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Distribution of hydrocarbons in sediment in Nankai accretionary prism off Kumano: IODP Expedition 338 preliminary result

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During IODP Expedition 338, D/V *Chikyu* drilled deep-sea sediment in Nankai accretionary prism off Kumano from October 1 2012 to 12 January 2013. In the first half, mud gas monitoring and sampling of cuttings were conducted between 875.5 and 2,005.5 m below the seafloor (mbsf) at Site C0002 in southern Kumano Basin. In latter half, coring was carried out at Site C0002 (200-505, 902-940 and 1,100.5-1,120 mbsf) in Kumano Basin, and Sites C0021 (0-294 mbsf) and C0022 (0-420 mbsf) on a slope of the accretionary prism. We, geochemical group, collected headspace gas and void gas samples and interstitial water samples.

In this expedition, gas hydrates could not be recovered, but low-temperature anomalies were observed by IR-camera and low-Cl^- anomalies were detected in analytical results of interstitial water between 200 and 400 mbsf in Site C0002. In this interval, high resistivity anomalies had been observed in LWD data during IODP Expedition 314 in 2007, which was interpreted as the presence of gas hydrates (Expedition 314 Scientists, 2009). These facts suggest gas hydrates distribute between 200 and 400 mbsf in Site C0002. Based on hydrocarbon ratios ($C_1/(C_2+C_3)$) and carbon isotope ratios of methane ($d^{13}C(CH_4)$), the origin of methane in formation gas of gas hydrates would be of microbial.

Data of $C_1/(C_2+C_3)$ and $d^{13}C(CH_4)$ in this expedition continuously filled the gap of these data in IODP Expedition 315. Mud gas monitoring data were consistent with headspace gas data in cross over intervals between coring and mud gas monitoring, suggesting mud gas monitoring data could be reliable in deeper part of the cross over intervals. Based on the mud gas monitoring data, around half of methane would be derived from thermal decomposition of organic matter around 2,000 mbsf. Taking account of thermal gradient of 43 degree C per 1 km acquired during IODP Expedition 315, temperature around 2,000 mbsf is estimated to be more than 80 degree C, and it is reasonable that thermal decomposition of organic matter occurs around 2,000 mbsf.

At Site C0022, where bottom simulating reflections (BSRs) had not been observed, sediment in cores showed no evidence of gas hydrates in this expedition. However, a lot of gas pockets were observed in sediment in cores, and extraordinary degassing broke core liners, suggesting sediment contained a large amount of gas, though such gases was not enough to form gas hydrates *in-situ* conditions of pressure and temperature. Based on $C_1/(C_2+C_3)$ and $d^{13}C(CH_4)$, the origin of the methane in headspace gases would be of microbial. A peak of methane in a fracture zone around 100 mbsf was observed, but isotopic composition of the methane showed no anomaly. It suggests the peak of methane were accumulated from ambient sediment not deeper sediment.

Keywords: Nankai Trough, accretionary prism, hydrocarbons, IODP, Expedition 338