

Cruise Summary

1. Cruise Information

Cruise number	KR08-15
Ship name	KAIREI
Title of the cruise	Research cruise by KAIREI
Chief Scientist	Hajime Shiobara [ERI, Univ. Tokyo]
Representative of Science Party	Hajime Shiobara [ERI, Univ. Tokyo]
Title of proposal	Research on the stagnant slab by using BBOBS and OBEM
Cruise period	15, November – 2, December, 2008
Port call	Jamstec, Yokosuka – Yokohama
Research Area	Philippine Sea and North Pacific Sea
Research Map	Refer Figure 1

2. Overview of Observation

-Purpose and background

To investigate the stagnant slab beneath the northern Philippine Sea, we had conducted a three-year array observation from 2005 until 2008 by using broadband ocean bottom seismometers (BBOBS) and ocean bottom electro-magnetometers (OBEM). It is a key part of the "Stagnant Slab Project" started in 2004 for 5 years as a cross disciplinary project, because of the first direct dense observation to reveal the fine physical structure above the stagnant section of the Pacific slab lies in the mantle transition zone. And, the change of the slab morphology along the Izu – Ogasawara (Bonin) – Mariana arc shown by a global tomography is also an interest to be resolved with high resolution. The experiment was to be conducted in three phases, each consisting of one-year deployment, resulting in a three-year time series data available. The aim is to acquire improved images of the stagnant slab and surrounding mantle in terms of seismic parameters and electrical conductivity. Such images cannot be constructed from existing data.

Stagnant slab : While the oceanic plate is subducting from the trench into the mantle, it means a state of that the plate (slab) is lying at the mantle transition zone (stagnation).

-Observations

- (1) Recovery of 15 BBOBS and 14 OBEM deployed in 2007 by using a chartered ship (Figure 2).
- (2) Deployment of 1 BBOBS and 1 OBEM at the T08 site to keep observation networks. Their recovery is planned during the KAIREI cruise in August, 2009.
- (3) Recovery of Ocean Bottom Doppler Current profiler (OBDC) at the T08 site. It was deployed during the KR08-06 cruise.
- (4) Back scattering observation of the multi beam sounder.

-Method and instruments

BBOBS and OBEM have been originally developed in the Earthquake Institute, University of Tokyo. For the mobility, they are designed as a free-fall deployment and self pop-up recovery equipment. The data recording is controlled by a preset timer, and the recovery is activated by the acoustic command from the ship.

This study had been started from 2005 for three years, and each observation phase is one year. During phase 1 and 2, no instrument was lost. This cruise was the recovery of instruments deployed as phase 3 by using the chartered ship in 2007.

The OBDC has the same outside design as the BBOBS to be a self pop-up recovery system and to extend the observation period.

-Research result

For the BBOBS, except T01 and T17 sites, they responded for the acoustic command, come up to the sea surface, and were safely recovered. As the BBOBS at the T17 site never responded but accepted the command, so it was recovered any way. The BBOBS at the T01 site normally responded but never come up, due to malfunction of one of two releasing units. But for the OBDC and all OBEM, they worked correctly and were safely recovered. The deployment of the BBOBS and the OBEM at the T08 site was completed normally.

It takes time to complete analyses for both of BBOBS and OBEM data, we need about two years to obtain results. On the ship, we performed quality check of raw data, and they have good quality. The data recovery rates are 71% and 100% for BBOBS and OBEM, respectively. Reason for the low rate of the BBOBS is troubles in the sensor control unit.

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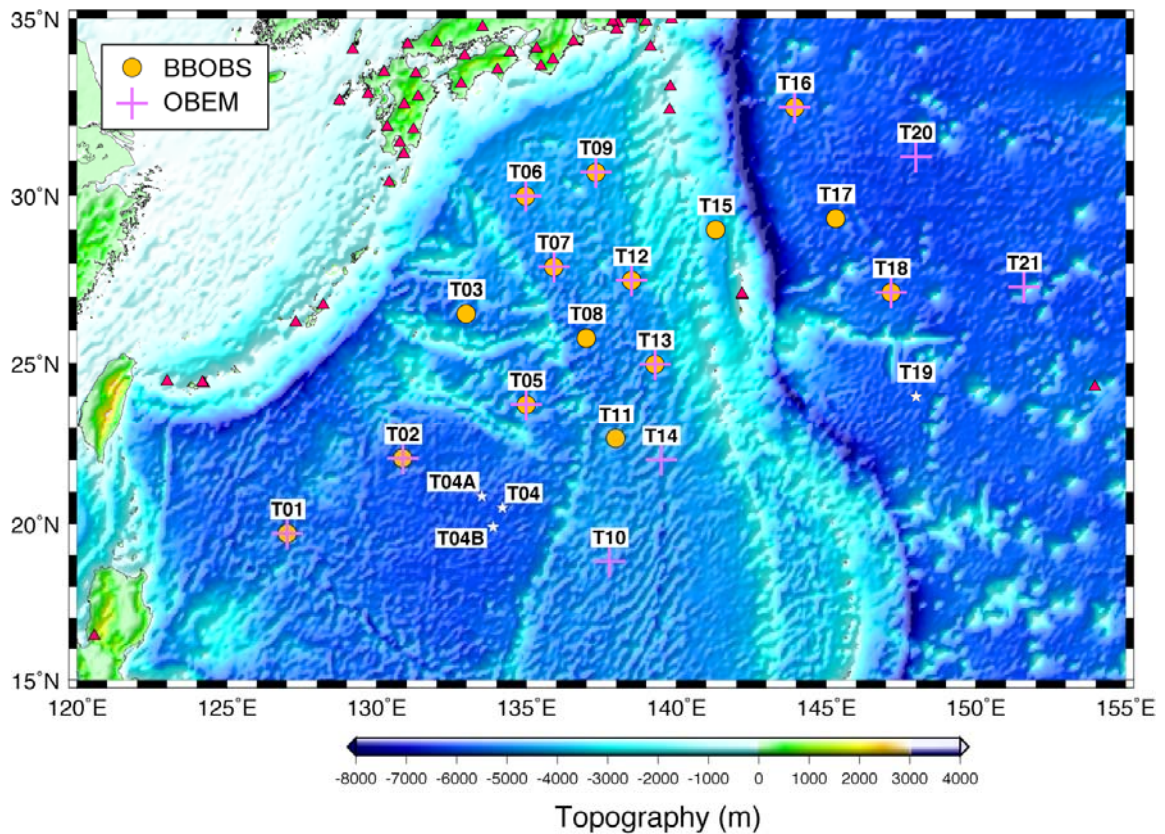


Figure 1. The location map of BBOBS and OBEM recovered during this cruise. Small white stars indicate the positions of BBOBS and OBEM previously deployed. Red triangles show locations of land broadband seismic stations.

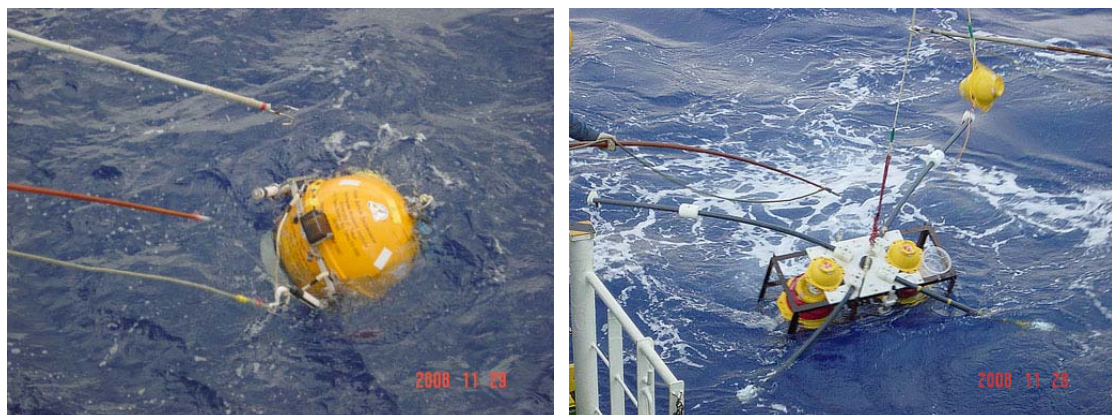


Figure 2. BBOBS (left) and OBEM (right) come up to the sea surface after one year observation. They released sinkers by the acoustic commands from the ship.