Evaluation of the environmental condition of Submarine Groundwater Discharge (SGD) by using carbon stable isotope ratio recorded in the shell of sessile bivalve

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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. In the present study we investigated two subjects 1)whether the $\delta^{13}C$ of ambient water reflect the proportion of fresh water flux in SGD, 2)whether the $\delta^{13}C$ recorded in the shell of the sessile bibalve reflect the that of the ambient water. The SGD flux and the proportion of fresh water flux in SGD were measured by the seepage meter at Kamaiso beach along the Mt. Chokai volcanic coast in June and September 2016.The rock-oyster (*Crossostrea nippona*) was also sampled at Kamaiso Beach and adjacent 3 areas (Mega, Takinoura, Torisaki). There was a positive significant relationship between salinity and the δ 13C of ambient water ($p<0.01$). The $\delta^{13}C$ of the rock-oyster shell was high where the SGD flow rate was high and the positive significant correlation was found between the $\delta^{13}C$ of the rock-oyster shell and that of ambient water. In order to estimate the proportion of fresh water flux in SGD from the $\delta^{13}C$ of the rock-oyster shell, we used the two end member mixing equation including DIC concentration of both sea water and underground water. The average proportion of fresh water flux in SGD estimated from the mixing model ranged from 4 % (Torisaki) to 35 % (Mega). These values are higher than those estimated from the $\delta^{13}C$ of ambient water (1.3 % Torisaki and 18.1 % Mega). The difference of these results are seems to be the difference of local SGD environment around rock-oyster.

Keywords: Submarine groundwater discharge, sessile bivalve, Rock-oyster, carbon stable isotope ratio, SGD flow rate, the proportion of fresh water flux in SGD

