Characteristics of magma accumulation process of a basaltic volcano Izu-Oshima, Japan as revealed from integrated monitoring of deep low-frequency earthquakes, volcano deformation and CO2 out-gassing

Hidefumi Watanabe

Disaster Prevention Division, Tokyo Metropolitan Government, Japan

E-mail: watanabe@eri.u-tokyo.ac.jp

In order to make successful mid-term eruption predictions, we need to detect particular precursory processes operating in magma-plumbing system. Since 1989, Izu-Oshima volcano has continued its re-inflation, after the last eruption in 1986, and further repeated deflation-inflation cycles, resulting a net inflation of the volcano. The rate of secular inflation decreased exponentially until 2006, while the amplitudes of the deflation-inflation cycles increased. Since 2007, the rate of secular inflation has kept a constant speed and has also increased the activity of deep low-frequency (LF) earthquakes occurring at the depth range of 30-40 km beneath the volcano. Each episodic LF earthquake activity was preceded by the volcano deflation and accompanied by the inflation. Based on these evidences, we may suppose that the volcano inflation is caused by the supply of magma from a source region at the depth range of 30-40 km beneath the volcano, and that an episodic out-gassing from the shallow magma reservoir triggers each deflation-inflation cycle. To demonstrate the proposed mechanism, we need to combine the data on magma accumulation and out-gassing processes. To monitor the out-gassing of basaltic magma accumulating beneath the volcano, CO_2 is most helpful. In September 2005, we started continuous monitoring of soil CO_2 concentration at the summit of Izu-Oshima volcano, and obtained an evidence for the out-gassing process; the correlated increase of soil CO_2 concentration during the periods of not only accelerated inflation but also deflation of the volcano. Integrating the observational data, we suppose that the rate of magma supply from the upper mantle has increased since 2007 and that the increase in amplitude of deflation-inflation cycles might indicate a volume increase of CO_2 over-saturated region at the upper part of the magma reservoir beneath the volcano.