Multidisciplinary observations at an expandable sub-marine cabled station off the Hatsushima island, the Sagami bay, Japan

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Abstract – **Western part of Sagami Bay is one of the active tectonic areas in Japan. In this area, Teishi Knoll, volcanic seamount, erupted in 1989 and the earthquake swarms occurs repeatedly every few years in the eastern coast of the Izu Peninsula. The real-time deep sea floor observatory was deployed about 7 km off Hatsushima Island, Sagami Bay, at a depth of 1174 m in 1993 to monitor seismic activities, underwater pressure, water temperature and deep currents. The video camera and lights were also mounted in the observatory to monitor the relations among biological activities associated with the tectonic activities. The observation system including submarine electro-optical cable with a length of 8 km was completely renewed in 2000. The several underwater-mateable connectors are installed in the new observatory for additional observation instruments.**

A ocean bottom electro-magnetic meter(OBEM), precise pressure sensor and ocean bottom gravity meter were installed using ROV Hyper-Dolphin in the cruise of R/V Natsushima from January 9 to 14, 2005. We started to operate them at February 10, 2005 after checking those of data qualities. Observed data have been sent to Yokohama institute, JAMSTEC.

Around the sagami bay, seismic activity is very high. A large earthquake (M5.4) occurred off Izu peninsula at April 21, 2006, and submarine land slide was then generated. Generated mud flow reached to the Hatsushima station, and moved positions of some sensors. The video camera was able to take a movie of mud flow. A OBEM and other sensors also detected some distinctive changes with the mud flow.

I. INTRODUCTION and outline of the Hatushima observatory

Sagami bay is a plate subdution zone along the sagami trough, and is one of the active tectonic areas in Japan. In western part of Sagami bay, east off Izu peninsula, earthquake activity very high. Submarine volcanoes have been erupted repeatedly. In 1989, Teishi Knoll erupted. Moreover, biological research also has been carried out in this area, and individual colonies were discovered.

For multidisciplinary observation to monitor seismic activities, Japan Agency of Marine-Sceinece and Tecnology (JAMSTEC) planed to construct submarine observatory, 7km off Hatushima island in Sagami bay, at a depth of 1174 m. Original Hatushima observatory was deployed and set up in 1993 [1]. This observatory has seismometer, hydrophone, thermometer, CTD, Video camera and electromagnetic current meter, however, did not has submarine external port. Original system made some trouble, and was recovered in 1998. The observation system including submarine electro-optical cable with a length of 8 km was completely renewed in 2000. The several underwater- mateable connectors are installed in the new observatory for additional observation instruments. New statioin is equipped with a transmissometer, an ADCP (Acoustic Doppler Current Profiler), a tsunami pressure gauge (a precise pressure gauge) and a gamma ray spectrometer as well as the same kind of sensors of the

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UT07+SSC07, Tokyo, Japan, 17-20 April 2007.

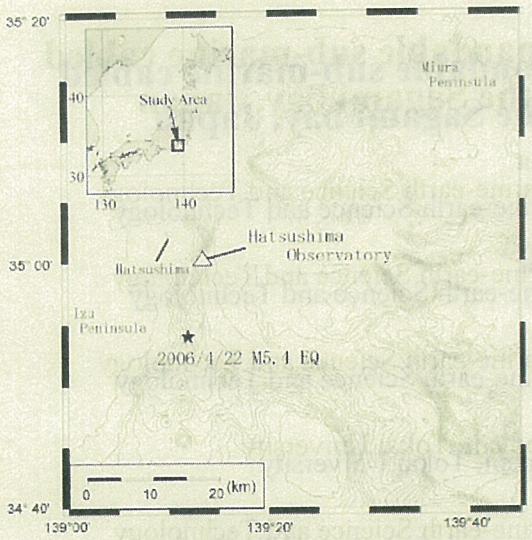

Figure 1 Study area off Izu peninsula.

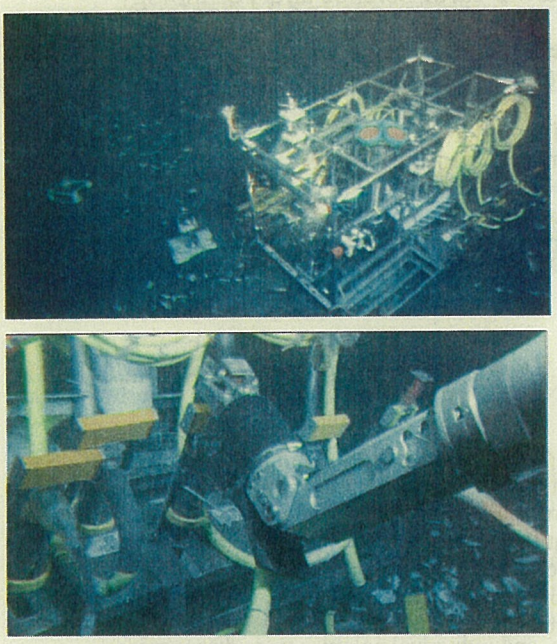

Figure 2 Upper panel is photo of renewed Hatsushima observatory. Lower panel shows the connect operation to underwater- mateable connector.

primary observatory. Performances of some of those sensors were improved. A/D sampling of seismometer is 24bits/200Hz (former one was 16bits/100Hz). One of two video cameras is a Super HARP (High-gain Avalanche Rushing Photoconductor) camera, which is far more sensitive than a CCD camera. An acoustic type was adopted for the current meter.

II. Deploy operation

On February 10, The Japan Agency for Marine-Earth Science and Technology (JAMSTEC) connected an ocean bottom microbarometer, an ocean bottom gravimeter, and an ocean bottom electromagnetometer to the Real-Time

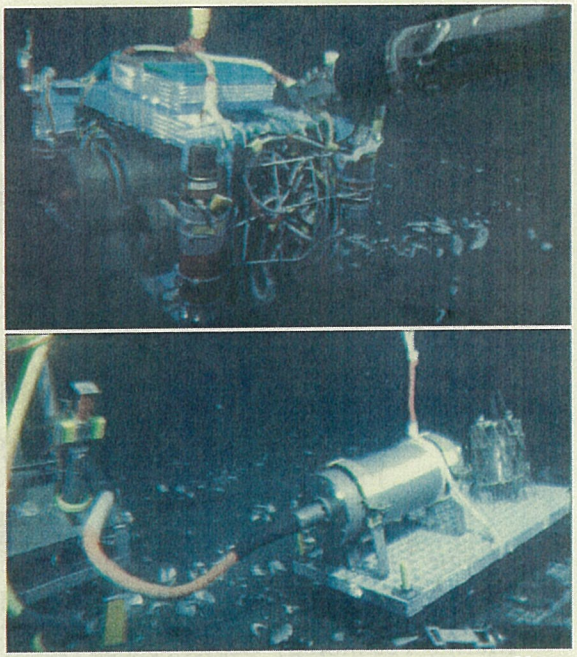

Figure 3 Ocean bottom eelectro-magnetometer (Upper panel) and ocean bottom microbarometer connected to underwater- mateable connector of Hatsushima observatory.

Deep Sea Floor Observatory at a depth of 1174 m located in the offshore of the Hatsushima island in Sagami Bay by using the Research Vessel "NATSUSHIMA" and the Remotely Operated Vehicle "HYPER-DOLPHIN", and has started the long-term, real-time observation tests on the ocean bottom.

These equipments have been developed in the joint study carried out by the JAMSTEC, Kyoto University, Tokai University, and Tohoku University. These facilities, laid out within an area having a radius of 10 meters or thereabouts, constitute a system that can obtain all the observation data on a real-time basis by using the submarine cable. Since the Hatsushima observatory has availability for the connection and replacement of various ocean bottom instruments, the subject system used this function. Adjusting these units have revealed that high quality data were obtained.

In addition to the surveys and analyses of earthquake generation process, these facilities are expected to support the build-up of a real-time disaster-prevention system comprising the precise prior detection of huge earthquake and tsunami waves, generated at the plate boundaries beneath the ocean bottom, before they reach the land. The cable-based integrated ocean bottom earthquake observation systems have been installed and operated in the offshore of Kushiro/Tokachi coast in Hokkaido and the Muroto cape in Kochi Prefecture.

III. Obtained data

Various obtained data on the sea floor has been sent to Yokohama institute, JAMSTEC, through the Hatsushima land station, and stored on our data server. Registered user can use data preview by web browser (http://www.jamstec.go.jp/scdc/top_e.html), and download data stored

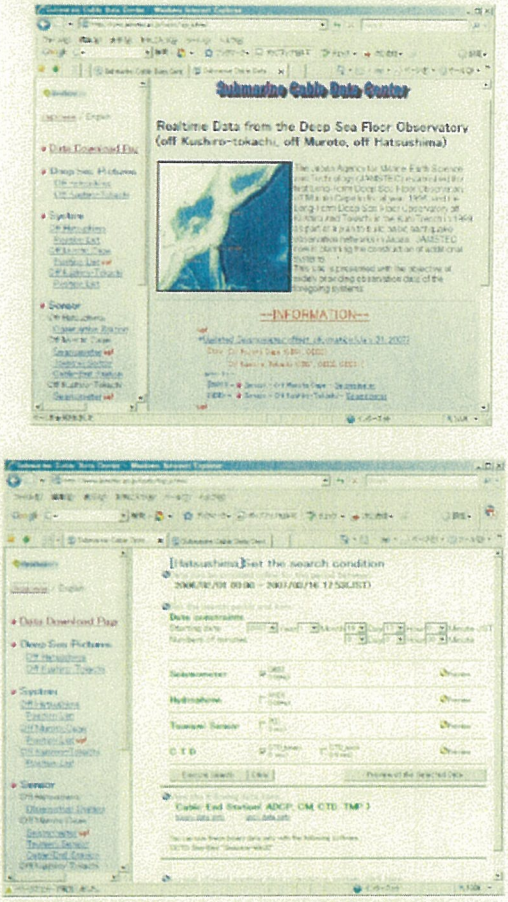

Figure 4 Upper panel is top page of JAMSTEC cable data center web sites. Lower panel shows a data select page for data preview and data download.

Figure 5 Large earthquake (M5.4) occurred off Izu peninsula at April 21, 2006, and submarine land slide was then generated. Generated mud flow reached to the Hatsushima station. The video camera was able to take a movie of mud flow.

on data center server (Fig.4). This web site has provided another cable data, Tokachi and Muroto cable.

A large earthquake (M5.4) occurred off Izu peninsula at April 21, 2006. At the sage time, submarine land slide was then generated. Generated mud flow reached to the Hatsushima station, and moved positions of some sensors. The video camera was able to take a movie of mud flow (Fig.5). The mudflow reached to the station five minutes after the seismic wave arrived [3].

IV. Summary

We connected an ocean bottom microbarometer, an ocean bottom gravimeter and an ocean bottom electromagnetometer to the Real-Time Deep Sea Floor Observatory at a depth of 1174 m located in the offshore of the Hatsushima island in Sagami Bay by using ROV. OBEM has been observed the real-time observation. Obtained data has been sent to and stored on data server on JAMSTEC. Using web browser, registered user can view and download our three cable station data.

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