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R/V Kairei Cruise Report

KR11-09

Seismic study around off Kii Peninsula,

Sep. 13, 2011 – Oct. 10, 2011

Japan Agency for Marine-Earth Science and Technology

(JAMSTEC)

Contents:

1. Cruise Information :

(1) Cruise number, Ship name: KR11-09, R/V Kairei

(2) Title of the cruise:

2011FY “Seismic study and earthquake observation study off Kii Peninsula”

(3) Title of proposal:

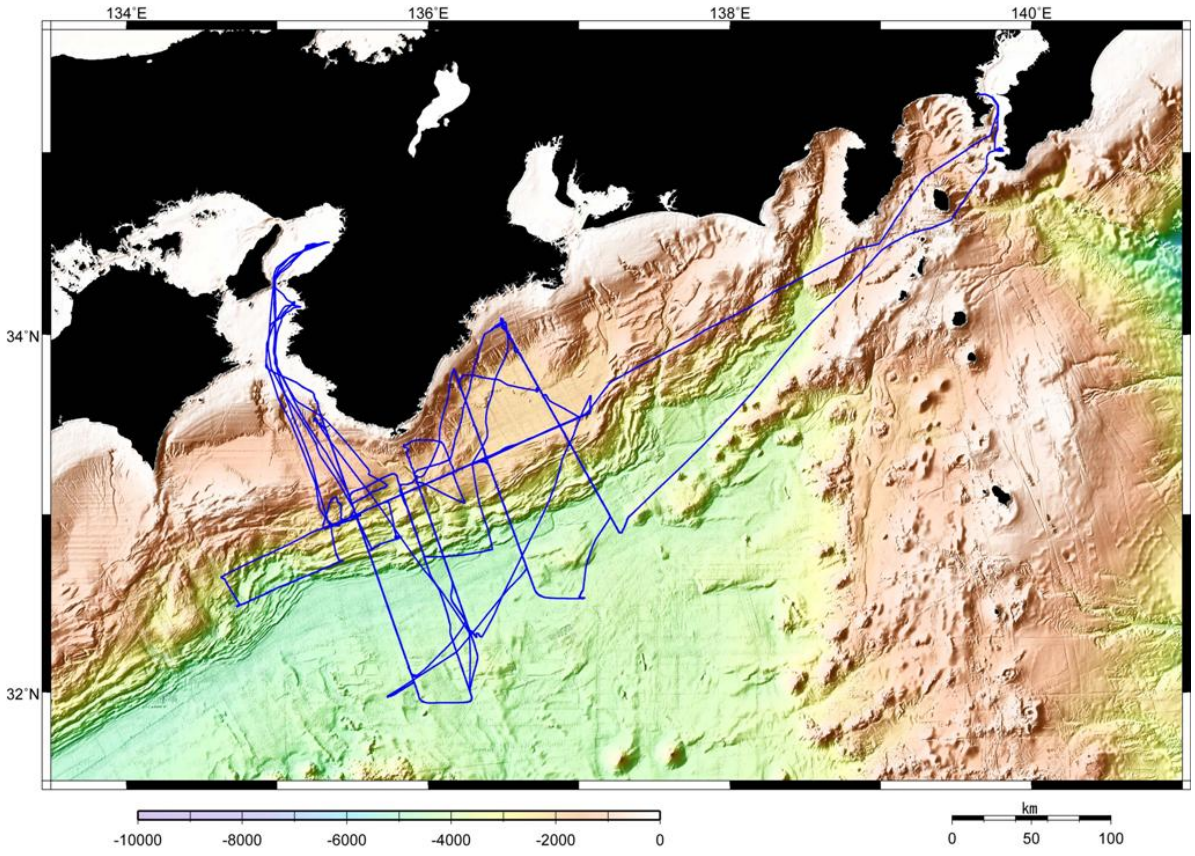
Seismic survey and observation study of evaluation for large earthquake synchronization in the Nankai Trough

(4) Cruise period, Port call:

2011/09/13-10/10, JAMSTEC (Yokosuka) to JAMSTEC (Yokosuka)

(5) Research Area: off Kii Peninsula

(6) Research Map:



2. Researchers

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3. Overview of Observation :

(1) Objectives :

This research cruise was conducted as a part of the study of "Research program concerning interaction between the Tokai, Tonankai, and Nankai Earthquakes" funded by the Ministry of Education, Culture, Sports, Science, and Technology of Japan.

In the Nankai Trough seismic subduction zone, a number of great earthquakes (M>8), such as 1944 Tonankai and 1946 Nankai earthquakes, have been repeatedly occurred. Notable features in this region are the segmentation of the rupture zones and synchronization of these segments. To understand the structure factors controlling the segmentation and the synchronization of rupture zones, it is necessary to reveal the detailed structure variations and seismic activities in this subduction zone. The objectives of this cruise are to reveal detailed seismic structure and seismic activity around off Kii Peninsula in the Nankai Trough.

(2) List of observation instruments :

1) Recovery of 9 OBSs around off Shikoku and Kii Peninsula

9 OBSs were recovered, although 10 OBSs was planned to recover during this cruise.

2) Deployment of ocean bottom seismometers (OBSs)

154 OBSs were deployed around off Kii Peninsula although 157 OBSs was planned to deploy during this cruise.

3) Seismic refraction/wide-angle reflection survey

A seismic refraction/reflection survey using a tuned air-gun array of 7,800 cubic inch and OBSs was conducted in 6 survey lines (KI01, KI02, KI03, KI04 and KI05) off Kii Peninsula. A part of lines KI03 and KI05 was towed with 444 channel hydrophone streamer with a 12.5 group interval.

4) Multi-channel seismic (MCS) reflection survey

Multi-channel seismic reflection surveys were conducted in 3 lines (KI01, KI02 and KI06) using the 444 channel hydrophone streamer with a 12.5 m group interval. This survey on TK07 line could not be conducted because of the bad sea condition.

5) Bathymetry, Gravity and Geomagnetic observation

During this cruise, bathymetry, gravity and geomagnetic data have been recorded continuously by SEABEAM2112, gravity meter (KSS-31) and three-component magnetometer (SFG1214), respectively.

6) Temperature and Conductivity observation for the correction of sonic speed

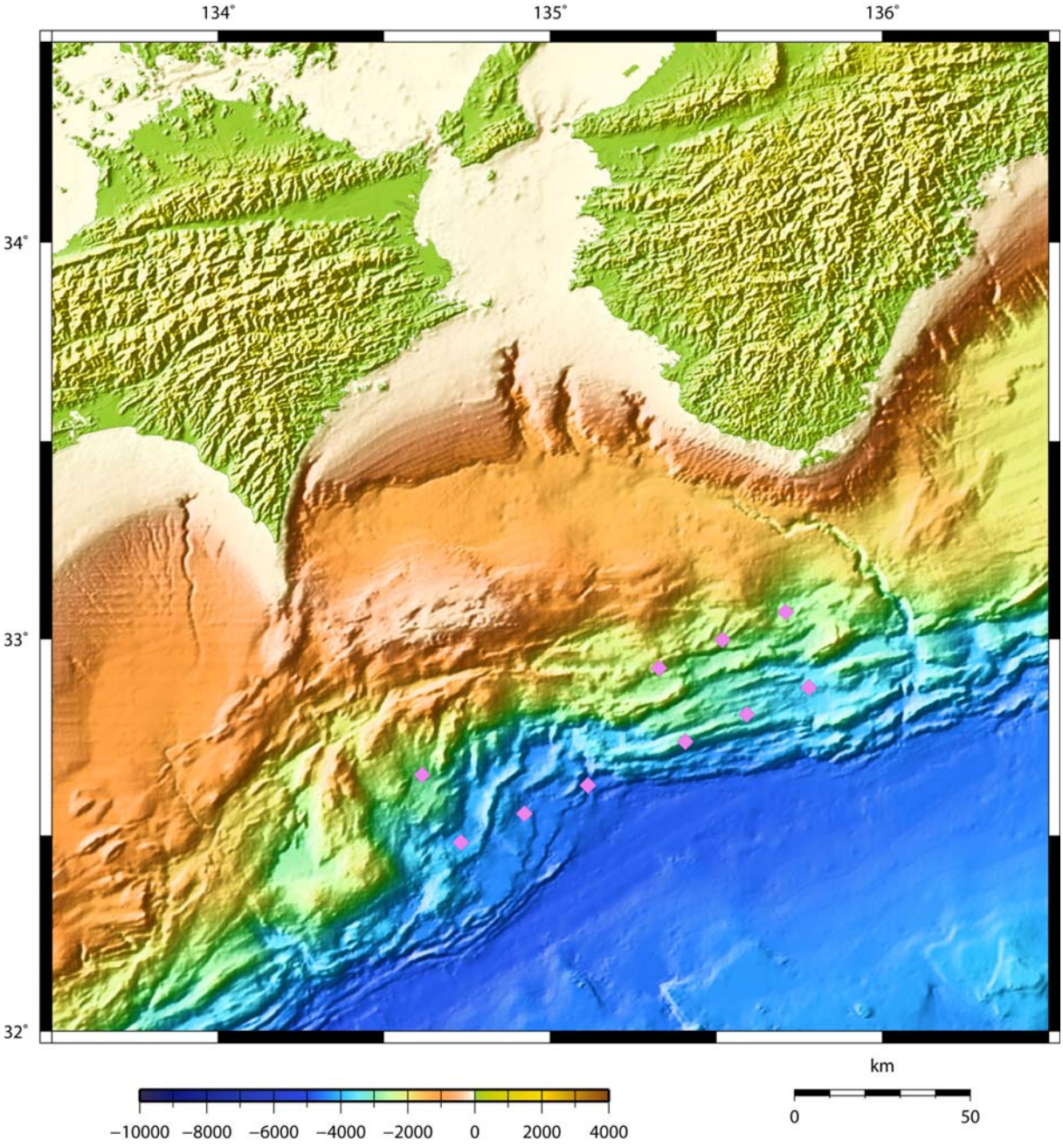
Expendable-Bathy Thermograph (XBT) has been conducted to correct the sonic speed for the bathymetry survey.

(3) Cruise log:

Date		Remarks
2011/09/13	Tue	Departure from JAMSTEC (Yokosuka), and transit to survey area
2011/09/14	Wed	Recovery of OBSs
2011/09/15	Thu	Standby due to weather condition (Osaka Bay)
2011/09/16	Fri	Standby due to weather condition (Osaka Bay)
2011/09/17	Sat	Standby due to weather condition (Osaka Bay)
2011/09/18	Sun	Standby due to weather condition (Osaka Bay)
2011/09/19	Mon	Deployment of OBSs
2011/09/20	Tue	Standby due to weather condition (off Hannan port)
2011/09/21	Wed	Standby due to weather condition (off Hannan port)
2011/09/22	Thu	Deployment of OBSs
2011/09/23	Fri	Deployment of OBSs
2011/09/24	Sat	Deployment of OBSs
2011/09/25	Sun	Deployment of OBSs, Air-gun shooting on line KI01
2011/09/26	Mon	Air-gun shooting on line KI01, standby due to weather condition (Wakayama-Shimotsu port)
2011/09/27	Tue	Standby due to weather condition (Wakayama-Shimotsu port)
2011/09/28	Wed	Deployment of OBSs
2011/09/29	Thu	Deployment of OBSs
2011/09/30	Fri	Airgun shooting and MCS survey on line KI03
2011/10/01	Sat	Airgun shooting and MCS survey on lines KI05 and KI05
2011/10/02	Sun	Airgun shooting and MCS survey on lines KI01 and KI02
2011/10/03	Mon	Airgun shooting and MCS survey lines KI02 and KI06
2011/10/04	Tue	Airgun shooting and MCS survey on lines KI06 and KI01
2011/10/05	Wed	Airgun shooting and MCS survey on lines KI01 and KI06
2011/10/06	Thu	Deployment of OBSs and Airgun shooting on line KI03
2011/10/07	Fri	Airgun shooting on lines KI03 and KI05
2011/10/08	Sat	Airgun shooting on lines KI02 and KI04
2011/10/09	Sun	Airgun shooting on line KI04
2011/10/10	Mon	Transit and arrive at JAMSTEC (Yokosuka)

(4) Seismic lines and OBS location

1) Location of recovered OBSs



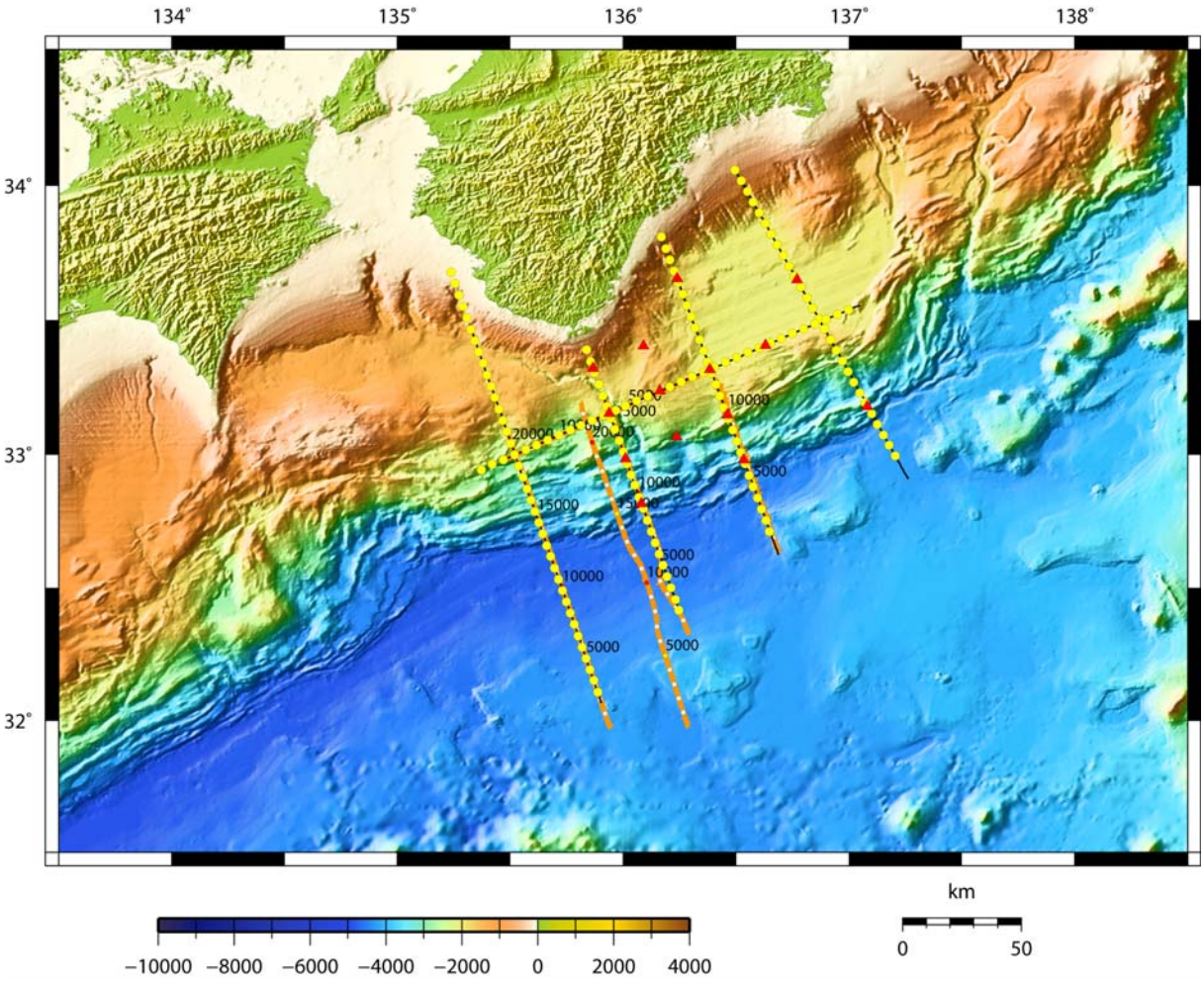
Purple diamonds show the Long-term OBSs recovered by KR11-09 cruise.

Site	Vessel position		
	Latitude (N)	Longitude (E)	Depth(m)
L01	33_16.8684	135_11.6317	1493.0

L02	33_10.2095	134_54.0888	907.0
L03	33_13.2891	135_41.0805	1836.0
L04	33_08.9128	135_28.7802	1815.0
L05	33_04.6703	135_16.9874	-
L06	32_58.0569	134_59.5166	1934.0
L07	32_53.0329	134_46.0547	1465.0
L08	32_47.9149	134_32.4114	1571.0
L09	33_04.1687	135_44.1412	2721.0
L10	32_59.8773	135_33.0527	2590.0
L11	32_55.9423	135_21.3441	2462.0
L12	32_49.2091	135_03.1776	3081.0
L13	32_44.3701	134_50.5132	-
L14	-	-	-
L15	32_52.5750	135_48.8062	3581.0
L16	32_48.1344	135_37.4484	3313.0
L17	32_44.5230	135_25.9174	-
L18	32_38.1218	135_08.2290	4615.0
L19	32_33.9234	134_56.6453	4458.0
L20	32_29.5522	134_44.8666	-

* L14 was not retrieved

2) Refraction/Reflection seismic survey and location of deployed OBSs



Yellow circles show the locations of deployed OBSs. Orange lines are air-gun shooting (50 or 200m) line with streamer. Black lines indicate only air-gun shooting line (200m).

a) Shooting coordinates

Line name	Latitude (N)	Longitude (E)
KI01mcs_0 (50m)	31_59.75558'	135_55.95465'
	33_05.50418'	135_28.98896'
KI01obs_0 (200m)	32_04.31372'	135_54.12414'
	33_03.29418'	135_29.85721'
KI01obs_1 (200m)	33_02.06786'	135_30.36520'
	33_28.10760'	135_19.47459'
KI02mcs_0 (50m)	32_20.88105'	136_16.53049'
	33_11.96968'	135_55.11328'
KI02obs_0	32_24.23944'	136_15.14212'

(200m)	33_13.35995'	135_54.61418'
KI03obs_0	32_39.41249'	136_40.37665'
(200m)	33_16.68325'	136_24.10420'
KI03obsR_0	33_43.76156'	136_12.32852'
(200m)	33_17.96380'	136_23.65520'
KI04obs_0	34_03.88884'	136_29.42527'
(200m)	32_54.35549'	137_15.74408'
KI05obs_0	33_17.18909'	136_18.05035'
(200m)	32_58.42163'	135_27.29299'
KI05obsR_0	32_55.54667'	135_19.63465'
(200m)	32_58.84742'	135_28.43154'
KI05obsR_1	33_19.81050'	136_25.22351'
(200m)	33_33.43505'	137_03.05251'
KI06mcs_0	32_52.02505'	135_55.89572'
(200m)	31_58.45379'	136_17.36860'
KI06mcs_1	33_09.96767'	135_48.59256'
(200m)	32_48.94858'	135_57.12616'

b) Deployed OBSs location

Site	Vessel position		
	Latitude (N)	Longitude (E)	Depth(m)
1	32_06.3630	135_53.2803	4231.0
2	32_08.9752	135_52.1882	4280.0
3	32_11.4529	135_51.1649	4319.0
4	32_14.0108	135_50.1332	4400.0
5	32_16.5490	135_49.0838	4456.0
6	32_19.0970	135_48.0335	4519.0
7	32_21.6718	135_46.9372	4563.0
8	32_24.2179	135_45.9329	4624.0
9	32_26.7778	135_44.8803	-
10	32_29.3145	135_43.7989	4722.0
11	32_31.8650	135_42.7891	4722.0
12	32_34.4253	135_41.7635	4782.0
13	32_37.0045	135_40.7459	4727.0
14	32_39.5158	135_39.6662	4738.0
15	32_42.0761	135_38.6263	4221.0

16	32_44.6167	135_37.5712	4054.0
17	32_47.1540	135_36.5089	3458.0
18	32_49.7132	135_35.4360	3317.0
19	32_52.2628	135_34.3968	3194.0
20	32_54.7968	135_33.3867	3108.0
21	32_57.3403	135_32.2582	2903.0
22	32_59.8869	135_31.1741	2447.0
23	33_02.4339	135_30.1716	2256.0
24	33_04.9990	135_29.0781	2109.0
25	33_07.5329	135_28.0116	1880.0
26	33_10.0940	135_26.9916	1696.0
27	33_12.6572	135_25.9292	1605.0
28	33_15.2037	135_24.8900	1548.0
29	33_17.7346	135_23.7984	1552.0
30	33_20.3123	135_22.7689	1570.0
31	33_22.8227	135_21.6757	1604.0
32	33_25.3851	135_20.6131	1549.0
33	33_27.8963	135_19.5649	1449.0
34	33_30.4788	135_18.4744	1411.0
35	33_33.0324	135_17.3976	659.0
36	33_35.5530	135_16.3532	738.0
37	33_38.1027	135_15.2859	164.0
38	33_40.6677	135_14.2228	110.0
39	32_24.8641	136_14.8757	4383.0
40	32_27.3598	136_13.8438	4444.0
41	32_29.9109	136_12.7793	4525.0
42	32_32.4742	136_11.7123	4593.0
43	32_35.0201	136_10.6498	4612.0
44	32_37.5717	136_09.5836	4616.0
45	32_40.1156	136_08.5298	4638.0
46	32_42.6371	136_07.4163	4589.0
47	32_45.1992	136_06.3629	4551.0
48	32_47.7489	136_05.3153	4168.0
49	32_50.2971	136_04.2498	4235.0
50	32_53.1152	136_03.0779	3841.0
51	32_55.3722	136_02.1133	3611.0
52	32_57.9220	136_01.0544	3338.0
53	33_00.4668	135_59.9805	3286.0

54	33_03.0212	135_58.8905	2792.0
55	33_05.5719	135_57.8310	2346.0
56	33_08.0951	135_56.7608	2262.0
57	33_10.6481	135_55.6839	2395.0
58	33_13.1551	135_54.6218	1940.0
59	33_15.5889	135_53.5571	1918.0
60	33_18.2194	135_52.4608	1722.0
61	33_20.7923	135_51.3502	1172.0
62	33_23.3353	135_50.2848	553.0
63	32_42.5910	136_38.8875	-
64	32_45.1235	136_37.9058	4411.0
65	32_47.6604	136_36.8197	4273.0
66	32_50.1903	136_35.6959	4485.0
67	32_52.7384	136_34.5788	4451.0
68	32_55.2907	136_33.4780	4457.0
69	32_57.8313	136_32.3985	3681.0
70	33_00.3469	136_31.2917	3548.0
71	33_02.8890	136_30.2144	3301.0
72	33_05.4107	136_29.0749	2928.0
73	33_07.9773	136_27.9580	2098.0
74	33_10.4649	136_26.8245	2191.0
75	33_13.0673	136_25.7272	2093.0
76	33_15.6022	136_24.5920	2019.0
77	33_18.1364	136_23.4550	1987.0
78	33_20.6769	136_22.3615	2032.0
79	33_23.1903	136_21.3655	2060.0
80	33_25.6933	136_20.2761	1998.0
81	33_28.2152	136_19.1462	1931.0
82	33_30.7547	136_18.0603	1985.0
83	33_33.2978	136_16.9198	1950.0
84	33_35.8315	136_15.8413	1903.0
85	33_38.3586	136_14.7173	1867.0
86	33_40.8930	136_13.5704	1812.0
87	33_43.4049	136_12.4607	1407.0
88	33_45.9335	136_11.3518	873.0
89	33_48.5550	136_10.1996	251.0
90	32_59.6090	137_12.2513	4231.0
91	33_01.9729	137_10.7066	4224.0

92	33_04.3038	137_09.1235	4243.0
93	33_06.6848	137_07.5532	4337.0
94	33_09.0488	137_06.0218	3826.0
95	33_11.6128	137_04.2917	3040.0
96	33_13.7661	137_02.8879	3575.0
97	33_16.1338	137_01.3371	3289.0
98	33_18.4739	136_59.7595	2799.0
99	33_20.9045	136_58.2373	2398.0
100	33_23.2345	136_56.6405	2322.0
101	33_25.6136	136_55.0962	1834.0
102	33_27.9731	136_53.5338	1920.0
103	33_30.3324	136_51.9909	2034.0
104	33_32.6768	136_50.4072	2059.0
105	33_34.9534	136_48.8525	2062.0
106	33_37.3771	136_47.2536	2060.0
107	33_39.7374	136_45.6263	2057.0
108	33_42.0860	136_44.0748	2015.0
109	33_44.4445	136_42.5703	2007.0
110	33_46.7967	136_40.9350	2011.0
111	33_49.1482	136_39.3577	2016.0
112	33_51.5043	136_37.7446	1993.0
113	33_53.9035	136_36.1861	1963.0
114	33_56.2204	136_34.5716	1839.0
115	33_58.6091	136_33.0197	1499.0
116	34_00.9511	136_31.3929	731.0
117	34_03.3131	136_29.8167	422.0
118	-	-	-
119	-	-	-
120	32_56.4627	135_22.4006	2570.0
121	32_57.6972	135_25.2155	2592.0
122	32_58.7703	135_28.2339	2459.0
123	-	-	-
124	33_00.9808	135_34.1151	2500.0
125	33_02.0735	135_37.0708	2371.0
126	33_03.1699	135_40.0352	2587.0
127	33_04.2782	135_42.9646	2713.0
128	33_05.3659	135_45.9115	2625.0
129	33_06.4702	135_48.8708	2507.0

130	33_07.5452	135_51.8060	2414.0
131	33_08.6366	135_54.7741	2117.0
132	33_09.8411	135_58.0716	2486.0
133	33_10.8146	136_00.6396	2093.0
134	33_11.9141	136_03.5977	1928.0
135	33_13.0055	136_06.5486	1858.0
136	33_14.0732	136_09.4968	1793.0
137	33_15.1611	136_12.4425	1805.0
138	33_16.2394	136_15.4091	1859.0
139	33_17.3219	136_18.3685	1942.0
140	33_18.4083	136_21.3322	1970.0
141	33_19.4948	136_24.2817	2004.0
142	33_20.5863	136_27.1990	2016.0
143	33_21.6684	136_30.1777	2016.0
144	33_22.7271	136_33.1473	2004.0
145	33_23.7881	136_36.1206	2007.0
146	33_24.8658	136_39.0890	2000.0
147	33_25.9262	136_42.0562	1992.0
148	33_27.0019	136_45.0367	1971.0
149	33_28.0709	136_47.9951	1945.0
150	33_29.1071	136_50.9835	1992.0
151	33_30.1857	136_53.9768	2037.0
152	33_31.2603	136_56.9165	2048.0
153	33_32.3112	136_59.8946	2037.0
L1	32_48.8790	136_04.8293	3896.0
L2	32_59.0539	136_00.5383	3335.0
L3	33_09.2387	135_56.2819	2040.0
L4	33_19.2681	135_51.9957	1636.0
L5	33_03.9544	136_14.1392	3074.0
L6	33_14.2214	136_09.7486	1776.0
L7	33_24.2691	136_05.3210	1637.0
L8	32_58.7512	136_31.9916	3378.0
L9	33_08.8824	136_27.5840	2368.0
L10	33_19.0290	136_23.0154	1987.0
L11	33_39.2884	136_14.3009	1836.0
L12	33_24.3996	136_37.8034	1999.0
L13	-	-	-
L14	33_10.7078	137_04.9135	3646.0

L15	33_39.0232	136_46.1418	2057.0

4. Notice on using:

This cruise report is a preliminary documentation as of the end of the cruise. It may not be corrected even if changes on content (i.e. taxonomic classifications) are found after publication. It may also be changed without notice. Data on the cruise report may be raw or not processed. Please ask the PI(s) for the latest information before using. Users of data or results of this cruise are requested to submit their results to Data Integration and Analysis Group (DIAG), JAMSTEC.