Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

ACG33-09 Room:202 Time:May 26 11:30-11:45

The evaluation of the effectiveness of the d13C signature in bivalve shells as proxy for environment of SGD

TOMINAGA, Osamu[1*] ; HORIBE, Nanami[1] ; NISHI, Saori[1] ; SUGIMOTO, Ryo[1] ; YAMADA, Makoto[2] ; SHOJI, Jun[3] ; HONDA, Hisami[2] ; KOBAYASHI, Shiho[4] ; TANIGUCHI, Makoto[2]

[1]Fukui Prefectural University, [2]Research Institute for Humanity and Nature, [3]Hiroshima University, [4]Kyoto University

Submarine groundwater discharge (SGD) is often characterized by high concentration of nutrients and documented as an important pathway between land and sea contributing to the biological productivity in coastal waters. However, to our knowledge, no scientific information about the relationship between environmental conditions of SGD and the extent of biological productivity of the primary consumers is available. The carbon stable isotope composition of dissolved inorganic carbon (δ^{13}C{DIC}) is generally different between SGD (low $\delta^{13}C_{DIC}$) and sea water (high $\delta^{13}C_{DIC}$). Bivalves record chemical and biological environment-signal in their shell. In this study, to examine whether the δ^{13}C of bivalve shell ($\delta^{13}C_{SHELL}$) reflect the $\delta^{13}C_{DIC}$ of the ambient water or not, we conducted the rearing experiments of Manila clam *Ruditapes philippinarum* under laboratory and field conditions. Manila clam was reared at three different salinity in the laboratory; 100% sea water (100 % SW), 80% sea water + 20% underground water (80 % SW) and 60 % sea water + 40% underground water (60 % SW). Water temperature of three salinity groups was maintained at 25 ℃ and the same amount of diet (*Chaetoceros gracillis*) was fed every day during experiments (3 months). There was a high positive correlation between $\delta^{13}C_{DIC}$ and salinity (r^2 = 0.997, n = 32, $p<0.001$). Although the significant difference among 100 % SW, 80 % SW and 60% SW was not found (ANOVA, $p>0.05$), the $\delta^{13}C_{SHELL}$ of 80 % SW and 60 % SW was tend to be lower than that of 100 % SW. The field experiment was carried out at 6 sites under different SGD condition in Obama Bay, Japan from July to August 2013. Manila clam was reared in the small containers with bottom sand, which were kept at the depth of 2 m under natural condition. There was a high negative linear relation between δ^{13}CSHELL and Radon 222 (^{222}Rn) concentration at surface layer of each rearing site ,which is a useful tracer of SGD (r^2 = 0.920, n = 6, $p<0.01$). Thus, it seems that the $\delta^{13}C_{SHELL}$ shows some possibility of being proxy for environmental reconstitutions of submarine groundwater discharge. However, the value of the $\delta^{13}C_{SHELL}$ was lower by about 5 ‰ than that of the $\delta^{13}C_{DIC}$ of ambient water in the laboratory experiment. It was the possible reason that isotopically light metabolic carbon, derived from food, is incorporated into shell carbonated.

Keywords: Dissolved inorganic carbon, metabolic carbon, bivalve shell, carbon stable isotope ratio, submarine groundwater discharge