

Cruise Summary

1. Cruise Information

Cruise number:

KY13-16

Ship name:

R/V KAIYO

Title of the cruise:

Thermal structure of the Philippine Sea plate subducting along the Nankai Trough and its relation to seismic activity

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:

Thermal structure of the Philippine Sea plate subducting along the Nankai Trough and its relation to seismic activity

Cruise period:

October 27, 2013 – November 6, 2013

Port call:

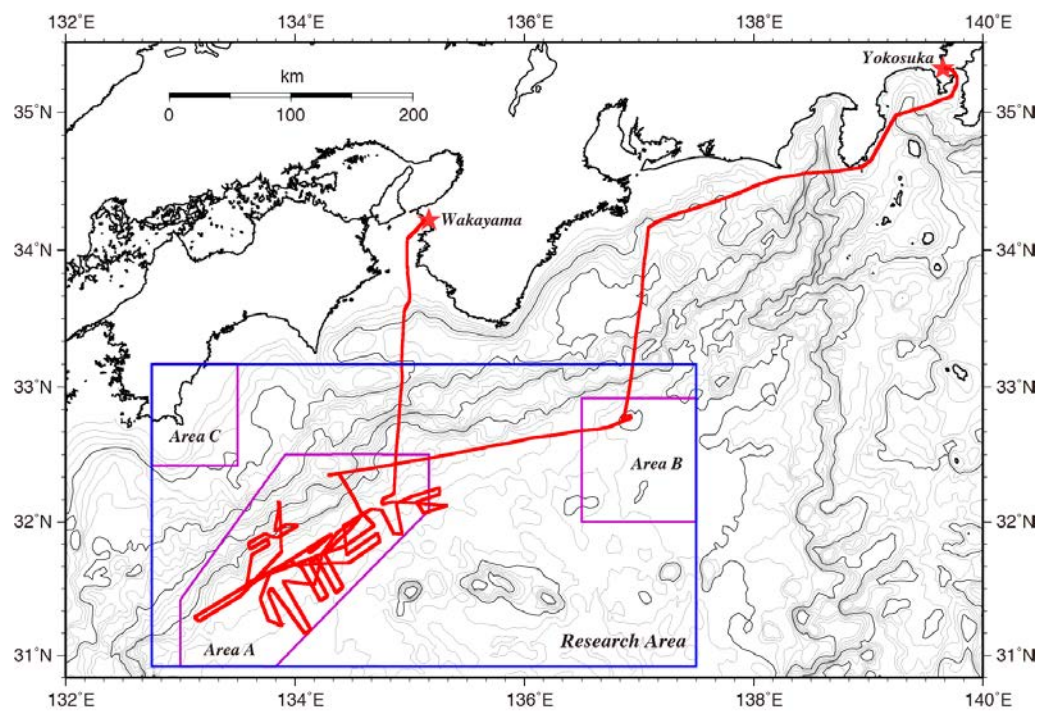
2013 Oct. 27 Dept. from Yokosuka

Nov. 6 Arriv. at Wakayama

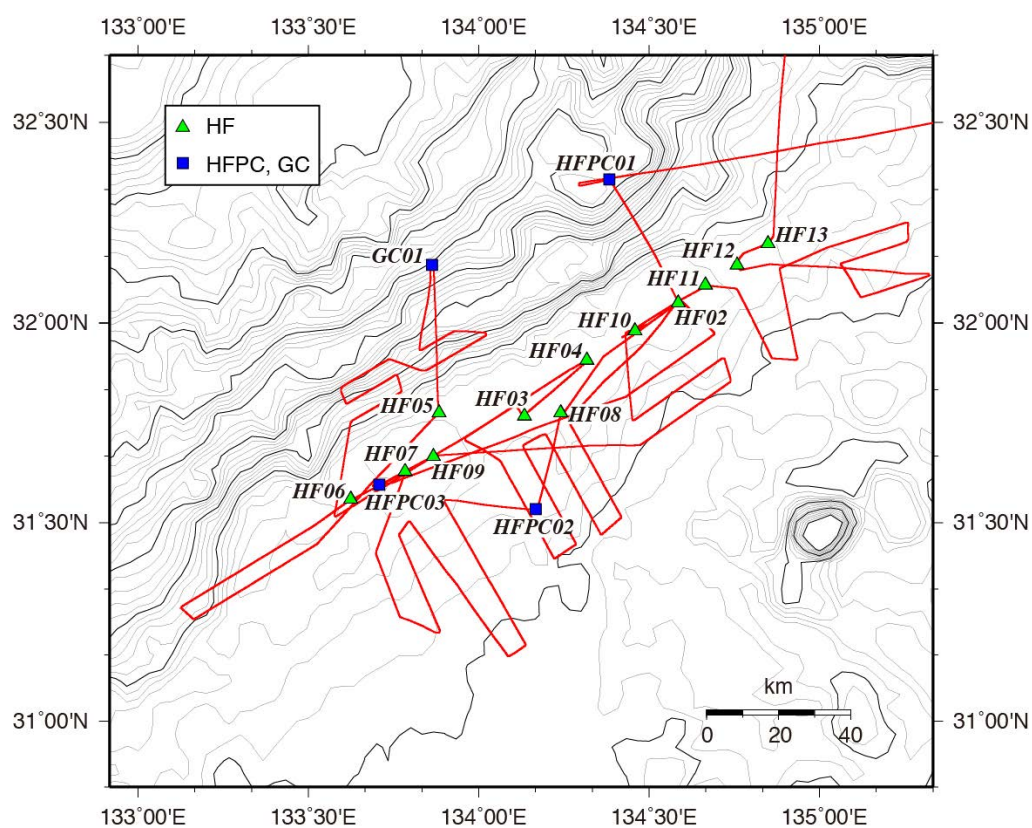
Research area:

Nankai Trough and Shikoku Basin

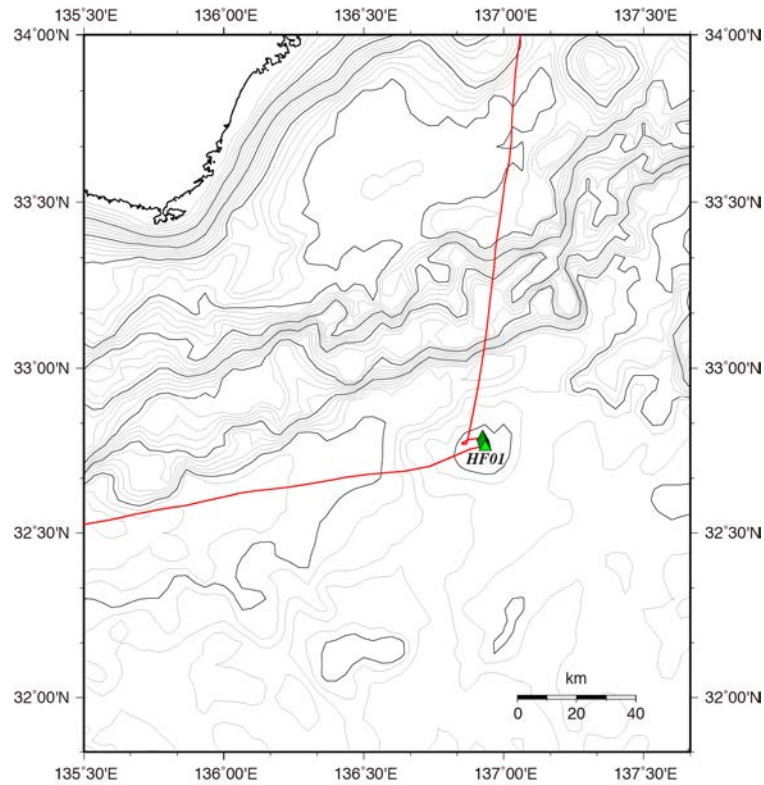
Research maps:



Research area and ship track of KY13-16 cruise



Measurement and sampling stations in the area A.



Measurement stations in the area B.

2. Overview of Observation

Overview of observation

[Research objectives]

We conduct heat flow measurements in the Nankai Trough off Shikoku and the Kii Peninsula and in the northernmost part of the Shikoku Basin. Detailed measurements on the floor of the Nankai Trough allow us to reveal variation of heat flow along the trough axis. We can then discuss a possible relationship between the heat flow distribution on the trough floor and the structure of the subducting Shikoku Basin crust. In the Shikoku Basin, we examine the influence of a basement high (Kashinozaki Knoll) on the heat flow distribution. Comparing the obtained data with results of numerical modeling, we evaluate heat transfer by pore fluid flow in the upper part of the oceanic crust and investigate how seismic activity and deformation process in the Nankai subduction zone is related to the temperature structure around the subduction plate interface, which may be controlled by the structure of the subducting plate. Sediment core samples taken for thermal property measurements are used for studies on the past variation of the Kuroshio current as well.

[Research items]

(1) Heat flow measurement (HF)

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

(2) Sediment core sampling (HFPC, GC)

Sampling of surface sediments with a piston corer and heat flow measurement at the same site using small temperature recorders mounted on the core barrel, or simple sediment sampling with a gravity corer.

(3) Bathymetry survey

Bathymetry mapping with a multi narrow beam system.

[Research results]

(1) Heat flow measurement

We carried out heat flow measurements at sixteen sites, thirteen with the deep-sea heat flow probe and three with the HFPC. Thirteen of them were located on the floor of the Nankai Trough off Shikoku, two were in the northernmost part of the Shikoku Basin, and one was on the Nankai accretionary prism off Shikoku. In measurements with the deep-sea heat flow probe, multiple penetrations were made for examination of local variability in heat flow. The probe or the core barrel successfully penetrated into sediment 27 times in total out of 33 trials. We could obtain temperature gradient data of good quality at stations on the trough floor.

(2) Sediment core sampling

Core sampling was attempted at three stations using the heat flow piston coring system and at one station with a gravity corer. We obtained 2.6 m and 3.6 m long core samples at two stations on the accretionary prism off Shikoku, a 3.0 m long sample on the trough floor, and a 0.5 m sample in the northernmost part of the Shikoku Basin. Visual description and photographing of the sample were conducted on board as well as measurements of thermal properties and color reflectance. Geochemical and micropaleontological analyses will be made on shore.

(3) Bathymetry survey

We conducted multi beam echo sounding surveys in the Nankai Trough area between 133°E and 135.5°E to fill out gaps in the existing multi narrow beam bathymetry data.