Hydrothermal circulation within modern sediment layer in a shallow submarine volcano, Wakamiko crater, south Kyushu, Japan

Jun-ichiro Ishibashi (E-mail: ishi@geo.kyushu-u.ac.jp), Mariko Seguchi, Keita Ogawa,
Miwako Nakaseama (Facul. Sci., Kyushu Univ.), Toshiro Yamanaka (SCS, Kyushu Univ.),
Minoru Kusakabe (ISEI, Okayama Univ.)

Associated with the well known submarine fumarolic bubble emissions (called as "Tagiri"), fluid emanation from a small sediment mound has been confirmed within the Wakamiko crater (31°40'N, 130°46'E, depth=200m) in Kagoshima Bay, which is located within adjacent to the active volcano Sakurajima. In this area, evidence for high-temperature hydrothermal activity such as authigenic pyrite and hydrothermal petroleum occurrence was reported.

During NT03- 09 and NT05- 01 cruises employing ROV (Remote Operation Vehicle) *Hyper Dolphine* (JAMSTEC), shallow core samples (up to 30cm length) were collected from inside of and around the small sediment mound where gentle fluid shimmering was observed. By stabbing a temperature probe (20cm length) into the mound, temperature up to 150°C was recorded before the coring. Pore fluid samples were extracted from the core sediment at 5cm intervals, and provided for chemical analyses and isotope measurements.

Chemical composition of the pore fluid was basically explained by simple mixing of the hydrothermal component and seawater, as shown in Fig. 1. Silica concentration of the hydrothermal endmember was about 5mmol/kg, which is comparable to quartz solubility at 200°C and at the seafloor pressure. From the mound, hydrothermal precipitates such as stibnite and barite were identified. Chemical composition of the shimmering fluid follows the same relationship as the pore fluid, suggesting the fluid ascends within the sediment. These fluid chemistry was characterized as significant low chloride concentration (<300mM) compared with seawater (550mM).

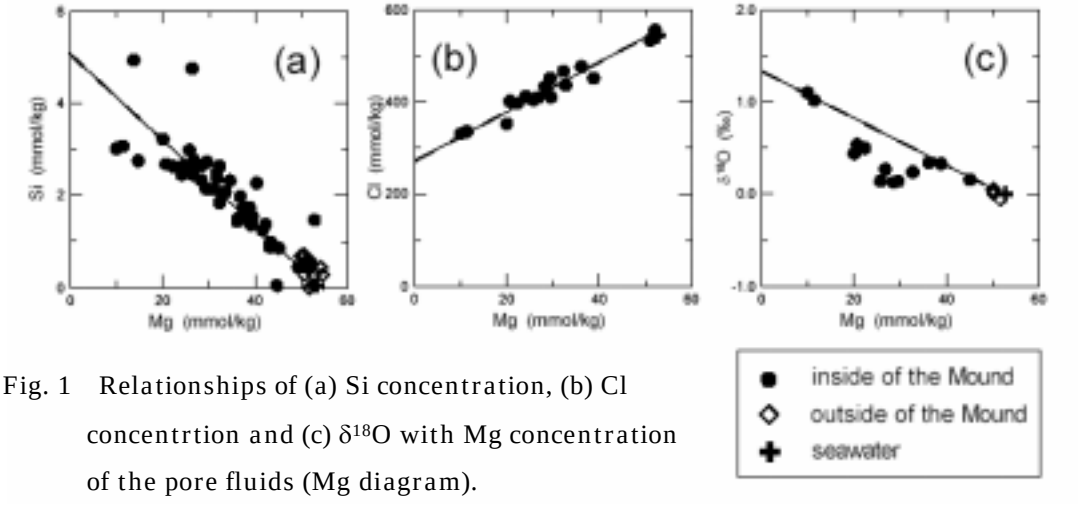

Fig. 1 Relationships of (a) Si concentration, (b) Cl concentrtion and (c) $\delta^{18}O$ with Mg concentration of the pore fluids (Mg diagram).

Isotopic compositions (δD and $\delta^{18}O$ values) of the hydrothermal fluid endmember estimated by the pore fluid data are plotted in Fig. 2, together with those of seawater and meteoric water. Significant negative δD value together with low Cl concentration suggests involvement of meteoric water into the hydrothermal circulation. Positive $\delta^{18}O$ value could be attributed to contribution of magmatic volatiles.

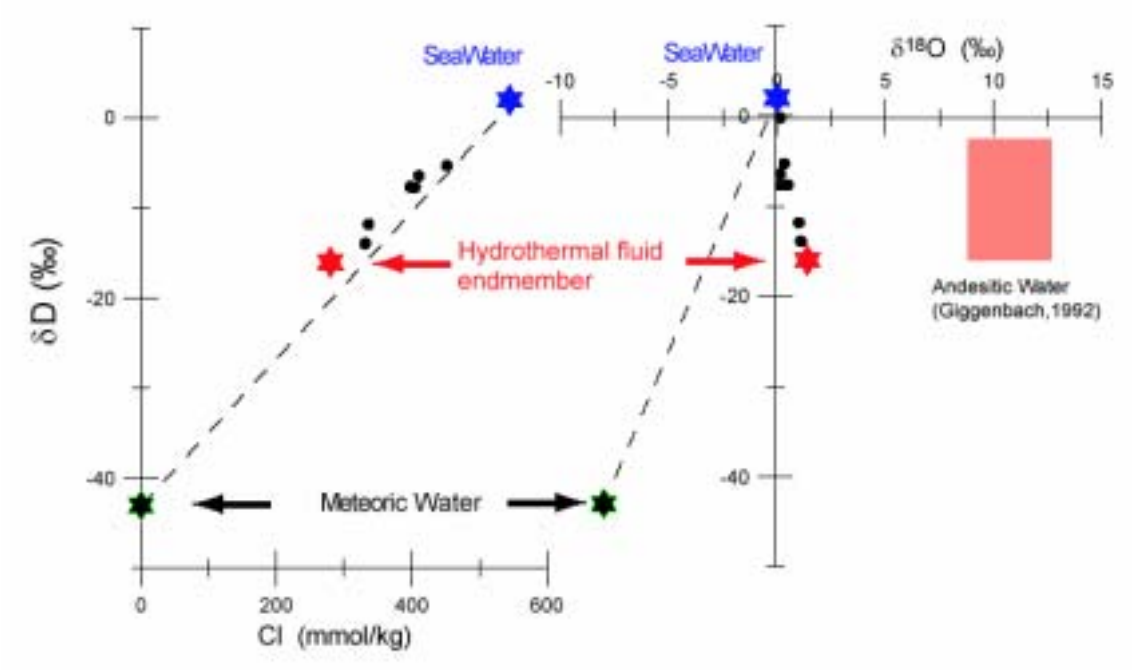

Fig. 2 Relationship among isotopic composition and Cl concentration of the estimated hydrothermal fluid endmember in Wakamiko crator, meteoric water and seawater.