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Recent and Future Developments of Deep Sea Research in JAMSTEC

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ABSTRACT

The first real-time and long-term deep seafloor observatory in JAMSTEC was deployed in 1993 at a depth of 1,174 m in Sagami Bay. A continuous observation more than three years long has been carried out so far. The second observatory for monitoring submarine earthquakes will be deployed off Muroto Peninsula in Nankai Trough in March 1997. The third one, to start observations in 1998, is a re-use of the submarine telephone cable between Okinawa and Guam Islands. The full ocean depth ROV *Kaiko* accomplished the deepest diving to the Mariana Trench in 1995 and 1996. OD21, a Japanese deep-sea drilling project for the 21st century, started planning and hardware designing in 1994.

INTRODUCTION

In the coming 21st century, one of the most significant scientific goals in Japan is to unveil the mechanism of the earthquake, which will lead to predict it and minimize the hazards. As a first step to this goal, we are to expand monitoring networks for submarine earthquakes at the plate boundaries around the islands of Japan. The first deep seafloor observatory in JAMSTEC, and also in the world, was deployed in 1993 at a depth of 1,174 m in Sagami Bay, and a continuous observation has been carried out so far. The second observatory for monitoring submarine earthquakes will be deployed off Muroto Peninsula in Nankai Trough in March 1997. The third one will start observation in 1998; it is a re-use of the submarine telephone cable between Okinawa and Guam Islands for multidisciplinary geoscientific seafloor observations (VENUS project). The full ocean depth ROV *Kaiko*, which means trench, accomplished successful diving to the Challenger Deep in the Mariana Trench in 1995 and 1996. The new mother ship *Kairei*, which means ridge, replacing *Kaiko*, was completed in 1996 and will be in operation in 1997. A 120-channel seismic profiler is also equipped on board the *Karei*. OD21 is a deep-sea drilling project funded by the Japanese government. This project is to build a new drillship with a riser system and to carry out studies on an international basis.

LONG-TERM, DEEP SEAFLOOR OBSERVATION OFF HATSUSHIMA ISLAND

In September 1993, a long-term and real-time deep seafloor observatory was deployed within the *Calyptogena soyoae* clam colony in Sagami Bay at a depth of 1,174 m (Fig. 1). The observatory is located 6 km southeast of Hatsushima Island in Sagami Bay, which is located at the plate boundary between the Philippine and North American plates. The aim of the observation off Hatsushima Island is to know the relations among biological, environmental, seismic and volcanic activities in this area

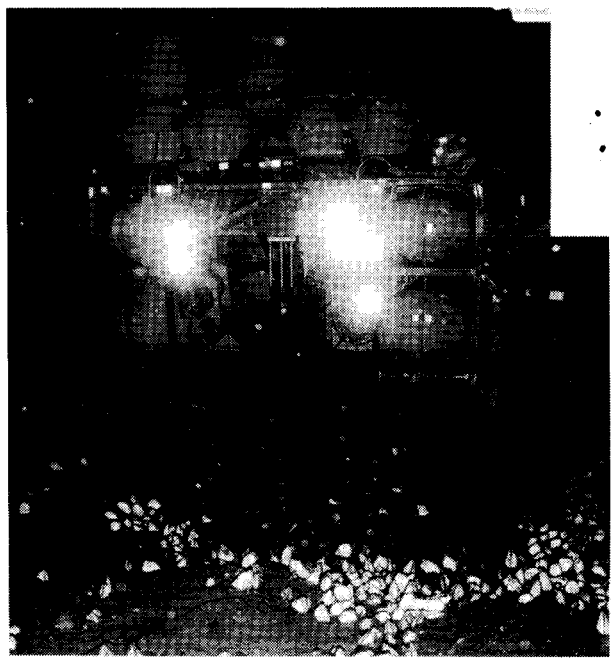

Fig. 1 Underwater observatory on seafloor off Hatsushima Island in Sagami Bay at depth of 1174 m. Photograph taken by JAMSTEC deep ROV *Dolphin 3K*.

(Momma, 1993, 1995a, 1995b). The observatory is equipped with two color video cameras, one of which has pan/tilt and a zoom unit, 6 250-watt halogen lights, a velocity-type seismometer, a hydrophone, 2 heat-flow temperature sensors, a CTD (conductivity, temperature and depth sensors), an electromagnetic current meter and a transponder, as shown in Table 1. The data and power to and from the land station at Hatsushima Island are transmitted in real time through an 8-km-long, double-armored, electro-optical cable, whose outer diameter is 26 mm. All the data including still video images are sent to JAMSTEC in Yokosuka through telephone link (Fig. 2).

As the observatory had to be deployed within the clam colony, accurate acoustic positioning of the underwater unit and dynamic positioning of the surface ship were necessary. During positioning in the deployment, the seafloor was watched carefully to search visually for the clam colony through the video camera, which was

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KEY WORDS: Long-term observation, deep sea, observatory, submarine cable, submarine earthquake, ROV, deep-sea drilling.