

Cruise Summary

1. Cruise No./Vessel : NT08-08, R/V Natsushima
2. Proposal title : Recovery of Earth Field Observation System and Connection of Broad-band seismometer to the off-Toyohashi seafloor cabled observatory.
3. Chief Scientist/Institution : Tada-nori Goto/JAMSTEC
4. Onboard Scientists
 - Takafumi Kasaya/JAMSTEC
 - Noriaki Sakurai/JAMSTEC
 - Aki Itoh/JAMSTEC
 - Masahiro Kawano/Tokai Univ.
 - Yuu Nanbara /Tokai Univ.
 - Satomi Minamisawa/NME
5. Area : Off Enshu, SW Japan
6. Port Call
 - Departure: Shimizu (Apr. 18, 2008)
 - Arrival: JAMSTEC pier (Apr. 23, 2008)

Background and summary of the research

In this cruise, we measure the locations of sensors connected to the off-Toyohashi seafloor cabled observatory. The purpose of this observatory is monitoring of the crustal below the seafloor, possibly related to seismic activities and crustal deformation. In 2007, the NT07-06 cruise, we attached two sensor packages to the observatory via underwater matable connector: a seismometer, pressure gauges etc. named as S-SMAD, and a magnetometer, voltmeter etc. named as DOMES. These sensor locations are not decided precisely, so that we used a simple acoustic survey on the seafloor using conventional ROV homer (short-range transponder for ROV navigation). Most of sensors are not far from the branch unit of the observatory within 30m in radius. First of all, the ROV 'Hyper-Dolphin' dives to the seafloor and set several ROV homers as basement points for survey. Then, the ROV moves on a sensor which we want to determine the relative location from basement points with the triangular surveying. The preliminary results are immediately drawn as a figure in the control room for the ROV. As a result, we succeed in the determination of relative location of sensors with accuracy less than 1m. The most probable cause for location errors does not come from the ROV homer system itself, but is due to multi-reflected acoustic waves from the metallic frames etc. near the ROV homer. Therefore, careful arrangements of the ROV homers allow us to obtain higher accuracy (with order of 10cm) using this survey method.

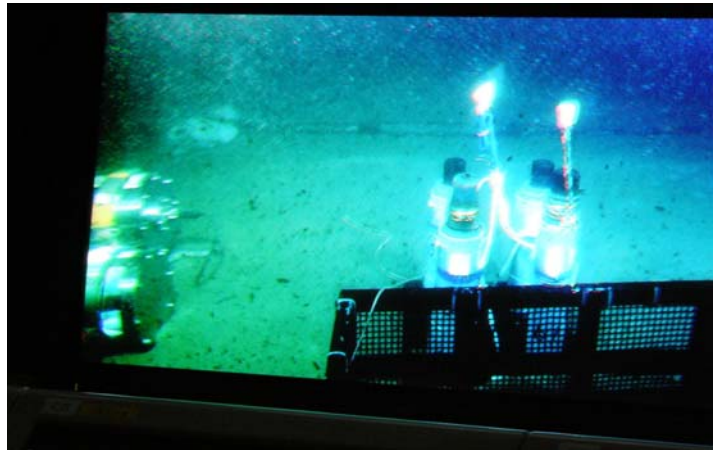


Fig.1 Left: ROV homers. Right : Video image of acoustic survey. The seismometer package is shown in the right of figure, and the submarine cable is also visible behind the ROV homer.

Around the seismogenic zone off Tokai area, we try to monitor the electrical conductivity of crust using the off-Toyohashi cable as a source, and the Earth Field Observation System (EFOS) as a receiver, respectively. In this cruise, we recovered two EFOS from the seafloor by the ROV 'Hyper-Dolphin'. Those stand-alone instruments (not connected to the observatory) were deployed in 2007, NT07-06 cruise and record the seafloor electric field variations for about one year continuously. The data was successfully recovered. The data analysis gives us information about the crustal conductivity value and its temporal variation, possibly related to groundwater migration in the crust.



Fig. 2 EFOS # 1(Left) and #2 recovery

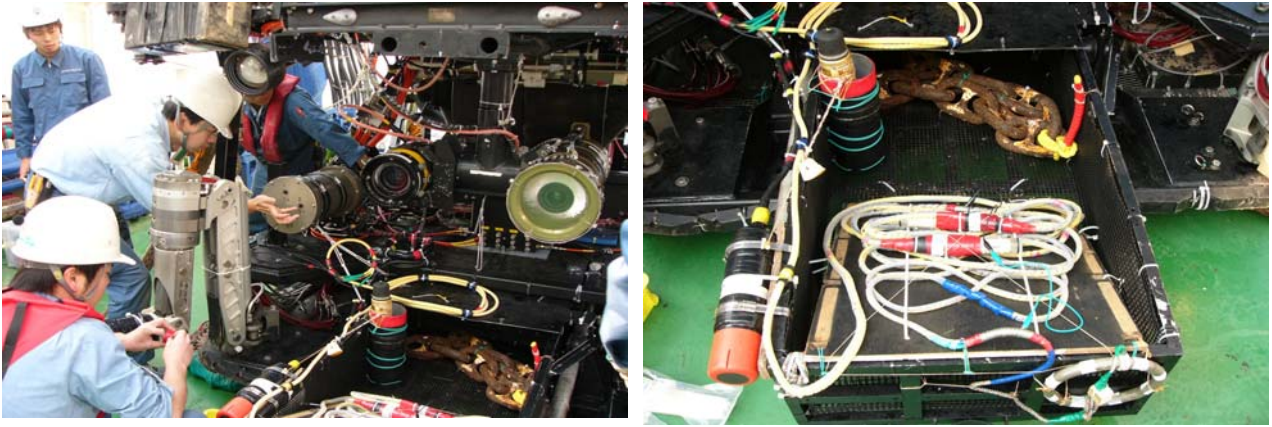


Fig. 3 MORSE (left: pressure case) and its sensor string (left: with length of about 10m)

In this cruise, we tested a newly developed instrument for in-situ measurement of resistivity of sediments below the seafloor (named as MORSE: Mobile Resistivity Sounding unit of Earth). This instrument has a probe or a sensor string for resistivity measurement. The test result is fine. The MORSE also records the artificial signal from the cabled observatory, which can be used for analysis of deeper resistivity structure (down to several tens meters).

Finally, we also observed the natural electromagnetic signal on the seafloor using OBEM (ocean bottom electromagnetometer). Although the only four day record is obtained, it is useful for analysis of artificial signal from the cabled observatory. For this deployment/recovery procedure, we tested an arm-folding system. The arms are for measurement of electric field on the seafloor. Although one of the arms could not be folded, three of them are successfully folded and result in a quick and easy recovery operation of OBEM to the board,