**Japan Geoscience Union Meeting 2011**
(May 22-27 2011 at Makuhari, Chiba, Japan)


SVC070-P13 Room:Convention Hall Time:May 23 16:15-18:45

# CO2/H2O ratio of magmatic gas at Shinmoe-dake volcano, Japan, in 1994: Implication to the eruption in 2011

Takeshi Ohba[1*]

[1]Dep. Chem. School Sci. Tokai Univ.

The chemical composition of fumarolic gases brings us useful information on the volatile in magma, because fumarolic gases contain volatile components such as H2O and CO2 originating in a degassing magma. For example, CO2 degasses preferentially relative to H2O. Therefore, the CO2/H2O ratio of the degassed volatile is expected to decrease along the progress of magma degassing. The CO2/H2O ratio of magmatic component in fumarolic gas could be a key for the estimation of volatile content in magma. Since the magmatic eruption is driven by the volatile in magma, the CO2/H2O ratio of fumarolic gas will be used for the evaluation of eruptive potential.

In this study, the chemical and isotopic composition of fumarolic gases at Shinmoe-dake volcano in 1994 is re-evaluated in terms of magmatic CO2/H2O ratio. The ratio is compared with those of other volcanoes with variety in the activity in order to implicate the 2011 eruption at Shinmoe-dake volcano.

In 1994, two fumarolic gases were sampled within the summit crater and on the outside flank of crater. The discharge of gas was strongly discharging with large noise. However, the temperature of gas was 103C at most (Ohba et al., 1997). In general, a magmatic gas is mixed with cool groundwater resulting in the formation of a vapor and liquid phases. The vapor phase is thought to be represented by the fumarolic gas at surface. The above model for the generation of fumarolic gas applies to the fumarolic gas at Shinmoe-dake. Based on the correlation between CO2/H2O ratio and isotope ratio of H2O in fumarolic gas, the magmatic CO2/H2O ratio was estimated to be 0.03 for the fumarolic gas at Shinmoe-dake volcano.

The eruptive potential seems to be correlated with the CO2/H2O ratio of magmatic component. For example, the CO2/H2O ratio is 0.006 for the dormant volcanoes such as, Kusatsu-Shirane, Atosanupuri and Hakone. In 1989, the seismic activity at Iwate volcano increased. The CO2/H2O ratio of magmatic component in 1989 and 1999 was 0.008. After all Iwate volcano has failed to erupt. Meakan-dake volcano is located close to Atosanupuri. Meakan-dake erupted phreatically in 2006. The CO2/H2O ratio for Meakan-dake is 0.012. The CO2/H2O ratio for Kuchinoerabu volcano is 0.013 (Shinohra et al., 2001). The seismic activity and SO2 flux have increased recently. The CO2/H2O ratio for fumarolic gas at Unzen was 0.03 during the effusive magmatic eruption (Ohba et al., 2008). The ratio was decreased to 0.015 when the effusion of magma stopped. The CO2/H2O ratio of fumarolic gas at Izu-Ohsima was 0.04 just after the magmatic eruption in 1986 (Kazahaya et al., 1993). The CO2/H2O ratio of volcanic gas at Mt. Etna is 0.1 to 1.0 (Shinohara et al., 2008). The volcanic activity at Etna volcano is significantly intense.

Comparing the CO2/H2O ratio at Shinmoe-dake in 1994 with the above examples, the ratio is recognized to be high as same as the ratio at volcanoes during eruption or after eruption. Presently it is difficult to use the CO2/H2O ratio as the precursor of eruption because the CO2/H2O ratio at Shinmoe-dake just before the eruption in 2011 was not obtained. The CO2/H2O ratio of magmatic component may be used for the evaluation of eruptive potential in medium- and long-terms. One application is possible to Tatun volcanoes in Taiwan. The CO2/H2O ratio at Tatun volcanoes was 0.018 to 0.027 (Ohba et al., 2010). Although no historical eruption at Tatun volcanoes was recorded, an eruption younger than 20kBP has been estimated (Chen and Lin, 2002). The high CO2/H2O ratio at Tatun volcano may suggest the eruptive potential in future.

Keywords: Shinmoe-dake, magma, CO2, H2O, fumarolic gas