

Volcanic hydrothermal system of Mt. Kusatsu-Shirane, Japan hosting the active crater lake Yugama

Takeshi OHBA, Kazushige NAKAMURA¹, Michiko OHWADA², Jun-ichi HIRABAYASHI, Kenji NOGAMI

Volcanic Fluid Research Center, Tokyo Institute of Technology

1: present affiliation, Nihon UNISYS

2: present affiliation, Geological Survey of Japan, AIST

Corresponding e-mail address: ohba@ksvo.titech.ac.jp

Mt. Kusatsu-Shirane is located at the middle of Honshu island Japan. It is an active volcano hosting crater lakes on the summit area. One of the craters, Yugama is filled with a strongly acidic lake water (pH=1.2). The color of the lake likes a mixture of green and gray. The unusual color attracts sight seeing people who climbs up a belvedere placed on the rim of crater. The crater lake is an important resource for local economy. In 1982 and 83, steam explosive eruption occurred in the crater. Debris of 0.5 to 1m in diameter were thrown over 500m of distance. Although the magnitude of the eruption was only 1 in VEI scale, if people were looking into the lake, they would be injured severely. Fortunately the eruptions in 1982 and 83 took place in winter, then no people was injured, because due to heavy snow accumulation the access to the summit area had been exhibited.

A number of researches have been carried out on the volcanic activity of Mt Kusatsu-Shirane, in terms of geochemistry, geophysics and geology. One of the missions by Volcanic Fluid Research Center (hereafter VFRC), Tokyo Institute of Technology is the monitoring of Mt.Kusatsu-Shirane for the mitigation of volcanic hazards by using geochemical methods. VFRC was established in 1987 and it is continuing the geochemical monitoring of Yugama lake water and also the chemical composition of fumarolic gas which is discharged on the north outer flank of Yugama crater. For the monitoring of volcanic activity, the chemistry of crater lake water has provided useful information, for example, Yugama, Poas in Costa Rica, Ruapehu in New Zealand, Ijen in Indonesia. Many active crater lakes associate fumarolic gas discharge within the crater rim (Ijen, Poas, and Aso in Japan) and outside the crater rim (Yugama, Irazu and Rincon de la Vileja in Costa Rica).

The chemistry of crater lake water and fumarolic gas could be believed to be related closely due to the adjacencies between them. In this study, the chemical and stable isotopic ratios of fumarolic gases were investigated at Mt. Kusatsu-Shirane and a shallow structure of the hydrothermal system involving the cater lake is modeled. The model for the hydrothermal structure will contribute the interpretation of chemical data acquired for the prediction of next eruption at the volcano.