Analysis of benthic community food web at gas hydrate deposits using stable isotope analysis

*AKARI FUKUDA[1], HIDEKI Numanami[2], Yohey Suzuki[3], Ryo Matsumoto[1]

1.Organization for the Strategic Coordination of Research and Intellectual Properties, Meiji University, 2.Department of Home Economics, Faculty of Home Economics, Tokyo Kasei-Gakuin University, 3.Department of Earth and Planetary Science, Graduate School of Science, the University of Tokyo

To better understand the ecology of benthic community at gas hydrate deposits, the stable isotopic signatures of carbon, nitrogen and sulfur ($\delta^{13}C$, $\delta^{15}N$ and $\delta^{34}S$) of the surface sediment and benthic fauna collected at Joetsu Basin and Mogami Trough were evaluated. We analyzed their food web and speculated the carbon and sulfur cycles in the benthic water at hydrate deposits.
Sampling of benthic fauna at seeps using a slurp gun and a strainer was conducted during September 2013 and October 2014 at seep and reference sites. We obtained surface sediment sample using MBARI ROV coring system at depths of 0-2.5 and 2.5-5 cm below seafloor. Macrofaunal sample was dissected on board and frozen. Meiobenthos were removed by sieving of sediment samples and frozen. In laboratory, faunal sample was powdered after freeze drying. We measured stable isotope signatures of carbon and nitrogen using IRMS (Flash 2000/Delta V IRMS, Thermo Scientific Inc.) after removal of inorganic carbon using HCl solution and neutralization by NaOH. Similarly, stable isotope signature of sulfur was measured using free dried faunal sample. We collected the precipitates of zinc and barium in pore water extracted from the sediment sample and seawater by filtration for sulfur isotope composition of sulfate and sulfide.
Our result shows that no distinct difference between the isotopic signatures of red snow crab, one species of eelpout, *Bothrocara hollandi*, northern shrimp and amphipods collected both at seep site and reference site. It suggests that their food habitat depends mainly on photochemically-produced organic carbon and sulfur from seawater sulfate even in an individual inhabiting around methane seep.
While, biplots of $\delta^{15}N$ versus $\delta^{13}C$ vs and $\delta^{34}S$ versus $\delta^{13}C$ suggest that some benthic animals such as solemyid clam and frenulata tube worm depend on carbon and sulfur derived from chemosynthetic bacteria.
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Keywords: methane hydrate, benthic fauna, food web, Stable isotope signatures

