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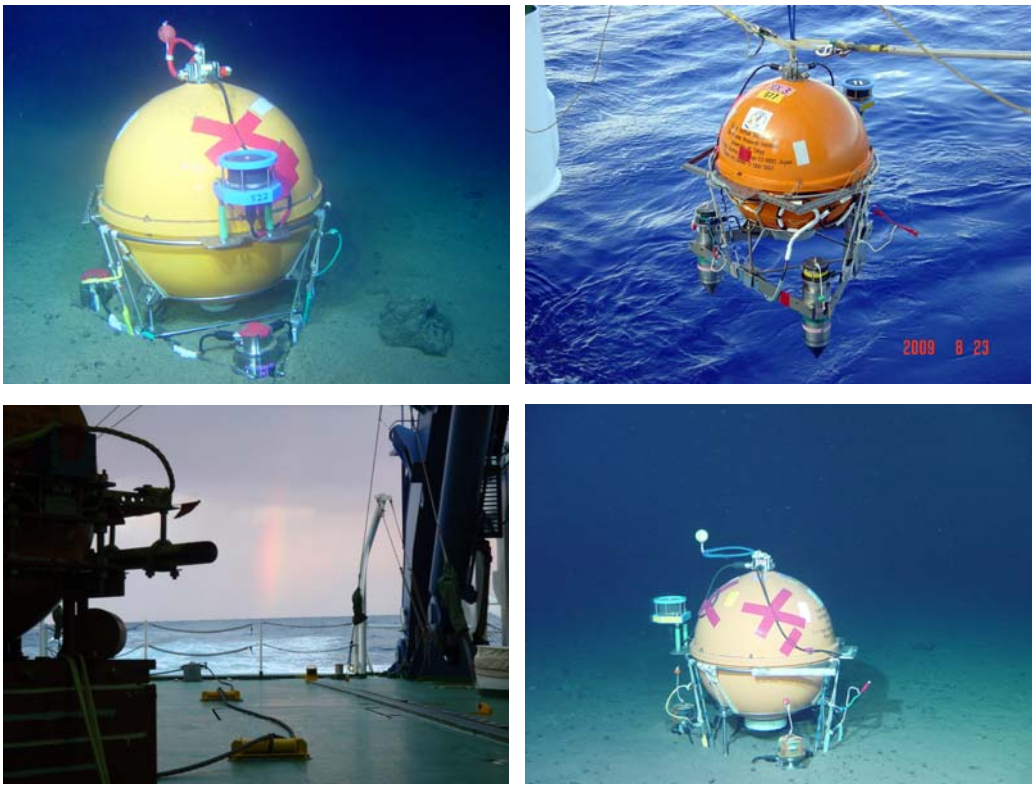
KAIREI Cruise Report

KR09-18

Research Dives by KAIKO-7000II

Philippine Sea



Dec., 17 – 27, 2009

Japan Agency for Marine-Earth Science and Technology
(JAMSTEC)

Content

1. Cruise Information

1.1. Cruise Number

KR09-18

1.2. Ship Name

KAIREI

1.3. Title of the Cruise

Research dives by KAIKO7000II

1.4. Title of Proposals

Study for mobile ocean bottom broadband seismic observation of the next generation

1.5. Cruise Period

Dec., 17 – 27, 2009

1.6. Port Call

Jamstec, Yokosuka – Jamstec, Yokosuka

1.7. Research Area

Philippine Sea

1.8. Research Map

Refer to Figure 1.

2. Researchers

2.1. Chief Scientist

Hajime Shiobara [ERI, Univ. Tokyo]

2.2. Representative of Science Parties

Hajime Shiobara [ERI, Univ. Tokyo]

2.3. Science Parties

Hajime Shiobara [ERI, Univ. Tokyo, chief]

Takehi Isse [ERI, Univ. Tokyo, co-chief]

Toshihiko Kanazawa [ERI, Univ. Tokyo, land support]

Masanao Shinohara [ERI, Univ. Tokyo, land support]

Hiroko Sugioka [IFREE, JAMSTEC, support]

Aki Ito [IFREE, JAMSTEC, support]

2.4. Captain, crew and KAIKO operation team

2.4.1. Captain and crew of the R.V. KAIREI

Captain	TANAKA HITOSHI
Chief Officer	KIMURA NAOTO
2nd Officer	SASAKI DAISUKE
3rd Officer	YAMAGUCHI RYO
Chief Engineer	TSUKADA MINORU
1st Engineer	FUNAE KOJI
2nd Engineer	KATO KENZO
3rd Engineer	SAKAEMURA SABURO
Chief Electronics Operator	TAKAHASHI MASAMOTO
2nd Electronics Operator	ITO HIDEHIRO
Boat Swain	NAKAMURA KINGO
Able Seaman	KAWAMURA YOSHIAKI
Able Seaman	KUBOTA TAKAO
Able Seaman	ISOBE HIDEO
Able Seaman	OHATA MASANORI
Sailor	HANAZAWA JIRO
Sailor	ABE SHUN
No.1 Oiler	KITANO MASARU
Oiler	KAWAI YOSHINORI
Oiler	UEDA MASAMI
Assistant Oiler	NAKAHARA YUKI
Assistant Oiler	TORAO SHIN
Chief Steward	SASAKI SUETO
Steward	ARIYAMA SHIGETO
Steward	KOSUJI KIYOTAKA
Steward	WADA TORU
Steward	NAKANO MIZUKI

2.4.2. KAIKO operation team

Operation Manager	NAMBU YOSHINOBU
Operation Manager	SAKURAI TOSHIAKI
1st ROV Operator	UEKI MITSUHIRO
1st ROV Operator	MIURA ATSUMORI
2nd ROV Operator	TAKISHITA KIYOSHI
2nd ROV Operator	WAKAMATSU HOMARE
2nd ROV Operator	KONDO TOMOE
2nd ROV Operator	SHIGETAKE SEIJI
3rd ROV Operator	ASAI RYU

3. Observation

3.1. Purpose and background

We have already developed the mobile broadband ocean bottom seismometer (BBOBS), and many practical observations and the result have been achieved since 1999. But, through the evaluation of the broadband seismic data, the noise level of horizontal components those are important in data analyses, is rather high in average and its variation in time is also large. The reason of this is assumed as the small tilt variation of the large housing sphere due to a tidal bottom current. To clear this problem, one idea of observation without tilt variation due to the bottom current is the use of small and low profile broadband sensor that enables to intrude into the sediment. Now, we are on the way to develop this new generation BBOBS (BBOBS-NX) under support of Grant-in-Aid for Scientific Research (B) during 2007–2010. Its final goal is the free fall deployment and self pop-up recovery system as same as the BBOBS in present.

3.2. Observations

We recover the BBOBS-NX2 deployed in the KR09-05 cruise and the BBOBS-NX3 those were not operated in the previous KR09-11 cruise, due to malfunction of the ROV, KAIKO7000II. To perform the test observation using the BBOBS-NX3 planned in the KR09-11 cruise, we deploy the BBOBS-NX3' (same system of the BBOBS-NX3) with support of the ROV. The BBOBS-NA2 (BBOBS using a new style anchor) is also deployed by the free-falling way. It is impossible to do this kind of test observation on the land, because there is almost no low noise station similar to the deep sea floor and the condition of solid-liquid interface and the existence of the bottom current.

3.3. Method and Instruments

The BBOBS-NX3' and BBOBS-NA2 are deployed by the free-falling way nearby the BBOBS-NX2. The recording unit of the BBOBS-NX3', the titanium sphere housing of 65 cm diameter, is moved from the top of the sensor unit and is put on the sea floor a few meters from the sensor unit. Finally, the BBOBS-NX2 and the BBOBS-NX3 are recovered through two dives of the ROV.

In the coming cruise, KR10-E01, the BBOBS-NX3' and BBOBS-NA2 are planned to be recovered by using the ROV.

3.4. Research Result

The BBOBS-NX3' was landed about 200 m of distance toward the south from the BBOBS-NX2 (Figure 2), while the expected drift direction was opposite from previous deployments. The BBOBS-NA2 did not answered when it should be at the sea floor by several ways. The BBOBS-NX3' intruded to the sediment with tilt of about 5

degrees by the acoustic communication from the ship. In the first dive of the ROV, all four instruments the BBOBS-NX2, the BBOBS-NX3, the BBOBS-NX3' and the BBOBS-NA2 answered well and could measure distances from the vehicle of the ROV, when it was about 10 m above the sea floor. The final deployment of the BBOBS-NX3' was correctly performed, but the covering the sensor unit by sands was not completed. As the BBOBS-NA2 was only 17m from there, we observed the situation of tumbling on the sea floor. Its acoustic transducer was in the top sediment. Next, we started to recover the BBOBS-NX2 (Figure 3a), and it was done safely but the direct connecting of two units was impossible. In the second dive, we covered the sensor unit of the BBOBS-NX3' by using fine sands (Figure 3b) as we could not see any part of the unit. Next, the BBOBS-NA2 was tried to be in correct situation as it could perform the observation, but it was failed. At least, the acoustic communication from the ship is possible by a rolling of it so as to appear the transducer in the water. Finally, the BBOBS-NX3 was also recovered same as the BBOBS-NX2.

The data of the BBOBS-NX2 and the BBOBS-NX3 were obtained without troubles. The noise level of the BBOBS-NX3 that was not correctly deployed was similar to that of the normal BBOBS. But, the noise level of the BBOBS-NX2 is low enough as we expected. It proved the way to deploy the broadband sensor at the sea floor to obtain high quality broadband seismic data.

3.5. Cruise Log

2009/12/17
13:00 Onboard
14:00 Departure from Yokosuka (JAMSTEC)
14:30-15:00 Briefing about ship's life and safety
16:40-17:00 Pray for safety of cruise to KONPIRASAN
19:00 Stay near Niijima islands due to bad sea condition

2009/12/18
Weather: fine but cloudy/ Wind direction: West/ Wind force: 9/ Wave: 3 m/ Swell: 3 m/
Visibility: 8nautical miles (12:00 JST)
Stay near Niijima islands

2009/12/19
Weather: fine but cloudy/ Wind direction: West/ Wind force: 8/ Wave: 4 m/ Swell: 3 m/
Visibility: 10 nautical miles (12:00 JST)
Stay near Niijima islands
13:00-14:00 Cruise Meeting

2009/12/20
Weather: fine but cloudy/ Wind direction: West/ Wind force: 9/ Wave: 4 m/ Swell: 3 m/
Visibility: 10 nautical miles (12:00 JST)
Stay near Niijima islands
09:00-09:40 Cruise Meeting

2009/12/21
Weather: fine but cloudy/ Wind direction: West/ Wind force: 8/ Wave: 4 m/ Swell: 3 m/
Visibility: 12 nautical miles (12:00 JST)
Stay near Niijima islands

2009/12/22
Weather: fine but cloudy/ Wind direction: West/ Wind force: 6/ Wave: 4 m/ Swell: 3 m/
Visibility: 10 nautical miles (12:00 JST)
04:00 Transit to survey area ”T08”

2009/12/23
Weather: fine but cloudy / Wind direction: NE/ Wind force: 3/ Wave: 3 m/ Swell: 1 m/
Visibility: 12nautical miles (12:00 JST)
12:30 Arrive at survey area ”T08”

12:42 XBT
13:09 Release the BBOBS-NA2
13:16 Release the BBOBS-NX3’
13:35-16:00 Calibration of the BBOBS

2009/12/24
Weather: blue sky / Wind direction: East/ Wind force: 3/ Wave: 3 m/ Swell: 1 m/ Visibility: 12nautical miles (12:00 JST)
08:32 Launch KAIKO (7K#464dive)
10:43 KAIKO lands (4904m)
15:25 KAIKO leaves the bottom (4908m)
17:20 KAIKO on deck
17:57 Recovered the BBOBS-NX2

2009/12/25
Weather: blue sky / Wind direction: West/ Wind force: 3/ Wave: 3 m/ Swell: 1 m/ Visibility: 12nautical miles (12:00 JST)
08:30 Launch KAIKO (7K#465dive)
10:47 KAIKO lands (4904m)
14:33 KAIKO leaves the bottom (4910m)
16:24 KAIKO on deck
16:30-16:40 Communicate with BBOBS-NA2&BBOBS-NX3’
16:59 Recovered the BBOBS-NX3
Transit to Yokosuka (JAMSTEC)

2009/12/26
Weather: overcast / Wind direction: WSW/ Wind force: 6/ Wave: 3 m/ Swell: 3 m/ Visibility: 8nautical miles (12:00 JST)
Transit to Yokosuka (JAMSTEC)

2009/08/27
08:30 Arrival at Yokosuka (JAMSTEC), KR09-18 finish and disembarkation

3.6. Dive Information

3.6.1. Dive Numbers

464 and 465

3.6.2. Payloads

The remote commander for the acoustic transponder

Hooks for recovery the BBOBS-NX2 and the BBOBS-NX3

Buckets of sands to cover the sensor unit of the BBOBS-NX3’

4. Acknowledgements

We thank for the captain and crew of R.V. KAIREI, the KAIKO operation team and a scientific support staff of NME. This study is supported by KAKENHI (19340121).

5. Notice on using

This cruise report is a preliminary documentation as of the end of the cruise. It may not be corrected even if changes on content (i.e. taxonomic classifications) are found after publication. It may also be changed without notice. Data on the cruise report may be raw or not processed. Please ask the Chief Scientist for the latest information before using.

Users of data or results of this cruise are requested to submit their results to Data Integration and Analysis Group (DIAG), JAMSTEC.

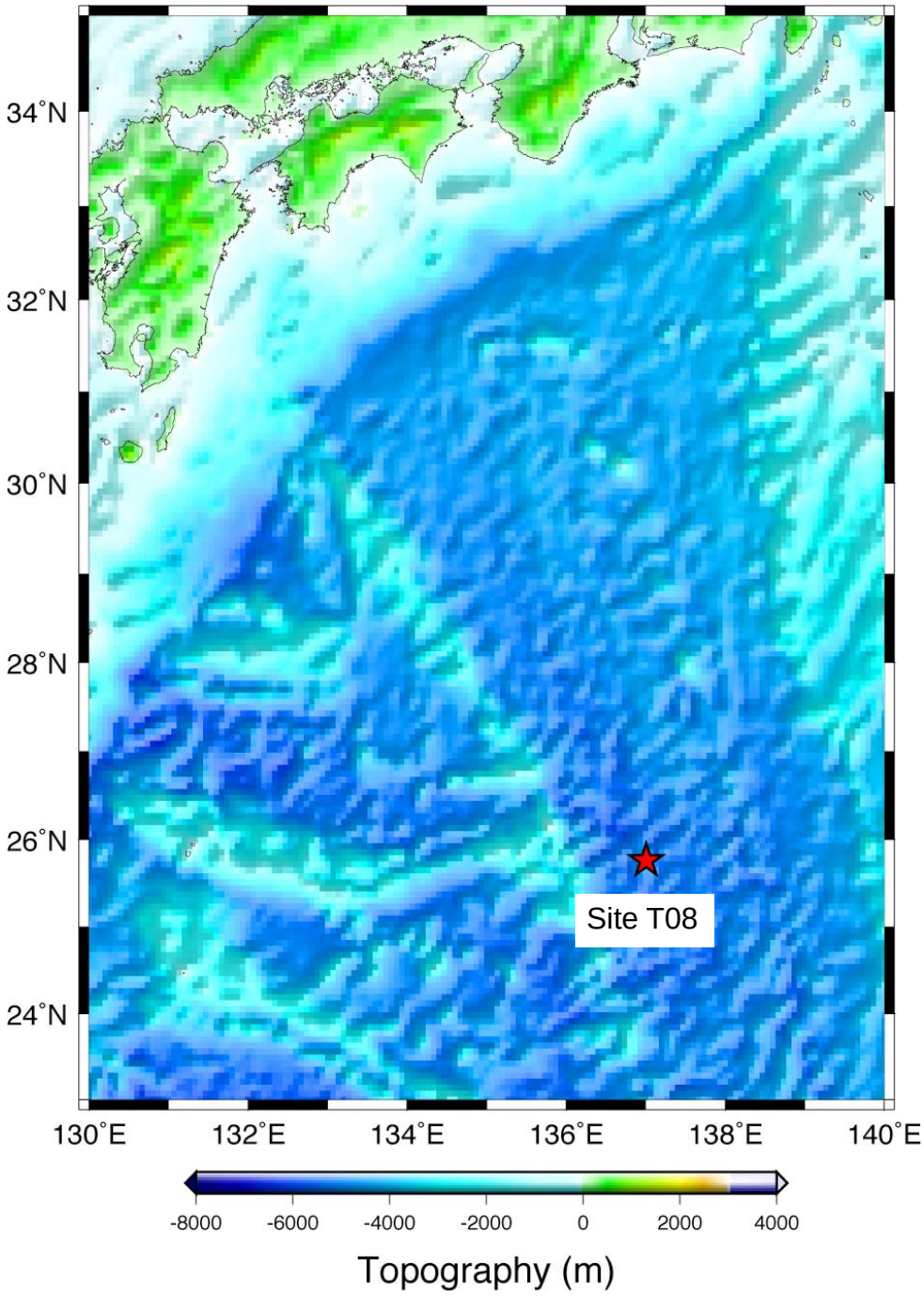


Figure 1. Research map.

Site T08: Broadband seismic observation station (depth: 4900 m)

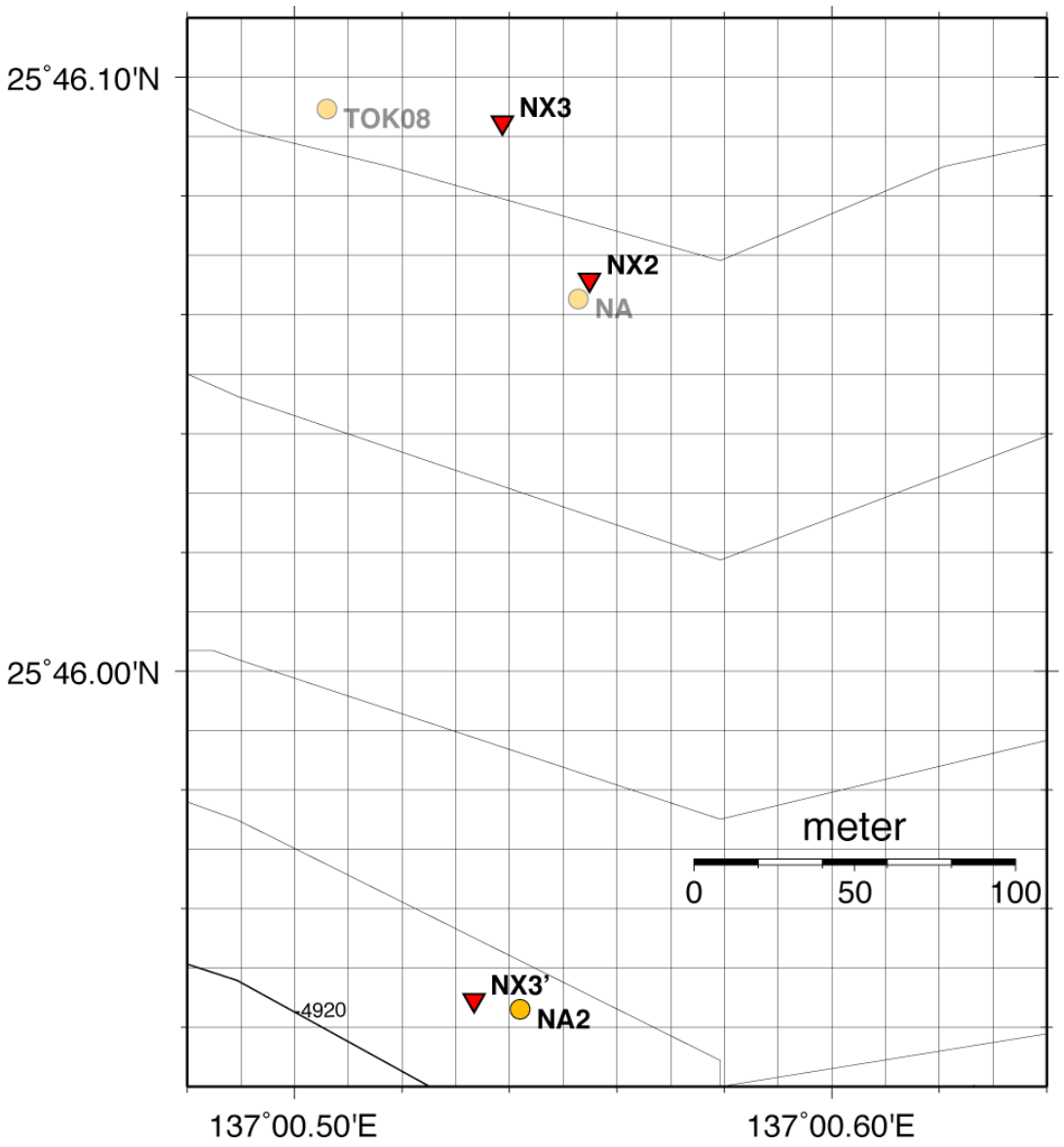
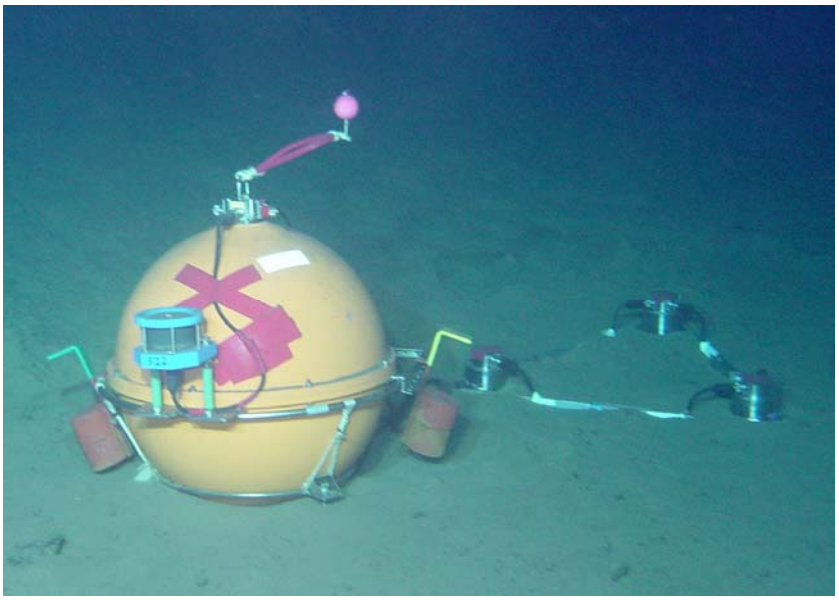


Figure 2. Location map of equipments.

The BBOBS-NX3' (NX3') was landed about 200 m southward from the BBOBS-NX2 (NX2). The BBOBS-NA2 (NA2) was incorrectly landed, but now it responds from the ship. The NX2 and the BBOBS-NX3 (NX3) were recovered in this cruise. Thin colored two equipments (TOK08 and NA) were BBOBS recovered in the KR09-11 cruise.

(a)



(b)

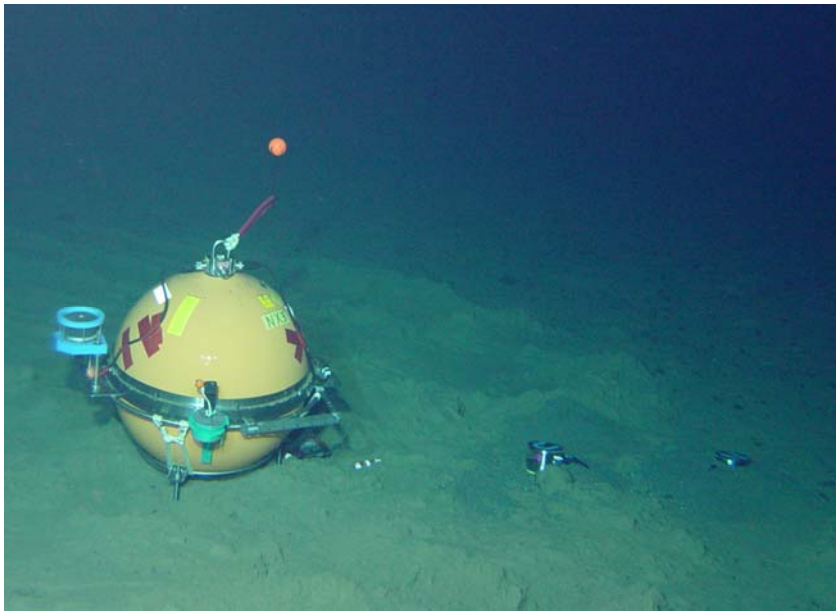


Figure 3. The BBOBS-NX2 and BBOBS-NX3'.

(a) The BBOBS-NX2 deployed in the KR08-06 cruise was recovered in this cruise. Before the final deployment by the ROV, it looked as the cover photo of the upper left.
(b) Over view of the BBOBS-NX3, before when the covering sands over the sensor unit (right) was started in the second dive.
As amounts of the sensor unit exposed in the water are different in two cases, it will be a good test to verify the effect of the bottom current to the sensors.