

Cruise summary

1. Cruise information

Cruise ID: YK10-09

Name of vessel: Yokosuka

Title of cruise: Nankai Trough, off Kumano

Chief Scientist: Yoshitaka Hashimoto [Kochi University]

Representative of the Science Party: Takeshi Tsuji [Kyoto University]

Title of the proposal: Dynamic Stress Variation within the Nankai Accretionary Prism:
Insight from Seafloor-Borehole Integrated Hydrologic Observation

Cruise period: 2010/08/04 – 2010/08/11

Port of Call: JAMSTEC, Yokosuka – Shingu– JAMSTEC, Yokosuka

Research area: off Kumano, Kii peninsula

2. Over view of the observation

-Purpose and background

The purpose of this cruise is to detect relationships between seep activities and fault displacement using long-term heat flow measurement and acoustic ranging system. The relationship is important to examine the stress change in an accretionary prism. Because fluid along a subduction zone affects on the strength of rocks, understandings of distribution, migration and drainage processes of fluid are significant to reconstruct evolutions of deformation and kinematics of an accretionary prism. Furthermore, the origin of the fluid will be also examined by chemical analyses of pore fluids from samples in seep-area.

At Nankai Trough, large earthquakes have been occurred repeatedly with 100-250 year interval. Nankai trough is the area where the most number of detailed researches have been conducted for geology, geophysics, geochemistry in the world revealing physical properties along subduction interface, relationship between subducting seamount and slip zone and so on. NanTroSEIZE was started from September 2007 as a bunch of expeditions in Integrated Ocean Drilling Program (IODP) to understand the seismogenic mechanism along subduction zones. Shinkai 6500 dives have been operated many times in this area for observations seafloor, core sampling, collection of rocks, long-term temperature and heat flow monitoring, natural gamma measurements

and flow meter monitoring, providing many evidences that fluid seeps are related to deformation structures in accretionary prism such as faults, landslides, mud volcanos.

- Observations, Activities

- * Installing acoustic ranging system (Area Aa)
- * Exchanging two long-term SAHF (Area Aa)
- * Spot measurement of heat flow by SAHF (All areas)
- * Observations of geology of seabed and seeps (All areas)

-Method, Instruments

- * Acoustic ranging system
- * SAHF
- * MBARI corer
- * Push corer
- * Scoop
- * Box

-Research result

Dive #1210 Omine ridge (Area Aa)

Bacteria mattes and pale-colored zones were observed. Two long-term SAHFs were exchanged from old ones to new ones. MBARI core sample was collected at SAHF #3. Acoustic ranging system was not found in this dive. About 50cm of samples were recovered. Brownish gray sandy silt is at the top (0-5 cm). Below that, gray sandy silt or silty clay are observed from 5 cm to 50 cm. Chemical analyses were also conducted for core samples. In the chemical analyses, 5 samples were collected from the core samples with 10 cm interval from the top.

Dive #1211 Omine ridge (Area Aa)

The acoustic ranging system was installed at an appropriate position above an expected fault. Seep areas were identified by bacteria mattes. Many seep areas were observed in this dive. MBARI core samples were collected from seep-areas. Point SAHF measurement was also conducted at a seep-area. Samplings by push corer and

scoop were done in a seep-area. A sandstone partly altered by hydrogen sulfide was collected.

Dive #1212 Mud volcano (Area C)

Thermometer was picked up in the southern part of Mud volcano. Two MBARI core samples were collected at the eastern side of Mud volcano. SAHF measurements were conducted at 5 points from NE at bottom of the mud volcano to SW of top of the mud volcano.

Dive #1213 Kashinosaki Knoll (Area B)

Outcrops were found at the bottom of a steep cliff where the intraoceanic fault was expected from seismic profile. Those outcrops were observed along the bottom of the slope in places. Outcrops are composed of volcanic ashes with pretty low porosity, suggesting that the outcrops were exposed by fault activities. Heat flow measurements and MBARI core sampling were conducted at the sediments just below the outcrops. Any evidence for cold seep associated with fault activities was not identified.