o streamer)
	9/13	06:19 13:29	HYU3 end Deploy streamer AZE03 start
	9/14	05:52 10:43 18:51	AZE03 end AZE02 start AZE02 end
	9/15	10:01	AZE04 start
	9/16	02:58	AZE04 end Retrieve airgun array and streamer
	9/17		Wait on weather (Saiki)
	9/18		Wait on weather (Saiki)
	9/19	06:55 17:04	XCTD Deploy streamer and airgun HYU4 start (OBS line shooting with streamer)
	9/20	07:34 15:05	HYU4 end HYG1 start
	9/21	03:53 13:38 18:19	HYG1 end Retrieve streamer HYU4 start (northern part of OBS line, airgun shooting only) HYU4 end Retrieve airgun
	9/22	22:53	Deploy streamer and airgun array AZN16 start
	9/23	10:44 12:29	AZN16 end AZN14 start
	9/24	00:57 02:47 14:25 16:03	AZN14 end AZN12 start AZN12 end AZN10 start
	9/25	05:56 07:37 12:02	AZN10 end AZN08 start AZN08 stop Retrieve airgun array and streamer
	9/26		Wait on weather (Uwajima)

	9/27		Wait on weather (Uwajima → Kudamatsu)
	9/28		Wait on weather (Kudamatsu)
	9/29		Wait on weather (Kudamatsu)
	9/30		Wait on weather (Kudamatsu)
	10/1		Wait on weather (Kudamatsu → Sukumo)
	10/2	05:56	XCTD Deploy streamer and airgun array
		14:15	AZN08 restart
		21:04	AZN08 end
		22:05	AZA01 start
	10/3	10:00	AZA01 end Retrieve airgun array and streamer Leave survey area
	10/4		Trip to Yokosuka
	10/5	09:00	Arrival at JAMSTEC Yokosuka port Disembarkation

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

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