

# Gas hydrate survey off Tokachi (the Pacific Ocean) in the framework of practical education of Kitami Institute of Technology

\*Yunosuke Hase<sup>1</sup>, Jumpei Matsuda<sup>1</sup>, Yuki Ikeura<sup>1</sup>, Akihiro Hachikubo<sup>1</sup>, Masaaki Konishi<sup>1</sup>, Hirotoshi Sakagami<sup>1</sup>, Hirotsugu Minami<sup>1</sup>, Satoshi Yamashita<sup>1</sup>

## 1. Kitami Institute of Technology

Distribution of BSR (bottom simulating reflector) has been reported off Tokachi, the Pacific Ocean (Hayashi *et al.*, 2010). Kitami Institute of Technology started gas hydrate survey in this area on 2014, using TS Oshoro-maru of Hokkaido University. This program is conducted in the framework of practical education (name of lecture: “Practical learning about the Okhotsk Region, its history and the natural environment”), and about 40 students participate the cruise. Three cruises (C008, C046, and C061) were executed in 2014-2018. We found many gas seeps ascending from sea floor, those height exceeded 700 m from the sea floor. We recovered gas-rich sediment cores by a gravity and hydrostatic corers. Here, we report characteristics of sediment gas in this area.

Samples of sediment gas, mainly dissolved gases in pore water, were obtained by a headspace gas method. 10 mL sediment was sampled from the sediment core by a plastic syringe (volume: 5 mL) and put into a 25 mL vial. 10 mL NaCl aqueous solution was introduced into the vial by using a micropipette and sealed employing a butyl rubber septum to make a headspace (5 mL volume). To avoid any changes in the headspace, preservative (benzalkonium chloride, BKC) was added and the headspace part was flushed by helium. We roughly checked gas composition of sediment gases onboard using a portable gas chromatograph, and after that we measured the molecular and isotopic compositions of headspace gases using another gas chromatograph and CF-IRMS in our laboratory.

Concentration of  $C_1$  increased with depth, and exceeded 1 [mM] in the bottom of some sediment cores (C008-GC1403, C046-GC1702, and C061-GC1803), indicating that their depths of SMI (sulfate-methane interface) were small and active gas seep existed at the sea floor. The minimum SMI depth was 50 [cmbsf] in C008-GC1403.  $C_1 / (C_2 + C_3)$  in these gas-rich layer was from 300 to 700. Concentration of  $H_2S$  exceeds 1 [mM] in the bottom of sediment cores. These results indicate that microbial gas is supplied from lower layer and AOM (anaerobic oxidation of methane) processes is active in beneath the sea floor.  $C_1 \delta^{13}C$  profiles showed minimum values (lower than -100‰) at the SMI depth in C061-GC1803.  $C_2 \delta^{13}C$  distributed between -55‰ and -30‰, suggesting that  $C_2$  seems also microbial origin.

## Reference

Hayashi M, Saeki T, Inamori T, Noguchi S (2010) The distribution of BSRs related to methane hydrates, offshore Japan. J Jpn Assoc Petrol Technol 75(1): 42-53

Keywords: gas hydrate, methane, the Pacific Ocean