

Cruise Summary

1. Cruise Information

Cruise number:

KR10-12

Ship name:

R/V KAIREI

Title of the cruise:

2010 Deep Sea Research

Research cruise with KAIREI

Chief scientist:

Makoto YAMANO Earthquake Research Institute, University of Tokyo

Representative of science party:

Makoto YAMANO Earthquake Research Institute, University of Tokyo

Title of proposal:

S10-59

Studies on the thermal structure and the water distribution in the upper part of the Pacific plate subducting along the Japan Trench

Cruise period:

November 14, 2010 – November 29, 2010

Port call:

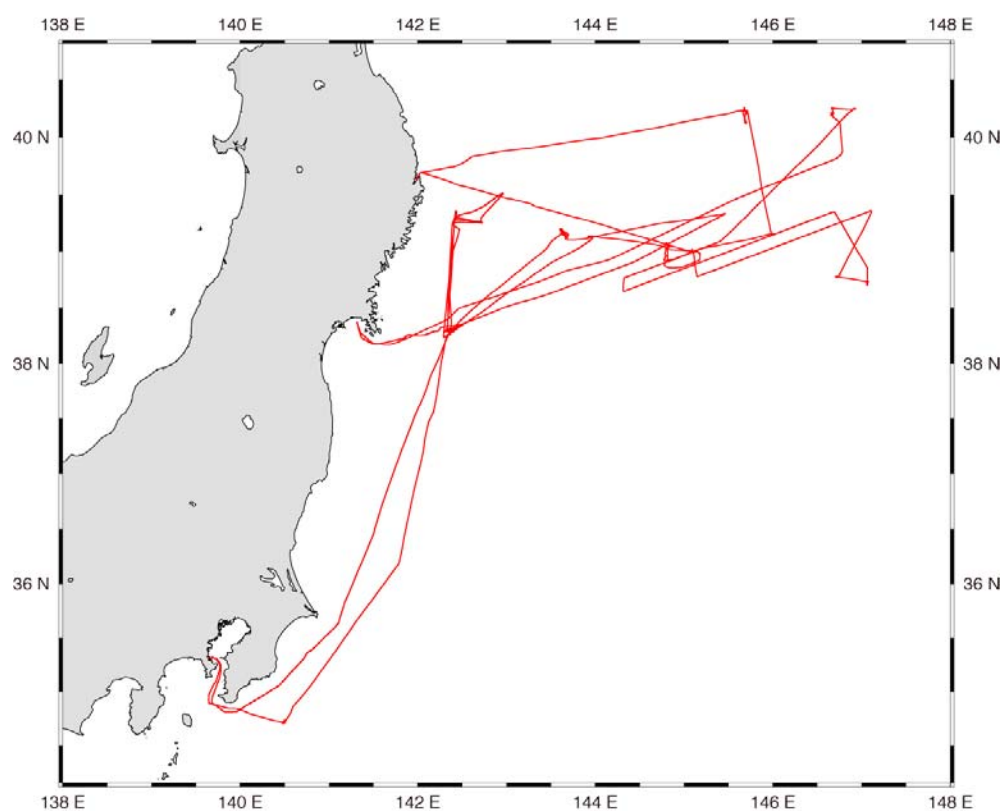
2010 Nov. 14 Dept. from Yokosuka (JAMSTEC)

Nov. 29 Arriv. at Yokosuka (JAMSTEC)

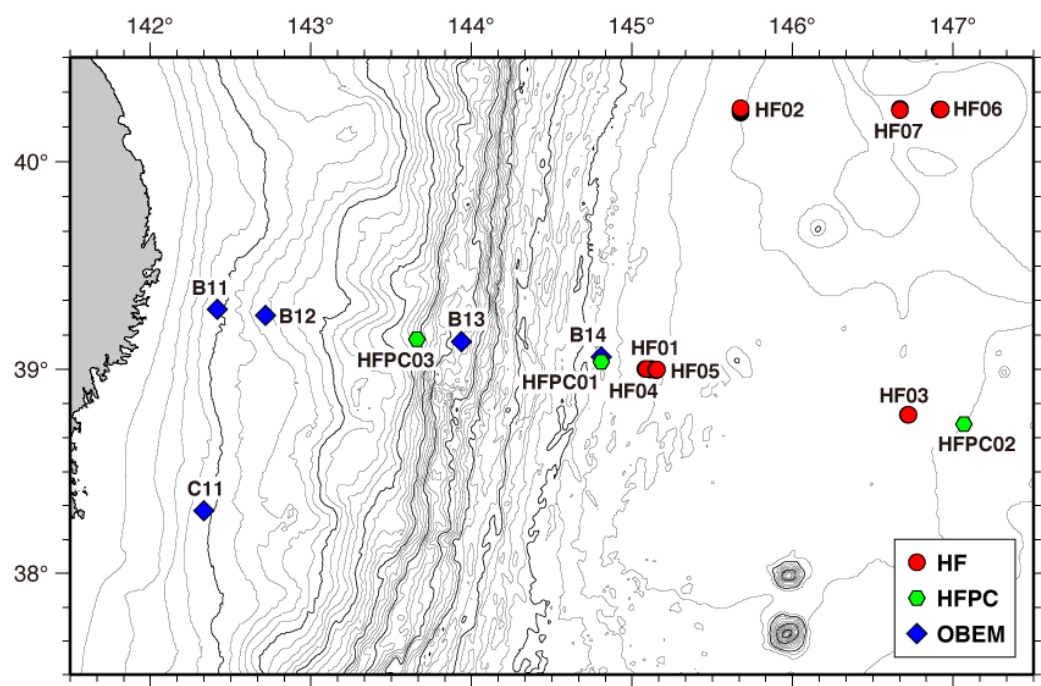
Research area:

Japan Trench area and a station off the Boso Peninsula

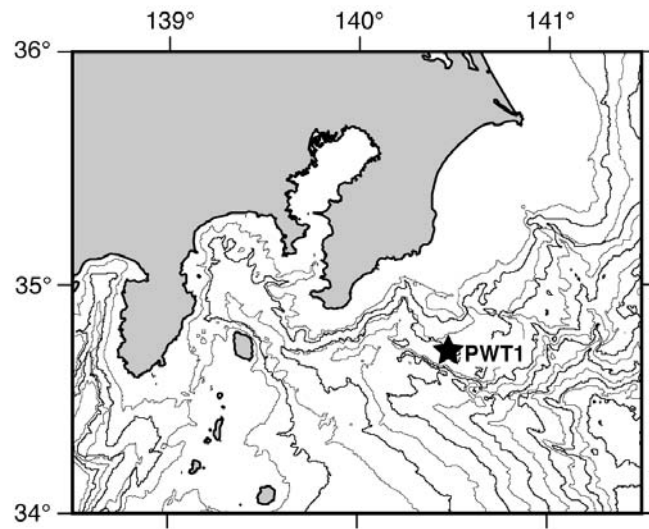
Research map:



Ship track of KR10-12 cruise.



Measurement and sampling stations in the Japan Trench area.



Measurement station off the Boso Peninsula.

2. Overview of Observation

Overview of observation

[Research objectives]

We intend to clarify the temperature structure and the water distribution in the upper part of the Pacific plate subducting beneath the northeast Japan arc through heat flow measurements and electromagnetic surveys in the Japan Trench area. Based on the obtained results, we will investigate intra-plate volcanism on the Pacific plate, heat transfer and water movement in the oceanic crust associated with development of normal faults on the seaward slope of the Japan Trench. We also examine relation between the temperature structure and water distribution along the subducting plate boundary and mechanical properties of the seismogenic zone.

[Research items]

(1) Heat flow measurement

Measurement of temperature profiles in surface sediment with ordinary deep-sea heat flow probes for determination of terrestrial heat flow.

(2) Long-term temperature monitoring on the seafloor

Long-term monitoring of the bottom water temperature using a pop-up type instrument for evaluation of influence of water temperature variation on heat flow measurement.

(3) Sediment core sampling with heat flow measurement (HFPC)

Sampling of surface sediments with a piston corer and heat flow measurement at the same

site using temperature sensors mounted on the core barrel.

(4) Ocean-bottom electromagnetic survey

Mesurement of electromagnetic fields on the seafloor with high-frequency ocean-bottom electromagnetometers (HF-OBEMs) and long-term OBEMs (LT-OBEMs) for magnetotelluric survey.

(5) Bathymetry and geophysical survey

Bathymetry mapping with a multi narrow beam system, gravity measurement, and measurements of total magnetic field and geomagnetic vector.

[Research results]

(1) Heat flow measurement

We carried out heat flow measurements at ten sites, seven with the deep-sea heat flow probe and three with the HFPC. Nine of the sites were located on the seaward side of the Japan Trench and the other one was on the landward side. In measurements with the deep-sea heat flow probe, multiple penetrations were made for examining local variability of heat flow. At one site with HFPC, we could not obtain sediment temperature profile data since the corer fell down right after hitting the bottom. Temperature gradient data of good quality were obtained at the other nine sites.

(2) Long-term temperature monitoring on the seafloor

At a station off the Boso Peninsula, we recovered one pop-up water temperature measurement system (PWT), which monitor variation of the bottom water temperature. Temperature data of good quality was obtained for 15 months since August 2009.

(3) Piston core sampling

Sediment core samples were collected at three stations using the heat flow piston coring system, along the core barrel of which seven temperature data loggers were mounted. The obtained core samples are 155 to 336 cm long. Visual description and photographing of the cores were conducted on board as well as measurements of physical properties such as magnetic susceptibility, thermal conductivity and shear strength. Additional physical property measurements and geochemical analysis of the samples will be made on shore.

(4) Ocean-bottom electromagnetic survey

We deployed HF-OBEMs at three stations on the landward side of the Japan Trench and LT-OBEMs at two stations, one on the landward side and the other on the seaward side. The HF-OBEMs were recovered during the cruise and data for 11 days were successfully obtained. The LT-OBEM will be recovered in April 2011 or later.