Fumarolic gases sampled at Ebino-Iwoyama and Shinmoedake volcanoes, Kirishima, Japan

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Introduction

New fumaroles have appeared at Mt Ebino-Iwoyama volcano Kirishima Japan in Dec 2015. After the appearance, volcanic earthquakes and tremor have been observed, suggesting the activation of volcanic activity. At Mt Shinmoedake volcano Kirishima Japan, a magmatic eruption happened in 2011. Until Jan 2017, the volcanic activity has decreased and the activity is almost dormant. In general, fumarolic gases contain magmatic components. In this study, we have sampled fumarolic gas at Ebino-Iwoyama and Shinmoedake volcanoes. The chemical and isotopic composition of fumarolic gases will give us the useful information for the evaluation of activity at the both volcanoes.

Fumarolic gas

We have sampled fumarolic gases at the fixed position on the summit area of both Ebino-Iwoyama and Shinmoedake volcanoes. The temperature of fumarolic gas, at the outlet of fumarole, was close to the boiling temperature of water under the local atmospheric pressure. The momentum of discharging fumarolic gases was low at the both volcanoes, producing no big sound.

Result and Discussion

(Ebino-Iwoyama volcano)

The CO2/H2O ratio of fumarolic gas had increased until May 2016 followed by a continuous drop after Jul 2016. In general, CO2 gas originates in the degassing magma. The recent decrease of CO2/H2O ratio suggest the suppressed degassing activity of magma. The apparent equilibrium temperature (AET) can be calculated by use of the concentration of H2O, H2S, SO2 and H2 in fumarolic gas. The calculated AET was 232C in Dec 2015. It increased to 313C in Feb 2016, followed by a stabilized temperature. In Dec 2015, the 18O/16O ratio of H2O in fumarolic gas was low. It increased significantly in Feb 2016 followed by a gradual increase. The changes in AET and 18O/16O ratio suggest an invasion by hot magmatic fluid within the shallow hydrothermal system beneath fumaroles.

(Shinmoedake volcano)

One conspicuous feature of fumarolic gas composition was the high CO2 concentration extending to 5 to 7%. The concentration is much higher than the value of fumarolic gas sampled in 1991 and 1994, which was 1.4 to 1.9%. On the other hand, H2S concentration was only 0.01 to 0.04%, much depleted relative to the gas in 1991 and 1994 such as 0.2 to 0.6%. The recent chemical composition of Shinmoedake volcano suggests the sustained degassing of CO2 rich magma with the process removing H2S gas working along the channel of volcanic fluid between magma and fumarole.

Keywords: Kirishima Ebino Iwoyama Shinmoedake, Volcanic gas, magma