

## Methane concentration and its Carbon Isotope composition of the Interstitial water and Seawater column in Japan Sea

# Osamu Ishizaki[1]; Ryo Matsumoto[2]; Akihiro Hiruta[3]; Yosuke Igeta[4]

[1] Tokyo Univ.; [2] Earth and Planetary Sci., Univ. of Tokyo; [3] Earth and Planetary Sci, Tokyo Univ.; [4] Marine Science, TUMSAT

Active methane plumes shown by acoustic signatures of quantitative echo sounder and topography of seafloor characterized by mounds and pockmarks suggest methane activities in eastern margin of Japan Sea. Methane hydrates in the seafloor sediments are collected by piston corers during UT04 cruise in 2004 and hydrate coated methane bubble emitting from seafloor during NT06-19 cruise in 2006 are observed and directly suggested methane activities. In order to evaluate the impact of such methane seepage on ocean and atmosphere systems, we determine the concentration and isotopic composition of methane in the seawater columns and interstitial waters.

Concentrations of methane in seawater column are more higher (100nmol/L) than other area(5nmol/L). Seawater collected from above the gas venting sites showed 15umol/L, suggesting that the plumes caused high concentrations of methane in this area.

Vertical profiles of methane concentrations in seawater column showed characteristic features. Between 200m to 300m below sea level (mbsl), there are anomalously high concentrations of methane. This depth is related to hydrostatic pressure boundary of methane hydrate stability and also the boundary of the water mass called Japan Sea Proper Water (JSPW). We concluded that the methane floated up to the depths as solid methane hydrate, and was dissociated and dissolved at this depth range. Dissolved methane were diffused laterally along the boundary of the water masses. Remarkably high methane concentrations have been recognized at the active gas venting sites, where methane plumes were found by quantitative echo sounder and gas hydrates were recovered by piston coring. Another feature is that there are higher concentrations at 100m to 200m above the seafloor regardless of the methane plume sites. Such high anomalies are thought to have been caused by back-ground diffusion of methane emitted from the seafloor. The depth of SMI (sulfate-methane interface) indicate high methane fluxes over the area. (Hiruta et al., 2006)

Carbon isotopic values of methane in sediments showed regional features. Methane gases collected around the methane plume sites are relatively heavy (-40permil PDB), while those obtained far from the plumes are lighter (-90permil PDB). Methane of the plume sites are thought to be composed of thermogenic. Carbon isotope values of methane in water column were observed to be enriched in C-13, about -40permil PDB, indicating that they were of thermogenic methane.

Sulfate ion concentrations decrease linearly from seafloor and diminished at SMI depth, while methane concentrations increase with depth in particularly below SMI depth. This indicates that methane is supplied from below and oxidized by sulfate ion which is supplied from seafloor (Borowski, 1999). Methane in sediments are most depleted in C-13 at around the SMI depth, and tend to increase upward and downward. Fractionations observed above SMI are explained as the result of microbial methane oxidation, whereas the profile below the SMI is likely to reflect increasing amount of thermogenic methane and/or differential upward diffusion-advection of isotopically light methane.