
 [JJ] Evening Poster | M (Multidisciplinary and Interdisciplinary) | M-IS Intersection

[M-IS17] Gas hydrates in environmental-resource sciences

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An increasing number of researches focusing on natural gas hydrates has recently been conducted from the environmental, material, and resource scientific viewpoints. This session aims to share and discuss the latest research results to understand and examine the nature and potential of gas hydrates in the past-present-future of the Earth. Because the researches on gas hydrates are interdisciplinary, broad topics from field and experimental researches, modeling, etc. will be presented in this session.

[MIS17-P09] Surveys Using an ROV in Areas with Gas Seeps in the Sea of Okhotsk Off the Coast of Abashiri, and the Estimated Amount of Gas Seeps

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In 1995, the Japanese government launched a project that was the first in the world to put methane hydrate (MH) into practical use. In those days, reflectors discovered in the Kitamiyamoto Bank off the coast of Abashiri were considered to be bottom simulating reflectors. This was the first inkling that MH might be found in the waters off Abashiri. In 2001, the National Institute of Advanced Industrial Science and Technology confirmed the presence of BSRs in waters off the coast of Abashiri on a research voyage for their GH01 project. At that time, core samples were taken from the surface layer of the seafloor. The samples swelled or fractured, indicating that they contained gas. The possible existence of MH in the surface layer of the seafloor was strongly suggested. Continuous exploration for MH reserves did not start until 2011, when the Kitami Institute of Technology and the University of Tokyo launched a joint investigation. In a survey conducted in 2012 by using the Umitaka-maru, a marine research training vessel owned by Tokyo University of Marine Science and Technology, MH was sampled for the first time off the coast of Abashiri. Since then, Kitami Institute of Technology has taken the leadership in ongoing surveys by using the Oshoro-maru, a research training vessel owned by Hokkaido University, and the Natsushima, a research vessel of the Japan Agency for Marine-Earth Science and Technology (JAMSTEC). These surveys have focused on the following: the use of a quantitative echo sounder and a multi-beam echo sounder to observe gas locations and submarine topography; the use of a single-channel seismic (SCS) reflection technique and a system called a sub-bottom profiler (SBP) for the sonic exploration of structures beneath the seabed; and the core sampling of marine sediments. These surveys have mainly been conducted aboard ship; the visual observation of gas seeps and MH-bearing sediments on the seafloor surface has not been implemented.

Thus, in July 2017, submersible surveys were conducted at two sites in the Sea of Okhotsk off the coast of Abashiri. One of these sites is the top of a seamount about 550m below the sea surface, and the other was at a submarine canyon about 750m below the sea surface. Kaiyo 3000, a remotely operated vehicle (ROV) carried by the Daiichi Kaiyo-maru, a vessel owned by Kaiyo Engineering Co., Ltd., was used for the

submersible surveys.

The surveys confirmed the concentrated presence of many vents that were leaking gas in relatively small areas, and the emission of large quantities of gas was successfully filmed. Gas was trapped by using a funnel-shaped container. The trapped gas was collected in a pressure vessel attached to the top of the container. When the seafloor surface near the gas vents was excavated by using the ROV's manipulator, small pieces of methane hydrate and gas ascending through the sea were observed. This indicated that methane hydrate exists in the surface layer of the seafloor. In the areas that were surveyed by submersible, there were many bacterial mats and carbonate aggregates. Many crabs of various species were observed near the carbonate aggregates and gas vents. Additionally, deep-sea cold-seep clams (*Calyptogena soyoe*) were collected. This clam species lives in areas of the ocean floor where methane seepage occurs.

Images recorded during the submersible surveys were used for estimating the amount of gas seeping in a 200m by 100m area on the top of a seamount 550m below the sea surface. In the survey areas, gas was found to be seeping from about 20 sites. Some sites had only one vent, and others had clusters of multiple vents. The amount of gas seeping from an area 5m in diameter where vents were concentrated was estimated at 170,000m³ a year. The amount of gas is valued at approximately 4 million yen. The amount and value of gas seeping from the entire survey area are estimated at 1,000,000m³ and 25 million yen, respectively.