Continuous Monitoring of Soil CO2 Concentration at the Summit of Mt. Mihara of Izu-Oshima Volcano (3)

Hidefumi Watanabe[1]

[1] Earthq. Res. Inst., Univ. Tokyo

(Introduction)

In order to conduct mid-term prediction of eruptions, we need to clarify precursory processes, especially, magma accumulation process and the way of magma achievement of the conditions to start rising up toward eruption. We have detected the secular re-inflation of Izu-Oshima volcano since 1990 after the last eruption in 1986-87 (Watanabe, 1998), and further revealed that the volcano has repeated inflation-deflation cycles resulting a net inflation and the accelerated inflation has been accompanied by the elevation of shallow seismic activity in the caldera region (Morita and Watanabe, 2005). We naturally suppose that the volcano inflation is caused by the supply of magma from depth. However, what is the origin of the deflation? There are two possible processes causing the deflation; magma drain back and the contraction of accumulated magma due to degassing. If the latter is the case, the inflation-deflation cycle indicates the accumulation and relaxation of magma beneath the volcano and closely related to the way of magma achievement of the conditions to start its rising up toward the eruption. Consequently, the observed inflation-deflation cycles might give us an invaluable clue to understand the precursory processes.

(Continuous monitoring of soil CO2 concentration)

To monitor the degassing of basaltic magma accumulating beneath volcano, CO2 is most helpful because CO2 has a low solubility in magma and separates from melt at the earliest stage after accumulation. On 28 September 2005, we started continuous monitoring of soil CO2 concentration at the eastern part of the summit of Mt. Mihara of Izu-Oshima volcano. Measured data are stored every 5 minutes in a logger and accessed via radio LAN system. All the instruments are powered by solar battery. We further surveyed the distribution of soil CO2 concentration around the summit area, and installed another continuous measurement system in December 2006 at the western part of the summit.

(Variations of soil CO2 concentration)

CO2 concentration data showed temporal variations in the range of 0.1-2.8vol% and the following features. 1) Soil CO2 concentration sometimes increased with duration of several hours to days. 2) Decrease of 1m-depth temperature followed that of soil CO2 concentration with delay of several hours, suggesting that both the soil CO2 and high temperature fumaroles are fed by volcanic gas emanating from depths. 3) There occurred several correlated increase of the soil CO2 concentration and the seismic activity in the caldera. 4) There occurred peculiar seismic events (with a predominant frequency of about 1Hz) originating from very shallow depths beneath the summit in the period of elevated CO2. These low frequency events might be generated by rapid flow of volcanic gas beneath the summit.

(Conclusion)

We observed temporal variations of soil CO2 concentration in relation to the elevation of seismic activity around Izu-Oshima volcano. We will further elucidate the magma accumulation and degassing processes beneath Izu-Oshima volcano by integrating ground deformation, seismic activity, and changes in magnetization, electrical resistivity and CO2 concentration beneath the summit.