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Towards mid-term eruption prediction of Izu-Oshima volcano (3): Magma accumulation and soil CO2 concentration variations

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In order to make successful mid-term or long-term eruption predictions, we need to detect particular precursor processes operating in magma-plumbing system. By integrating the precursors to the 1986 eruption of Izu-Oshima volcano, we proposed that the accumulation of magma had continued for more than 10 years until 1980, and then basalt magma started to rise up through the well-developed conduit. Since 1989, we have detected the secular re-inflation of the volcano and further revealed the repeated inflation-deflation cycles, resulting a net inflation of the volcano. The rate of secular inflation has decreased exponentially until 2008, and then kept a constant speed. We naturally suppose that the volcano inflation is caused by the supply of magma from depths. What is the origin of the deflation? There are two possible processes causing the deflation, magma drain back and the contraction of magma due to degassing. In either case, the inflation-deflation cycle indicates the accumulation and relaxation of magma beneath the volcano and closely relates to the way of magma achievement of the conditions to start its rising up toward the eruption. The elucidation of inflation-deflation cycles may throw light on understanding the precursor processes. To monitor the degassing of basaltic magma accumulating beneath the volcano, $CO_2$is most helpful because CO_2separates from melt at the earliest stage of accumulation. In September 2005, we started continuous monitoring of soil CO_2concentration at the eastern part of the summit of Izu-Oshima volcano. We observed the correlated increase of soil CO_2 concentration during the periods of not only accelerated inflation but also deflation of the volcano. Degassing of the accumulated magma might cause the deflation.

Keywords: eruption prediction, precursors to eruption, Izu-Oshima volcano, magma accumulation, CO2