

Total organic carbon in subsurface sediment off Abashiri, the Sea of Okhotsk

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Because ultimate origin of hydrate-bound hydrocarbon is organic matter deposited on the sea floor, total organic carbon in sediment relates to formation of natural gas hydrates. Waseda (1998) noted that content of total organic carbon is a key factor controlling formation of gas hydrates of microbial origin. In this study, we report total organic carbon and its $\delta^{13}\text{C}$ in subsurface sediment retrieved off Abashiri (the Sea of Okhotsk), where natural gas hydrate exists, and compared with those of other places off Hokkaido. Sediment samples were obtained off Abashiri (C032, 1KY17, HKS17, and HKS18), off Monbetsu (GA18 and GA19), and off Tokachi (C046, C061, and C080). 182 sediment samples were dried, homogenized, and about 5 mg of samples were put into silver foil capsules. They were decarbonized with 12N hydrochloric acid for 24 h, and then dried and analyzed their TOC with a Flash 2000 Elemental Analyzer connected to a Delta V isotope ratio mass spectrometer. These samples were wrapped in tin capsules and combusted in an oxygen atmosphere. The system was calibrated using a standard of JCAC-01 (L-alanine, -23.43‰ in V-PDB).

Natural gas hydrates were retrieved in the sediment cores of HKS1807 and HKS1808 using a hydrostatic corer, and 1KYPS1701-04 using a push corer with ROV. The content of total organic carbon was 1.3-1.6% in HKS1807 and HKS1808, 0.8-2.3% in 1KYPS1701-04, and generally less than 1% for other sediment cores off Abashiri. It is reasonable to say that hydrate-bound sediment cores are rich in organic matter. On the other hand, C061-GC1803 off Tokachi showed around 2% and cores of GA18 and GA19 partly exceeded 3%, suggesting that the content of organic matter is not a sufficient condition for gas hydrate formation. $\delta^{13}\text{C}$ of total organic carbon distributed around -25‰ for all samples, however, some samples of 1KY17 showed less than -30‰. Because sediment cores of 1KY17 (1KYPS1701-04) were short (up to 25 cm) and obtained from the gas seepage, the organic matter might be affected by oxidized methane.

Reference

Waseda A (1998) Organic carbon content, bacterial methanogenesis, and accumulation processes of gas hydrates in marine sediments. *Geochem J* 32: 143-157

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