Water-rock interactions within a seafloor hydrothermal system at Suiyo Seamount, Izu-Bonin Arc

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We studied geochemistry of hydrothermal fluids collected from Suiyo Seamount (28 34'N, 140 30'E, depth 1360m), during the dive programs in 2001 and 2002 conducted by Archaean Park Project. The results showed some specific signature representative for a hydrothermal system associated with magmatic activity in island arc setting.

Fluid samples were collected from whole area of the hydrothermal field including the drilled holes, which temperature ranged from 4 to 300 degree. Although this wide range of sampling, chemical compositions of most of the obtained samples revealed simple mixing between a unique hydrothermal endmember and ambient seawater (with exception for the hydrothermal pool site reported by Yamanaka et al. 2003). Moreover, estimated chemical composition of the hydrothermal endmember has been stable for this decade. These results strongly suggest a single hydrothermal aquifer distributing widely beneath the seafloor. The silica concentration of the endmember fluid was close to the saturation with quartz, which indicates chemical equilibrium among the hydrothermal fluids and minerals within the aquifer.

Geophysical surveys and geological studies of the drilled core has revealed geological structure beneath the Suiyo seamount caldera floor as dominated with dacite lava and unconsolidated sediments of volcanic sands and pumice fragments (Urabe et al., 2002). The coarse volcaniclastic sediment is considered as suitable for hydrothermal aquifer, which would enhance fluid-mineral interactions due to large surface area of minerals. This means the fluid geochemistry is strongly controlled by fluid interactions with dacite rocks and alteration minerals. Significant calcium enrichment in Suiyo hydrothermal fluids is attributed to fluid interactions with low-K series dacite in Suiyo seamount. Fluid interaction with clay minerals such as mica, through chlorite/montmorillonite (Marumo et al., 2002) would be one of important factors to characterize geochemical signature of Suiyo Seamount hydrothermal activity.