Fluid geochemistry of hydrothermal system in the Suiyo Seamount

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During dive programs conducted by Archaean Park Project (2000-2002), fluid samples were extensively collected from both high-temperature (up to 300deg) and low temperature vents within submarine arc volcano Suiyo Seamount. Concentrations of chemical species are explained by simple mixing between the hydrothermal endmember and ambient seawater, with only some exception. This suggests a single aquifer distributes beneath the caldera floor. Major elements chemistry agrees with the model that the hydrothermal fluid is equilibrated with surrounding alteration minerals by fluid rock interaction at high temperature.

Concentrations of reducing species in the hydrothermal end member were rather low compared with mid-oceanic ridge hydrothermal system. Following two factors may explain this signature. First, concentrations of organic-derived species (CH4 = 140uM, NH4 = 15 uM) reflect little supply of terrigenous organic sediment over Suiyo Seamount. Second, incorporation of magmatic volatiles could control fluid chemistry as higher redox condition. High CO2 / CH4 ratio (CO2 = 40.6 mM), low H2 concentration (100 to 150uM), low H2S concentration (around 1.5 mM) are attributed to oxygenic signature of dacite magma beneath the Suiyo hydrothermal field. Carbon and sulfur isotope systematics supports magmatic volatiles incorporation. The hydrothermal system in the intra-oceanic arc setting would provide less energy sources than that of mid-oceanic ridge for chemosynthetic organisms beneath the seafloor.