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R/V Kaiyo Cruise Report

KY11-E05

Rapid response survey after the 2011 Tohoku earthquake in the Japan Trench

Oct. 21, 2011-Nov. 11, 2011

Japan Agency for Marine-Earth Science and Technology

(JAMSTEC)

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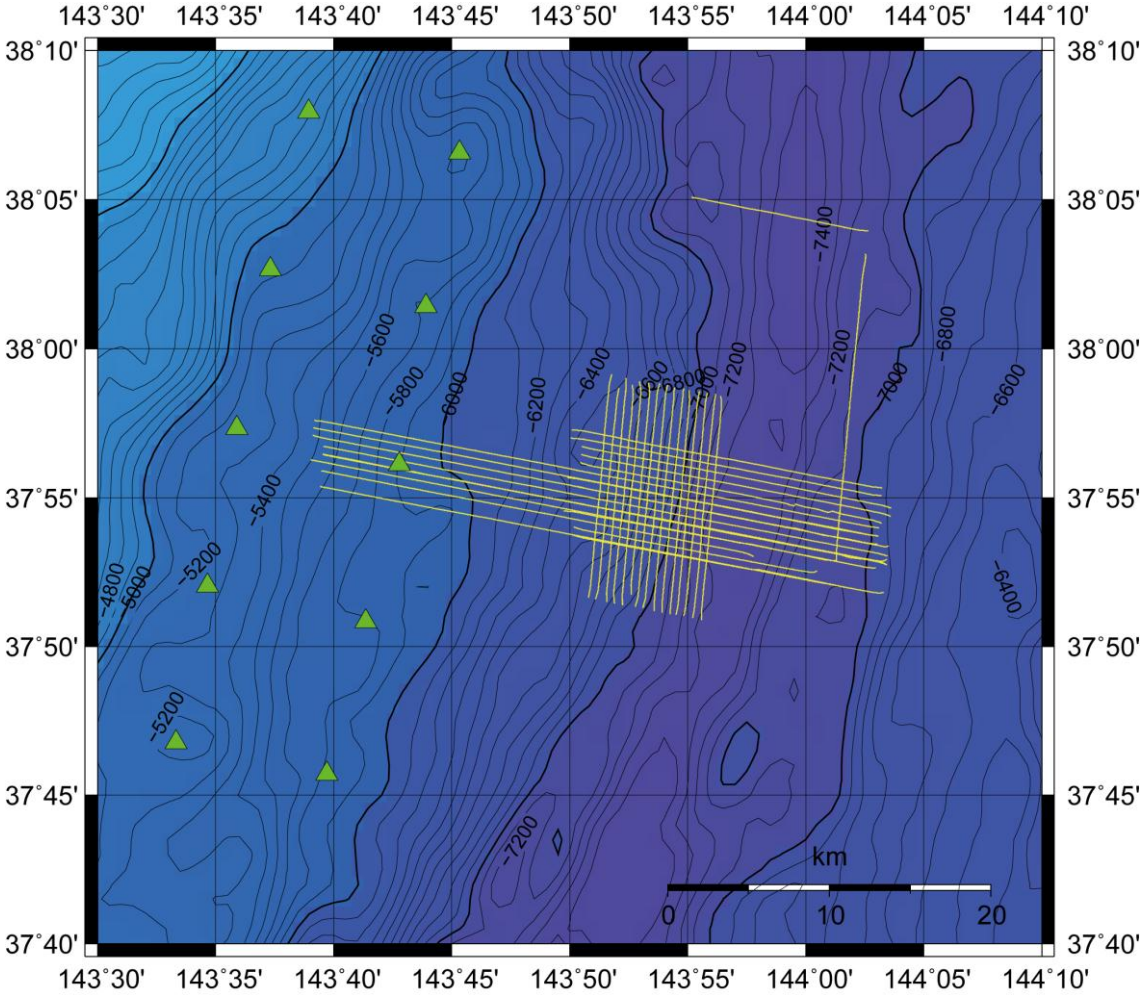
1. Cruise Information

- Cruise ID: KY11-E05
- Name of vessel: R/V Kaiyo
- Title of the cruise: Rapid response survey after the 2011 Tohoku earthquake in the Japan Trench
- Cruise period: Oct. 21, 2011 – Nov. 11, 2011
- Ports of call: Yokosuka – Yokosuka
- Research area: Japan Trench off Miyagi
- Research Map



2. Researchers

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3. Overview of Observation

- Background and objectives

  The 2011 off the Pacific coast of Tohoku Earthquake, which occurred on 11th March , 2011, was one of the largest earthquakes (Mw =9.0) observed in Japan. This earthquake brought serious damage not only by its strong grand motion but also by devastating tsunamis. To understand the mechanisms of this earthquake and tsunami generation, it is indispensable to investigate the structure beneath the seafloor in detail. After the earthquake, JAMSTEC has conducted the rapid response seismic surveys off Miyagi area, which is recognized as the source area of the large tsunami pulse. These surveys have been carried out using R/V Kairei, with larger volume of sounding source array and a long streamer cable, to mainly focus on the deeper structure, e.g. the plate boundary underling beneath the landward slope of the Japan trench. To elucidate the shallower structure, high-resolution survey is necessary. The

purpose of the KY11-E05 cruise is to obtain high-resolution seismic images of shallower part beneath the inner (landward) slope to trench axis of the Japan trench off Miyagi. We used "portable" multichannel seismic reflection system which consist of a 192-channel, 1200 m streamer cable and cluster gun system with total volume of 320 $inch^3$ in this survey. A gridded survey lines with ~500 m spacing were planned and these data will contribute to the site selection of the IODP drilling expedition to the fault ruptured during the Tohoku earthquake.

We also conducted the bathymetric survey on the seismic lines using SeaBeam 2112, XCTD casts, and ADCP observation. Ten Ocean bottom seismometers deployed in August were also recovered during this cruise.

- Observations
  - Recovery of OBSs
    - ✧ Ten OBS (green triangles on the map), which were deployed in August 2011, were recovered in the Japan Trench area.
  - High resolution multichannel seismic reflection survey
    - ✧ We shot cluster gun array with 320 $inch^3$ of total volume along 32 survey lines (yellow lines on the map). A 192-channel streamer cable (6.25 m/channel) was towed during the shooting.
  - Bathymetry survey
    - ✧ Bathymetry data was collected using SeaBeam 2112 system onboard along the seismic survey lines.
  - XCTD observation
    - ✧ Two casts of XCTD were conducted during the cruise.
  - ADCP observation
    - ✧ ADCP data were collected during the cruise.

4. List of Observation Instruments

- Ocean Bottom Seismometer (OBS)
- 192-channel hydrophone streamer cable
- Cluster gun
- SeaBeam2112
- Expendable Conductivity, Temperature and Depth (XCTD)
- Acoustic Doppler Current Profiler (ADCP)

5. Cruise Log

Date	Remarks
2011/10/21	Leave from JAMSTEC (Yokosuka)
2011/10/22	Transit, Stay off Kinkasan
2011/10/23	OBS recovery
2011/10/24	OBS recovery
2011/10/25	MCS system maintenance
2011/10/26	Stay off Kinkasan
2011/10/27	MCS survey (HD25)
2011/10/28	MCS survey (HD27, HD25A, HD28A, HD21A)
2011/10/29	MCS survey (HD24A), MCS system maintenance
2011/10/30	MCS system maintenance, MCS survey (HD26B, HD29B)
2011/10/31	MCS system maintenance
2011/11/1	Stay off Kinkasan
2011/11/2	MCS survey (HD29B, HD25B, HD28B, HD32B)
2011/11/3	MCS survey (HD27B, HD31B, HD34B, HD30B, HD33B, HD27B)
2011/11/4	MCS survey (HS32B, HS36B, HS31B, HS35B, HS30B, HS34B)
2011/11/5	MCS survey (HS38B, HS37B, HS41B, HS44B, HS40B, HS43B, HS39B)
2011/11/6	MCS survey (HS42B, HS45B, HD23B)
2011/11/7	Stay off Kinkasan
2011/11/8	MCS survey (HD65B)
2011/11/9	MCS survey (HD24B, HD21B), MCS system maintenance
2011/11/10	Transit
2011/11/11	Arrival at JAMSTEC (Yokosuka)

6. Research Information

- OBS recovery position

Site	Recovery			
	Time	Vessel position		
	UTC	Lat(N)	Lon(E)	Depth(m)
JMY01	2011/10/23 19:33:20	38_07.9504	143_38.9430	-
JMY02	2011/10/23 22:32:00	38_06.5793	143_45.3383	5489.0
JMY03	2011/10/23 17:17:41	38_02.6625	143_37.3118	5052.0

JMY04	2011/10/24 01:21:05	38_01.4332	143_43.9004	5685.0
JMY05	2011/10/23 14:22:01	37_57.3456	143_35.8923	5218.0
JMY06	2011/10/24 04:02:03	37_56.1242	143_42.7773	5905.0
JMY07	2011/10/23 11:55:32	37_52.0502	143_34.6494	5285.0
JMY08	2011/10/24 06:44:07	37_50.8418	143_41.3503	5824.0
JMY09	2011/10/23 09:31:07	37_46.7875	143_33.3149	5112.0
JMY10	2011/10/24 10:19:50	37_45.7293	143_39.7108	5880.0

- MCS survey lines

LINE NAME	VESSEL POSITION (First and last good shot)	
	Lat.	Lon.
HD21A_0	37_51.82433'N	144_02.81567'E
	37_55.38317'N	143_39.35767'E
HD21B_0	37_52.63917'N	143_57.49517'E
	37_53.76283'N	143_50.08733'E
HD22B_0	37_52.52550'N	144_00.03283'E
	37_54.03617'N	143_50.11550'E
HD23B_0	37_53.21117'N	143_57.37550'E
	37_55.91950'N	143_39.41083'E
HD24A_0	37_56.18633'N	143_39.51500'E
	37_52.61733'N	144_03.02583'E
HD24B_0	37_54.56383'N	143_50.24317'E
	37_53.43700'N	143_57.68000'E
HD25_0	37_53.14800'N	144_01.37467'E
	37_56.46700'N	143_39.46517'E
HD25A_0	37_52.89833'N	144_02.97833'E
	37_56.46350'N	143_39.46517'E
HD25B_0	37_52.89833'N	144_02.97883'E
	37_54.83717'N	143_50.22050'E
HD26B_0	37_53.16800'N	144_03.00733'E
	37_56.73500'N	143_39.51783'E
HD27_0	37_56.98983'N	143_39.59450'E
	37_53.94867'N	143_59.69567'E
HD27_1	37_53.70467'N	144_01.25033'E
	37_53.42600'N	144_03.10983'E

HD27B_0	37_55.37300'N	143_50.35267'E
	37_55.25983'N	143_51.10733'E
HD27B_3	37_54.37333'N	143_56.90800'E
	37_54.02083'N	143_59.21833'E
HD27B_4	37_53.86933'N	144_00.27533'E
	37_53.42883'N	144_03.11033'E
HD27B_5	37_53.51500'N	144_02.55833'E
	37_55.38917'N	143_50.27833'E
HD28A_0	37_57.26783'N	143_39.62267'E
	37_53.69733'N	144_03.13817'E
HD28B_0	37_55.64217'N	143_50.38017'E
	37_53.70217'N	144_03.13967'E
HD29B_0	37_57.53583'N	143_39.64850'E
	37_55.58983'N	143_52.57000'E
HD29B_1	37_55.90933'N	143_50.43217'E
	37_53.97033'N	144_03.16683'E
HD30B_0	37_54.30600'N	144_02.76817'E
	37_54.56600'N	144_01.08633'E
HD30B_1	37_54.65533'N	144_00.48267'E
	37_54.77850'N	143_59.65367'E
HD30B_2	37_54.87067'N	143_59.05033'E
	37_56.19383'N	143_50.38600'E
HD31B_0	37_54.52500'N	144_03.14767'E
	37_56.46333'N	143_50.41200'E
HD32B_0	37_54.79150'N	144_03.17567'E
	37_56.73700'N	143_50.43917'E
HD33B_0	37_56.99317'N	143_50.54200'E
	37_55.05417'N	144_03.28000'E
HD34B_0	37_57.25900'N	143_50.59417'E
	37_55.31683'N	144_03.30600'E
HD65B_0	38_05.01283'N	143_55.65283'E
	38_03.93100'N	144_02.72383'E
HS30B_0	37_52.05150'N	143_50.60817'E
	37_59.23233'N	143_51.48300'E
HS31B_0	37_52.00117'N	143_50.94117'E

	37_59.18067'N	143_51.81083'E
HS32B_0	37_51.95017'N	143_51.28033'E
	37_58.72783'N	143_52.10467'E
HS33B_0	37_58.61650'N	143_52.43550'E
	37_51.43667'N	143_51.55550'E
HS34B_0	37_58.38517'N	143_52.74583'E
	37_51.38500'N	143_51.89833'E
HS35B_0	37_58.51583'N	143_53.10100'E
	37_51.33550'N	143_52.23167'E
HS36B_0	37_58.46417'N	143_53.44017'E
	37_51.68733'N	143_52.61383'E
HS37B_0	37_51.71667'N	143_52.96233'E
	37_58.87517'N	143_53.84150'E
HS38B_0	37_51.64533'N	143_53.29233'E
	37_58.82633'N	143_54.17233'E
HS39B_0	37_58.31183'N	143_54.44667'E
	37_51.13150'N	143_53.57233'E
HS40B_0	37_58.26033'N	143_54.78383'E
	37_51.08033'N	143_53.90983'E
HS41B_0	37_58.20983'N	143_55.12200'E
	37_51.03017'N	143_54.23950'E
HS42B_0	37_51.44300'N	143_54.63750'E
	37_58.62333'N	143_55.50900'E
HS43B_0	37_51.39217'N	143_54.97383'E
	37_58.57200'N	143_55.84850'E
HS44B_0	37_51.34100'N	143_55.30867'E
	37_58.52133'N	143_56.18817'E
HS45B_0	37_58.00583'N	143_56.46567'E
	37_50.82617'N	143_55.59000'E
HS61B_0	38_02.77617'N	144_02.51400'E
	37_52.77267'N	144_01.29517'E

7. 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 Scientist 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.