

Cold seepage fluctuation accompanied by conductivity reduction on the seafloor off Hatsushima Island in Sagami Bay

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Deep seafloor off Hatsushima Island in Sagami Bay is known for the existence of cold seepage and there are largest size of chemo-synthetic biological communities mainly consisted of Vesicomid clams. For the purpose of understanding the distribution of chemo-synthetic biological communities of Vesicomid clams and tube worms and the distribution of sub-bottom temperature gradients that can suggest the distribution and activities of cold seepage, dive surveys by R/V 'Kaiyo' / ROV 'Hyper-Dolphin' in March, 2001 (KY01-01 cruise) and R/V 'Natsushima' / ROV 'Dolphin-3K' and submersible 'Shinkai 2000' in November, 2001 (NT01-10 and NT01-11 cruise) were carried out.

In this area, cable-connected multi-disciplinary deep seafloor observatory was deployed in 1993 and real-time continuous observation of deep-sea environment has been carried out. In KY01-01 cruise, visual survey by video camera and acoustic mapping of colonies by CTFM sonar in several hundred meters around the observatory. At the same time, sub-bottom temperatures were measured at several sites. As the result, it became clear that the cold seep activity seemed to be most active in the large colony site about 40m south of the observatory, since the sub-bottom temperature gradient of this site is as high as 14.9 K/m in the survey area. Also, low temperature gradient less than one tenth is observed at the site 10 m apart from the high gradient site. This might suggest the locality of seepage, such as there is up-flow in one site and down-flow in the other site.

In NT01-10 and NT01-11 cruise, three dive surveys: ROV 'Dolphin-3K' #546 dive, submersible 'Shinkai 2000' #1320 dive and #1323 dive were carried out. In these surveys, sub-bottom temperature gradient distribution were investigated mainly at the sites which had not been measured in KY01-01 cruise and the continuous observation was carried out for 15 days by installing CTD sensor (Sea & Sun Technology GmbH CTD110M, pressure sensor was changed to Paroscientific 8BT2000-I.) with methane sensor (production of CAPSUM Technologie GmbH) at the site where the highest sub-bottom temperature gradient was observed. As the result, the phenomena that the water conductivity often had spike-shaped reduction by 5.7 % at most were observed. Width of the spike was a few minutes for short ones and more than 3 hours for long ones. This seemed to reflect the time variation of the seepage activity. As for sub-bottom temperature gradient distribution, a gradient as high as 21.5 K/m was detected in the north of the long-term observatory.

On the other hand, the phenomena were observed that the sub-bottom temperature fluctuated just after submersible left the seafloor, or that the conductivity reductions did not occurred in several days after deployment. These might suggest that underwater works on the seafloor affect the movement of pore water below the seafloor or cause the disturbance of the seafloor.