Formation model of fumarolic gases by the 36Ar/H2O and 18O/16O ratios applied to Mt. Hakone and Mt. Kusatsu-Shirane

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The steam explosion is one of the styles of volcanic eruption. The steam explosion is brought by the increase of pressure in hydrothermal reservoir. The increase in the flux of fumarolic gas is not classified as eruption even if the increase of discharge is much extensive. The steam explosion may be regarded as an ultimate state of increased flux of fumarolic gas. In this context, the understanding of formation process of fumarolic gas could be a key for the understanding of steam explosion.

A model for the formation of fumarolic gas from Mt. Kusatsu-Shirane volcano was made by Ohwada et al. (2003) by focusing on the correlation between 36Ar/H2O and 18O/16O ratios. The common method was applied to Mt. Hakone volcano in this study. Twelve fumarolic gases were sampled and analyzed. The most of 36Ar/H2O molar ratios were much higher than 7.5E-9, which is the molar ratio of water saturated with air at 1 bar. In contrast, the 36Ar/H2O molar ratio was less than 7.5E-9 for the gas from Mt. Kusatsu-Shirane volcano. The high value in the 36Ar/H2O ratio at Mt. Hakone volcano can be attributed to the addition of a steam with meteoric origin, because if the ground water is heated conductively and a part of water is evaporated, 36Ar dissolved in the ground water is totally transferred to the vapor phase, resulting in the creation of steam with high 36Ar/H2O ratio. The addition of the steam with meteoric origin has been proposed by Sawa et al. (2005) based on the correlation between CO2/H2O and 18O/16O ratios, which is consistent to the conclusion in this study.