Long term visual observation on deep seafloor off Hatsushima Island in Sagami Bay

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JAMSTEC (Japan Marine Science and Technology Center) deployed a primary cabled observatory equipped with two CCD video cameras on deep seafloor off Hatsushima Island in Sagami Bay at a depth of 1170 m in September, 1993. The observatory was also equipped with a CTD (Conductivity, Temperature and Depth of seawater) sensor, a current meter, an underground thermometer with two probes, a seismometer (three component servo velocimeter) and a hydrophone for the purpose of real time long term multidisciplinary monitoring of deep seafloor environment that could be related to crustal movement of surrounding area. This site is a cold seepage site where one of the largest chemo-synthetic biological communities consisted mainly of Vesicomyid clams exists. About 7 km southwest of this site, on the east coast of Izu Peninsula, earthquake swarms have occurred repeatedly and Teishi Knoll that is located in the earthquake swarm area erupted in 1989. All data of the observatory were transmitted in real time through fiber optic submarine cable to the shore station on Hatsushima Island.

The observatory was rebuilt comprehending new technologies such as underwater matable connectors developed after the deployment in 1993 and replaced in March, 2000. One of two video cameras of the secondary observatory is a Super HARP (High-gain Avalanche Rushing Photoconductor) camera, which is far more sensitive than a CCD camera. The secondary observatory is also equipped with a transmissometer, an ADCP (Acoustic Doppler Current Profiler), a tsunami pressure gauge (a precise pressure gauge) and a gamma ray spectrometer in addition to the same sensors as those of the primary observatory.

Since the primary deployment, observation by those sensors including video cameras has been carried out for more than nine years, including two periods of observation blank (July, 1999 - March, 2000 for re-installation and March - November, 2002 for repair). Because of darkness, nothing can be seen without lights on the seafloor. Considering the lifetime of lights, usually observation time by cameras is limited to 26 minutes per one day and only on Thursday and Friday every week continuous visual observations for hours are carried out. At the shore station, video images have been recorded on S-VHS tapes for the primary observatory and DVCAM tapes (partly on S-VHS and 8mm tapes) for the secondary observatory. The number of tapes is more than 4,500 at present. Since the transmission system of the primary observatory had only one channel for video signal transmission, signals of two cameras were selectable but both could not be transmitted nor recorded separately at the same time. One the other hand the secondary observatory has two channels for video signal transmission, so both video images can be seen and recorded separately on corresponding tapes at the same time.

Visual observation is a very powerful method to understand deep seafloor phenomena. For example, it has revealed mudflow and sedimentation caused by a land slide associated with swarm earthquakes, seasonal change of the amount of suspended materials and its relation to 'spring bloom' of planktons on sea surface and sub-bottom temperature increase, and so on. However, events that occur on the seafloor have various kinds of time scales - order of seconds to years -, and need multidisciplinary approach - not only earth science but also biology -. Management of large amount of video images is a very hard task. Precious matters or events might be left unfound. Effective ways of utilizing those videos are necessary.