

A sigh of volcano Izu-Oshima (2): A signal from a preparation process of the future volcanic eruption at Izu-Oshima volcano

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Many previous studies support that volcanic eruptions do not happen suddenly but some phenomena prior to the eruption were observed by geophysical network. Among them, the expansion of volcanic edifice is one of the important signals for long-term prediction of the coming next eruptions. Many volcanologists vaguely supposed that the inflations of volcanic edifice are caused by magma rises from deeper source to magma reservoirs located a few kilometers beneath the summit and increasing amount of the magma and/or chemical reaction including degassing process. However, the detailed processes have not been well-solved by geophysical evidences, and the preparing processes to the volcanic eruption have not been yet understood in detail.

We constructed dense seismic and GPS arrays at Izu-Oshima volcano, where it has passed 18 years since the latest volcanic eruption and its average interval of the eruption is historically around 30 years. We have already reported on the phenomenon occurring April-August 2004 in which the inflation of the volcanic edifies and increasing micro-seismicity located beneath the summit (Morita et al., 2005, 2006). We re-analyzed the GPS data for the longer time interval and found out another inflation event occurring between February 2005 and February 2006, and deflation event occurring between July and December, 2006.

Two inflation events have the almost same pattern of horizontal displacement vectors for 20 GPS stations in Izu-Oshima volcano, and the final displacement for the both inflation process is almost same. It strongly support that the both inflation process are caused by the inflation of the same pressure source or two sources located closely. The location and shape of the pressure source is not easy to solved from limited coverage of GPS array network, but we suppose that isotropic volume increase at the depth of 4km beneath the northward of the summit, because the seismic velocity gap was found at the depth, and miro-seismicity is limited at the region just above the inflation source. The rate of the ground displacements in both inflation processes is completely different. The rate between April and August 2004 is approximately four times faster that that between Feb. 2005 to Feb. 2006. And, the seismicity accompanied with the both inflation processes is approximately proportional to the ground inflation rate. It may show that the strain rate at the tip of the magma reservoir controls the seismicity. Otherwise, the inflation process of the both period has different process. This point is still open in the present data.

In the period of July to December 2006, we found distinct deflation process. The pattern of horizontal displacement vectors for the GPS stations is completely different from the reverse pattern of the both inflation process. It shows that the deflation process is caused by the shrink of the pressure source of the inflation process, and the inflation process and deflation one are not caused by expansion and shrink of the same magma reservoir. From the preliminary analysis, the deflation process may be caused by the shrink of the sill type of source located beneath the summit. In the presentations, we will mention the possible source models for inflation and deflation process in detail, and will try to propose possible scenario of the both process.

From long term observation by GSI, cycles of inflation and deflation have been repeated in the latest ten years. From the facts mentioned above, we proposed that the magma beneath Izu-Oshima volcano is accumulated monotonically and continuously, but intermittently. And the magma supply process is composed of two phases; inflation process and deflation process. It looks that the sighs of the volcano for the fore-coming volcanic eruption in future.

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