Towards mid-term eruption prediction: A comparative study of precursory processes at Izu-Oshima volcano, Japan

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In order to make successful mid-term or long-term eruption predictions, we need to detect particular processes operating in magma-plumbing system quantitatively. 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. In order to observe the whole process of magma accumulation and migration leading to the next eruption, we have constructed a dense seismic and geodetic observation network covering the whole volcano, and electromagnetic and microgravity observation system around the summit crater. 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. We naturally suppose that the volcano inflation is caused by the supply of magma from depth. 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. To monitor the degassing of basaltic magma accumulating beneath the volcano, CO_2 is most helpful because CO_2 separates from melt at the earliest stage of accumulation. In September 2005, we started continuous monitoring of soil CO_2 concentration at the eastern part of the summit of Izu-Oshima volcano. We observed correlated increase of the soil CO_2 concentration and seismic activity around Izu-Oshima volcano. We will discuss the magma accumulation and degassing processes beneath Izu-Oshima volcano based on ground deformation, seismic activity, and changes in magnetization, electrical resistivity and CO_2 concentration beneath the summit.