

Characteristics of gas in shallow sediments from seepage field off Tokachi (the Pacific Ocean)

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In the framework of practical education of Kitami Institute of Technology (name of lecture: “Practical learning about the Okhotsk Region, its history and the natural environment”), we conducted research cruises off Tokachi from 2014 to 2019, where many gas seeps ascend from the sea floor and their height exceeded 700 m. During the cruises of C008, C046, C061, and C080 using TS Oshoro-maru of Hokkaido University, 11 sediment cores were retrieved from this area using a gravity and hydrostatic corers. In this report we summarize characteristics of sediment gas in this area. Sediment gas samples were obtained by a headspace gas method. We measured gas composition of the sediment gases onboard using a portable gas chromatograph (CP-4900, Varian), and after that we measured the molecular and isotopic compositions of the samples using another gas chromatograph (GC2014, Shimadzu) and CF-IRMS (Delta V, Thermo Fisher Scientific) in our laboratory. SMI (sulfate-methane interface) depths of C008-GC1403 and C080-GC1901 cores were around 50 cm, indicating active gas seepage. However, those of C008-GC1401 and C080-GC1902 cores were more than 2 m. C061-GC1802 core only contained carbonates. These coring points locate within 200 m, suggesting that gas seepage field is not uniform. Hydrogen sulfide was detected except two sediment cores, indicating that the process of anaerobic methane oxidation is active beneath the sea floor. $C_1 / (C_2 + C_3)$ showed minimum around the depths of SMI (sulfate-methane interface), because concentration of ethane simply increased with depth compared with methane. The above high methane flux points showed depletion in $\delta^{13}C$ of carbon dioxide, because light carbon dioxide was generated by oxidation of light methane.

Keywords: gas hydrate, methane, the Pacific Ocean