



## Kairei Cruise Report

KR16-18

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

Dec. 17, 2016 - Dec. 26, 2016

Japan Agency for Marine-Earth Science and Technology

(JAMSTEC)

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## 1. Cruise Information

(1) **Cruise ID:** KR16-18

(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:** Dec. 17, 2016 – Dec. 26, 2016

(6) **Ports of departure / call / arrival:** Naha port to Kagoshima port

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

(8) **Research Map**

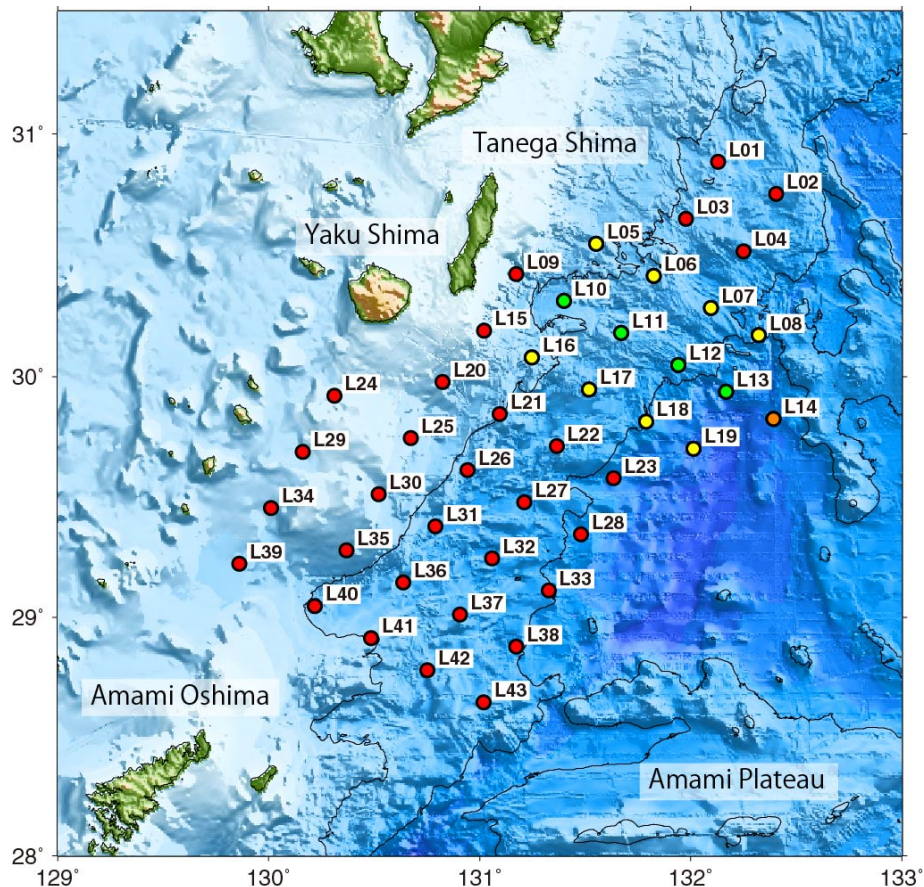


Figure 1. Map of study area. Yellow (L05-L08, L16-L19) and green (L10-L13) are OBSs equipped with a pressure logger TDR2050 and TD10000, respectively. At Orange site (L14), OBS is equipped with two pressure loggers (TDR2050 and TD10000). Red means OBSs with no pressure logger.

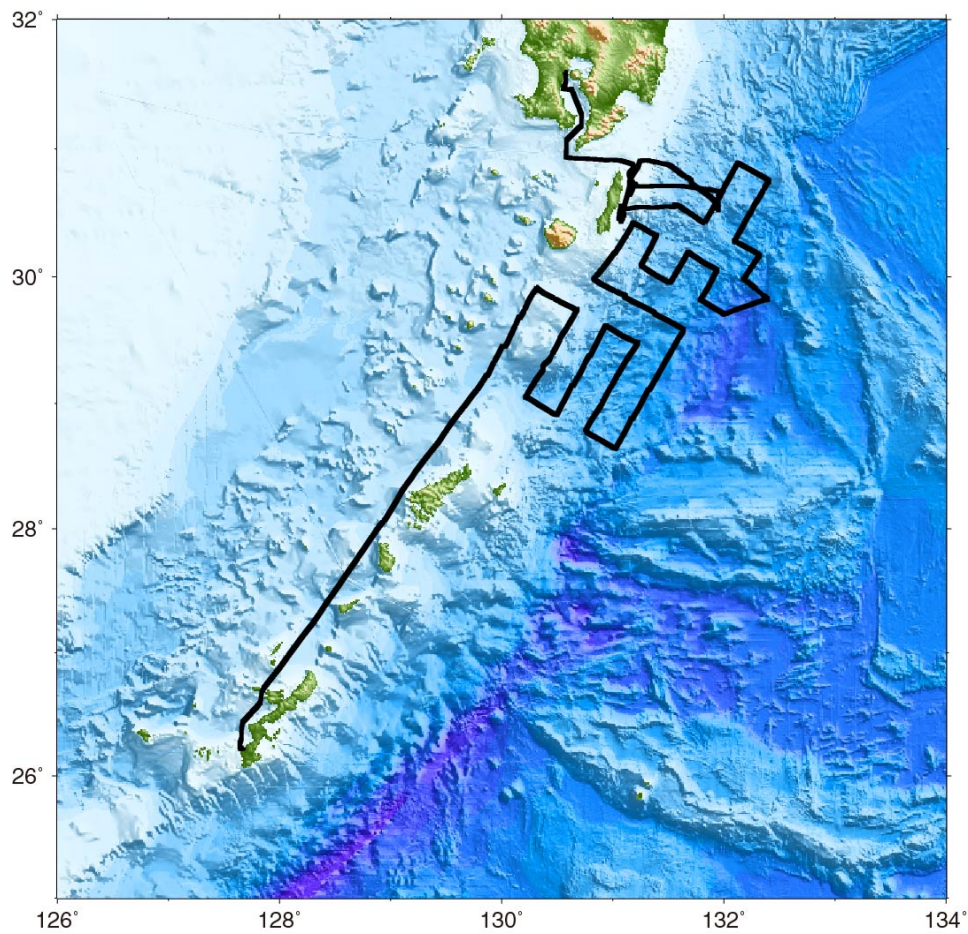


Figure 2. Ship track during KR16-18 cruise.

## 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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### **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. We have deployed 43 OBSs during KR16-10 cruise in Sep. 2016. In this KR16-18 cruise, we successfully recovered all OBSs.

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

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

We recovered 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 “RBR TDR 2050, RBR Ltd.” and “RBR TD 10000, RBR Ltd.” are mounted on OBSs to observe crustal deformations due to slow earthquakes.

##### **(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

2016/12/17 (Sat)	Departure from Naha port Transit to the survey area
2016/12/18 (Sun)	Calibration of OBS positions OBS recovery
2016/12/19 (Mon)	Calibration of OBS positions OBS recovery
2016/12/20 (Tue)	Calibration of OBS positions OBS recovery
2016/12/21 (Wed)	OBS recovery
2016/12/22 (Thu)	Standby off the east coast of Tanega-shima due to bad weather
2016/12/23 (Fri)	Standby off the east coast of Tanega-shima due to bad weather
2016/12/24 (Sat)	Standby off the east coast of Tanega-shima due to bad weather Transit to Survey area OBS recovery Transit to Kagoshima bay
2016/12/25 (Sun)	Transit to Kagoshima bay Standby in Kagoshima bay
2016/12/26 (Mon)	Arrival at Kagoshima port

Table 1. Cruise log of KR16-18

### (4) Research Information

#### (a) OBS recovery

We successfully recovered 43 OBSs that were deployed during KR16-10 cruise. Before OBS recovery, we calibrated OBS positions at sites L15-L43. 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).

OBS No.	North Latitude		East Longitude		Depth (m)
	deg	min	deg	min	
L01	30	53.249	132	7.933	2246
L02	30	45.200	132	24.243	2994
L03	30	39.160	131	58.671	2281
L04	30	31.189	132	14.990	2932
L05	30	33.070	131	33.180	1901
L06	30	25.158	131	49.497	2080
L07	30	17.082	132	5.737	3438
L08	30	10.268	132	19.241	3894
L09	30	25.150	131	10.947	1304
L10	30	19.015	131	23.961	2195
L11	30	11.212	131	40.280	2430
L12	30	3.149	131	56.511	3561
L13	29	59.111	132	10.948	4221
L14	29	49.564	132	23.512	4808
L15	30	11.302	131	1.267	470
L16	30	4.741	131	14.697	1838
L17	29	57.056	131	31.030	2787
L18	29	49.026	131	47.213	3892
L19	29	42.187	132	0.759	5122
L20	29	58.545	130	49.495	747
L21	29	50.688	131	5.664	1899
L22	29	42.952	131	22.067	2989
L23	29	35.078	131	38.272	4521
L24	29	55.189	130	18.761	355
L25	29	44.664	130	40.517	879
L26	29	36.290	130	56.416	2776
L27	29	28.678	131	13.036	3825
L28	29	20.842	131	29.021	4285
L29	29	41.273	130	9.821	567
L30	29	30.743	130	31.367	860
L31	29	22.682	130	47.578	3203
L32	29	14.555	131	3.459	3763

L33	29	6.608	131	19.777	3971
L34	29	27.286	130	0.694	990
L35	29	16.700	130	22.271	1259
L36	29	8.527	130	38.402	3158
L37	29	0.678	130	54.549	2882
L38	28	52.558	131	10.594	3675
L39	29	13.356	129	51.727	1069
L40	29	2.783	130	13.171	2152
L41	28	54.635	130	29.396	1968
L42	28	46.587	130	45.399	3064
L43	28	38.428	131	1.403	2719

Table 2. List of OBS positions. Locations of L01-L14 were calibrated by acoustic communications during KR16-10 cruise, and others were calibrated during KR16-18 cruise.

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

Bathymetry, magnetic and gravity data are recorded throughout this 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. Takafumi Aoki, and the crew of the R/V KAIREI, and the marine technician team (Nippon Marine Enterprises, Ltd.) for their efforts in OBS recovery 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 a program “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.