

Gas hydrate survey at the gas seepage area off Rebun Island, Japan Sea

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We investigated sea-floor sediments off Rebun Island (Japan Sea) to understand environment of near-surface gas hydrates, where gas plumes exist and ascend from the sea floor. HKY17, HKY18, and HKY19 cruises were conducted in 2017-2019 using RV Hokuyo-Maru (237 t) of the Wakkanai Fisheries Research Institute, in a framework of joint research between Kitami Institute of Technology and Hokkaido Research Organization. We observed gas plumes in this area and obtained 14 sediment cores during the three cruises using a gravity corer and hydrostatic corer. Their maximum length was around 140 cm, and some cores showed high concentration of methane (more than 0.1 mM), indicating high methane flux from the deep sediment layer. HKY1701 core showed heavy methane isotope (more than -50‰), however, it was not a proof of thermogenic gas because methane concentration was low (less than 0.002 mM). Methane $\delta^{13}\text{C}$ of sediment gases in other cores were around -80‰, suggesting their microbial origin. The relation between $\delta^{13}\text{C}$ of methane and carbon dioxide showed that the sediment gases were in the field of methane oxidation in the upper sediment layer. Methane-rich cores (HKY1804, HKY1805, HKY1901, and HKY1902) showed high concentration of hydrogen sulfide, generating by the process of anaerobic methane oxidation. Although hydrate-bound thermogenic gas were retrieved off Sakhalin Island and off Joetsu city (eastern margin of Japan Sea), it is concluded that microbial methane is dominant at the gas plume field off Rebun Island.

Keywords: gas hydrate, Japan Sea, gas origin