

Cruise summary

1. Cruise Information:

(1) **Cruise number, Ship name:** KR15-11, *R/V KAIREI*

(2) **Title of the cruise:** 2015FY “Research project for compound disaster mitigation on the great earthquakes and tsunamis around the Nankai trough region” and “Integrated Research Project on Seismic and Tsunami Hazards Around the Sea of Japan”

(3) **Chief Scientist [Affiliation]:** Tsutomu TAKAHASHI (Leg 1), Tetsuo NO (Leg 2-4) [JAMSTEC]

(4) **Representative of Science Party [Affiliation]:** Shuichi KODAIRA [JAMSTEC],

(5) **Title of proposal:**

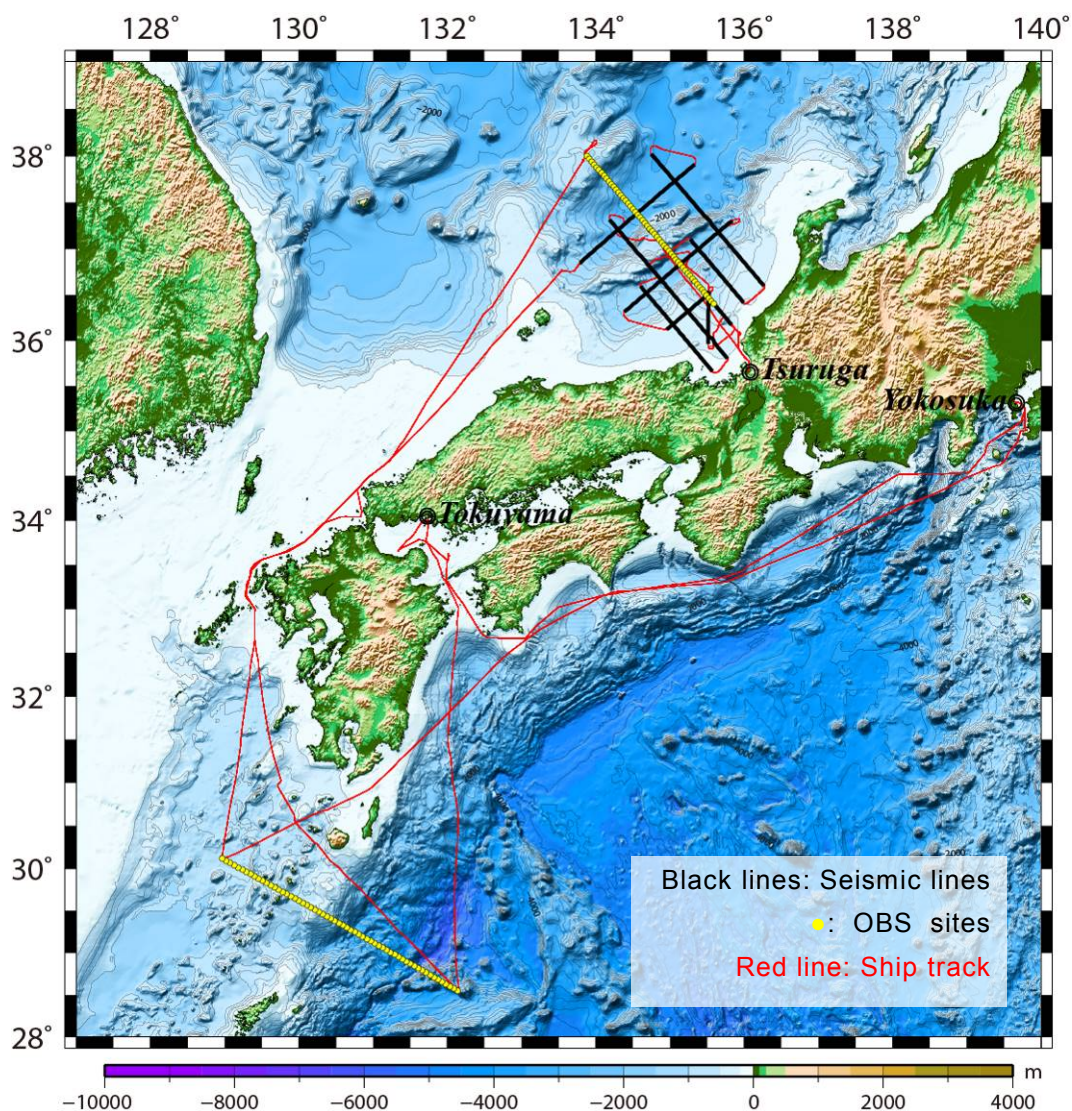
a) Research project for compound disaster mitigation on the great earthquakes and tsunamis around the Nankai trough region

b) Integrated Research Project on Seismic and Tsunami Hazards Around the Sea of Japan

(6) **Cruise period, Port call:** 2015/7/22 - 8/22, Yokosuka port (JAMSTEC) to Yokosuka port (JAMSTEC)

(7) **Research Area:** Off Nansei Islands, Japan Sea

(8) **Research Map:**



2. Overview of Observation:

(1) Objectives:

a) Off Nansei Islands:

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 launched 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 2013FY, we have conducted a seismic survey in southern part of Ryukyu arc. This observation successfully clarified high seismicity in the crust, the splay fault near the fault zone of the 1771 Yaeyama earthquake, and precise geometry of subducting Philippine Sea plate. In 2015FY and 2016FY, we will conduct seismic surveys in northern part of Ryukyu arc that is adjacent to the mega-thrust fault zone of Nankai trough. This study conducts a wide-angle refraction survey in northern Ryukyu arc to clarify the plate geometry and seismic velocity structure.

b) Japan Sea:

The relationship between crustal structure and the earthquakes that have occurred along the eastern margin of the Japan Sea has been revealed recently by seismic survey as part of the research project “Multidisciplinary research project for construction of fault model in the high strain rate zone” (Sato et al., 2014; No et al., 2014). However, many areas in the Japan Sea have not yet been conducted to seismic survey for study of the crustal structure. Therefore, we have participated in “Integrated Research Project on Seismic and Tsunami Hazards Around the Sea of Japan” conducted by the MEXT of Japan; in particular, we have performed seismic surveys from the R/V *KAIKEI* in the Japan Sea since 2014. In August 2015, we conducted a marine seismic survey to study the crustal structure around the area off Fukui and Kyoto. The survey covered the areas from the continental shelf to the Yamato Basin and the Kita-Oki Bank.

(2) List of observation instruments:

1) MCS survey (Japan Sea):

We conducted a MCS survey around the areas off Fukui and Kyoto in the Japan Sea using the R/V *KAIKEI*. MCS data were acquired along 9 lines with a total length of approximately 1358.9 km. Some seismic lines were crooked to avoid the many fishing operations and equipment in the survey area. To obtain high-quality MCS data, we shot an air gun array at a spacing of 50 m, which corresponds to a spacing of 20 to 30 s depending on the vessel speed (average of 4 kn). The tuned air gun array had a maximum capacity of 7,800 cu.in. (approximately 130 l) and consisted of 32 air guns. The standard air pressure was 2,000 psi (approximately 14 MPa). During the experiment, the air gun array depth was maintained at 10 m below the sea surface. During the shooting, we towed a 444-channel hydrophone streamer cable with a group interval of 12.5 m. The towing depth of the streamer cable was maintained at 12 m below the sea surface by depth controllers. The sampling rate and record length were 2 ms and 16 s, respectively.

2) Refraction survey using OBSs:

We deployed 54 OBSs along the line SJ15FK (Japan Sea) and 60 OBSs along the line RK01 (Off Nansei Islands). Seismic survey of the line RK01 could not be conducted due to typhoons. The line SJ15FK performed a refraction survey using an airgun array with a shot spacing of 200 m. The airgun array in the seismic refraction/reflection survey by the OBSs was placed in almost the same configuration as that in the MCS survey.

3) Bathymetry, magnetic, and gravity observations:

Bathymetry, magnetic, and gravity data were recorded continuously during the survey.