



## Kairei Cruise Report

KR16-10

2016FY “Research project for compound disaster mitigation on the great earthquakes and tsunamis around the Nankai trough region”, northern Ryukyu arc

Sep. 7, 2016 - Sep. 14, 2016

Japan Agency for Marine-Earth Science and Technology

(JAMSTEC)

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## 1. Cruise Information

(1) **Cruise ID:** KR16-10

(2) **Name of vessel:** Kairei

(3) **Title of the cruise:**

2016FY “Research project for compound disaster mitigation on the great earthquakes and tsunamis around the Nankai trough region”

(4) **Title of proposal**

Research project for compound disaster mitigation on the great earthquakes and tsunamis around the Nankai trough region

(5) **Cruise period:** 2016/9/7 – 2016/9/14

(6) **Ports of departure / call / arrival:** Yokosuka port (JAMSTEC) to Wakayama port

(7) **Research area:** Northern Ryukyu arc

(8) **Research Map**

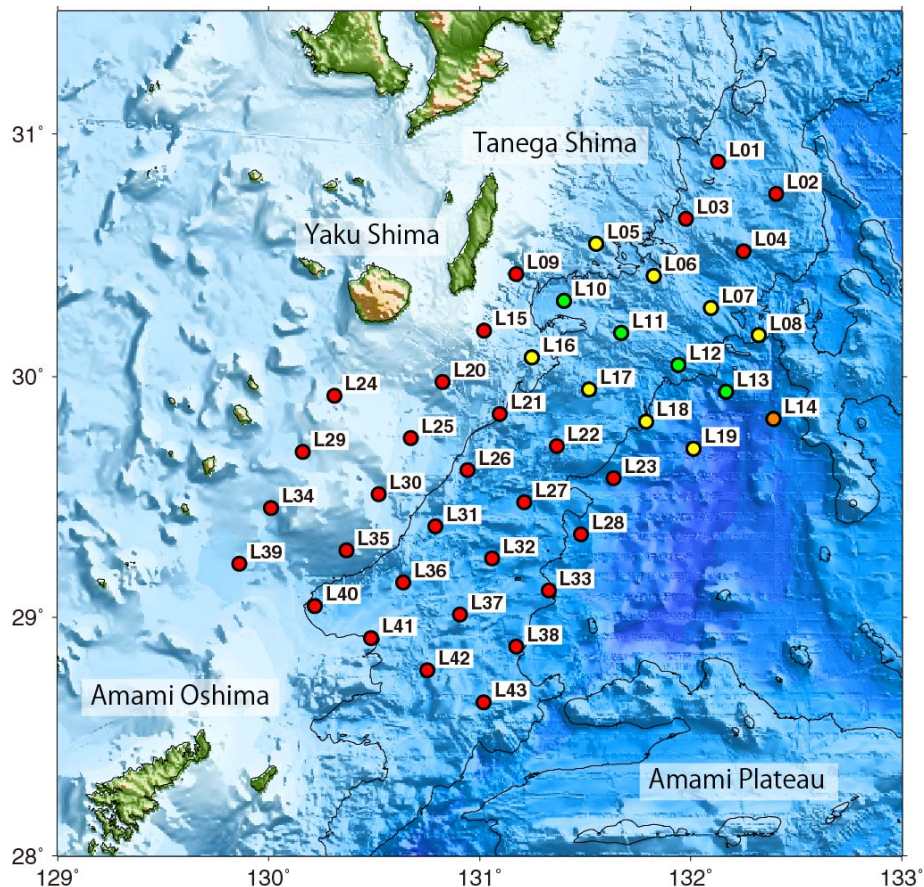


Figure 1. Map of study area. Yellow (L05-L08, L16-L19) and green (L10-L13) are OBSs equipped with a pressure logger TDR2050 and TD10000, respectively. At Orange site (L14), OBS is equipped with two pressure loggers (TDR2050 and TD10000). Red means OBSs with no pressure logger.

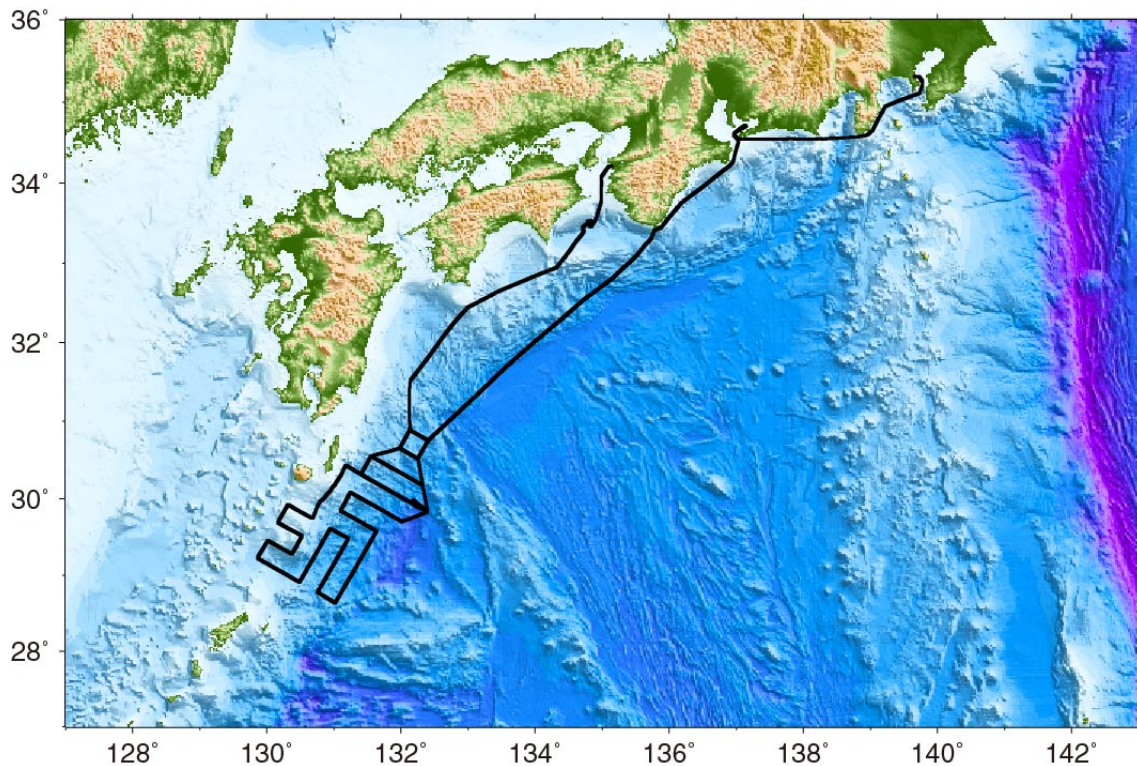


Figure 2. Ship track during KR16-10 cruise.

## 2. Researchers

(1) **Chief scientist [Affiliation]:** Tsutomu Takahashi [JAMSTEC]

(2) **Representative of the science party [Affiliation]:** Shuichi Kodaira [JAMSTEC]

(3) **Science party (List) [Affiliation, assignment etc.]**

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Narumi Takahashi [NIED/JAMSTEC]

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Ryuta Arai [JAMSTEC]

Yuka Kaiho [JAMSTEC]

Tetsuo No [JAMSTEC]

Mikiya Yamashita [JAMSTEC]

Yasushi Ishihara [JAMSTEC]

Takashi Tonegawa [JAMSTEC]

### **3. Overview of Observations**

#### **(1) Objective**

Seismic studies in Ryukyu subduction zone are usually based on the seismic data on islands, and therefore island distribution causes a significant restriction of estimations of seismicity and underground structures in this area. To elucidate details of seismicity, lithospheric structures and plate geometry of this arc, we conduct a series of passive and active seismic surveys around Ryukyu arc, as a part of research project “Research project for compound disaster mitigation on the great earthquakes and tsunamis around the Nankai trough region” funded by Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan. In 2015FY, we have conducted Multi Channel Seismic (MCS) surveys in northern part of Ryukyu arc that is adjacent to the mega-thrust fault zone of Nankai trough. MCS data clearly shows the reflected signals from the top of subducted Philippine Sea plate and many faults in the continental plate. In 2016 FY, we will conduct a passive seismic observation with 43 Ocean bottom seismograms in northern Ryukyu arc. During this KR16-10 cruise, we successfully deployed 43 OBSs. These OBSs will be recovered in KR16-18 cruise.

#### **(2) List of observation equipments**

##### **(a) OBS**

We deployed 43 OBSs in northern Ryukyu arc. These OBSs are “TOBS-24N, TOKYO SOKUSHIN CO., LTD” that is equipped with a 3-component short period geophone and hydrophone.

##### **(b) Pressure logger**

Pressure loggers were mounted on OBSs at 13 sites. These pressure loggers are “RBR TDR 2050, RBR Ltd.” and “RBR TD 10000, RBR Ltd.”.

##### **(c) Bathymetry, magnetic, and gravity observations**

Bathymetry, magnetic, and gravity data were recorded continuously during the survey. The bathymetry surveys on the R/V KAIREI used a multi-narrow beam echo sounder (Sea Beam 3012, SeaBeam Instruments). Gravity data was acquired by a shipboard gravimeter (BODESEEWERK KSS31, Fugro Co. Ltd.). The magnetic survey used a three-component magnetometer (SFG-1214, Tiera Technica Corporation).

### (3) Cruise log

2016/9/7 (Wed)	Departure from JAMSTEC Transit to the survey area Standby in Mikawa-bay due to a typhoon.
2016/9/8 (Thu)	Standby in Mikawa-bay due to a typhoon Transit to the survey area
2016/9/9 (Fri)	Transit to the survey area OBS deployment
2016/9/10 (Sat)	OBS deployment
2016/9/11 (Sun)	OBS deployment
2016/9/12 (Mon)	OBS deployment Calibration of OBS positions OBS recovery & re-deployment at site-L13 due to unstable acoustic communication
2016/9/13 (Tue)	Calibration of OBS positions Transit to Wakayama port
2016/9/14 (Wed)	Arrival at Wakayama port

Table 1. Cruise log of KR16-10

### (4) Research Information

#### (a) OBS deployment

43 OBSs were deployed in northern Ryukyu arc. OBSs at site L05-L08 and L16-L19 are equipped with a pressure logger (RBR TDR2050). OBSs at site L10-L14 are equipped with another pressure logger (TD10000). Site L14, a reference site for pressure observation, mounted two pressure loggers (TDR2050 and TD10000).

After OBS deployment, we calibrated OBS positions at sites L01-L14. During this calibration, we found that acoustic communication was unstable at site L13. We recovered and re-deployed the OBS on this site.

OBS No.	North Latitude		East Longitude		Depth(m)
	deg	min	deg	min	
L01	30	53.249	132	7.933	2246.0
L02	30	45.200	132	24.243	2994.0
L03	30	39.160	131	58.671	2281.0

L04	30	31.189	132	14.990	2932.0
L05	30	33.070	131	33.180	1901.0
L06	30	25.158	131	49.497	2080.0
L07	30	16.726	132	6.317	3438.0
L08	30	10.268	132	19.241	3894.0
L09	30	25.150	131	11.262	1304.0
L10	30	19.004	131	23.968	2196.0
L11	30	11.212	131	40.280	2430.0
L12	30	3.149	131	56.511	3561.0
L13	29	59.111	132	10.948	4221.0
L14	29	49.564	132	23.512	4808.0
L15	30	11.398	131	1.345	460.0
L16	30	4.783	131	14.824	1855.0
L17	29	56.821	131	31.082	2830.0
L18	29	48.841	131	47.294	3958.0
L19	29	42.115	132	0.766	5202.0
L20	29	58.684	130	49.546	737.0
L21	29	50.706	131	5.718	1981.0
L22	29	42.739	131	21.985	2984.0
L23	29	34.744	131	38.148	4574.0
L24	29	55.302	130	18.770	357.0
L25	29	44.709	130	40.453	870.0
L26	29	36.755	130	56.572	2803.0
L27	29	28.786	131	12.795	3898.0
L28	29	20.680	131	28.860	4279.0
L29	29	41.338	130	9.671	621.0
L30	29	30.754	130	31.358	873.0
L31	29	22.715	130	47.436	3210.0
L32	29	14.772	131	3.614	3884.0
L33	29	6.640	131	19.647	4060.0
L34	29	27.399	130	0.727	891.0
L35	29	16.872	130	22.266	1246.0
L36	29	8.714	130	38.309	3190.0
L37	29	0.760	130	54.424	2900.0
L38	28	52.616	131	10.383	3775.0

L39	29	13.455	129	51.631	1078.0
L40	29	2.801	130	13.095	2176.0
L41	28	54.735	130	29.173	2012.0
L42	28	46.760	130	45.164	3091.0
L43	28	38.601	131	1.158	2757.0

Table 2. List of OBS positions. Locations of L01-L14 were calibrated by acoustic communications, and others are the vessel positions at the time of OBS deployment.

**(c) Bathymetry, magnetic, and gravity observations**

Bathymetry, magnetic and gravity data are recorded throughout this cruise. Figure 3 shows the bathymetry data acquired during OBS deployment.



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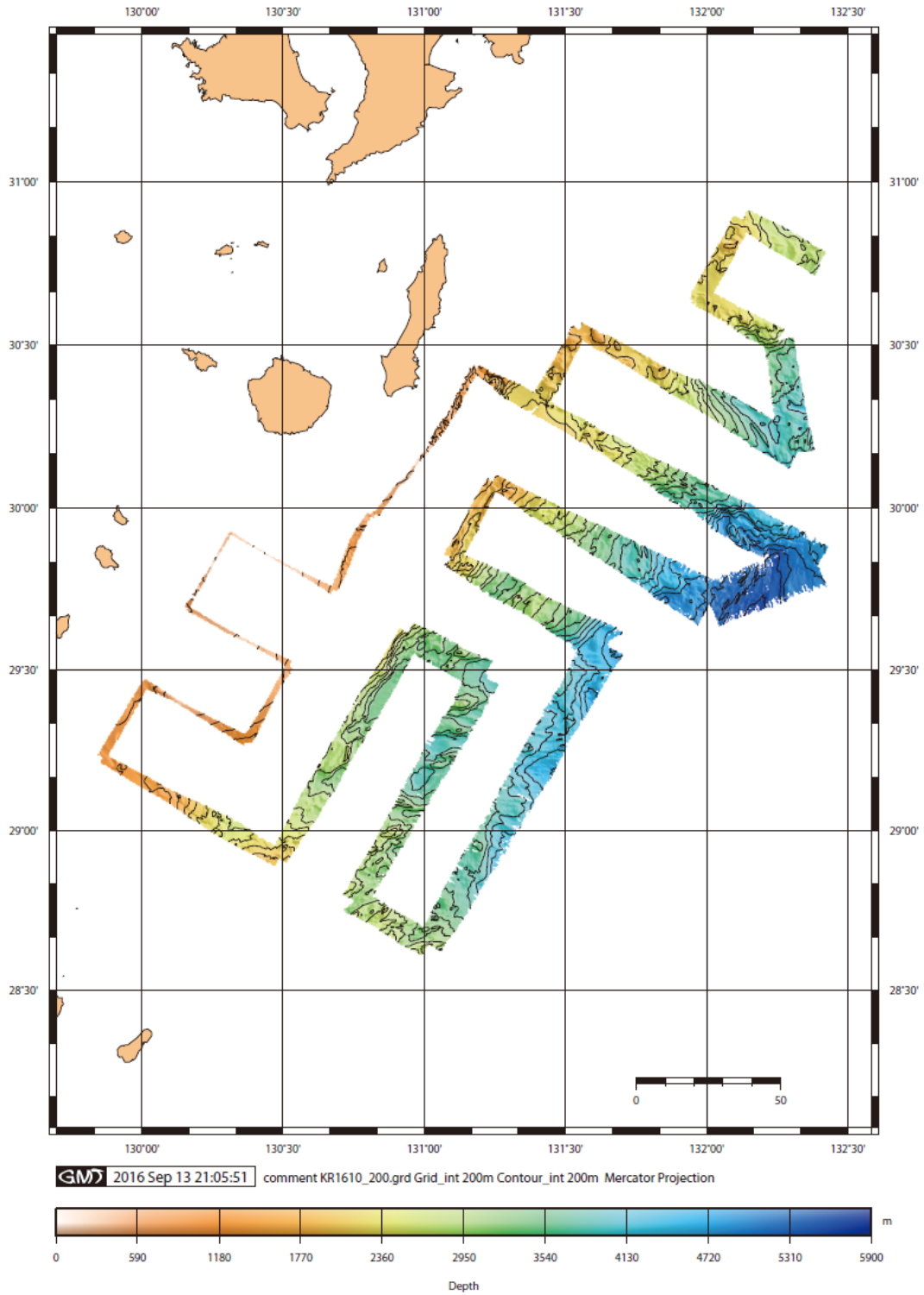


Figure 3. Bathymetry data recorded during KR16-10 cruise

#### **4. Notice on Using**

This cruise report is a preliminary documentation as of the end of the cruise.

This report may not be corrected even if changes on contents (i.e. taxonomic classifications) may be found after its publication. This report may also be changed without notice. Data on this cruise report may be raw or unprocessed. If you are going to use or refer to the data written on this report, please ask the Chief Scientists for latest information.

Users of data or results on this cruise report are requested to submit their results to the Data Management Group of JAMSTEC.

#### **Acknowledgement**

We thank the captain, Mr. Eiko Ukekura, and the crew of the R/V KAIREI, and the marine technician team (Nippon Marine Enterprises, Ltd.) for their efforts in OBS deployment and other geophysical data observation. We are grateful to participants of CEAT (Research and Development center for Earthquake and Tsunami) and MARITEC (Marine Technology Center) in JAMSTEC for their great support in this cruise. This cruise is funded by programs called “Research project for compound disaster mitigation on the great earthquakes and tsunamis around the Nankai trough region” which is part of the Special Coordination Funds for Promoting Science and Technology of the Ministry of Education, Culture, Sports, Science, and Technology. We used “The Generic Mapping Tools” by Wessel and Smith (1998) to construct the figures.

#### **References**

Wessel P, Smith WHF (1998) New improved version of generic mapping tools released, *Eos Trans. AGU*, 79(47), 579, doi: 10.1029/98EO00426.