

A sigh of volcano Izu-Oshima; A preparative process of the future volcanic eruption

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How do active volcanoes prepare following eruptions? Many volcanologists vaguely supposed that magma rises to a magma reservoir located beneath the volcano, and increasing amount of the magma and/or chemical reaction including degassing process causes eruptive activity. However, the geophysical evidences of the above process are not found, and the preparing processes to the volcanic eruption have not been yet understood in detail.

It has passed 18 years since the latest volcanic eruption at Izu-Oshima, whose interval of the eruption is historically around 30 years. The campaign GPS observations proved that the volcano started to inflate around 10 and several years ago, and it still continues now. Therefore, we assumed that the volcano enters the preparation process to the following volcanic eruption. In order to investigate the preparation process in detail, we began to revise the seismic and geodetic network in Izu-Oshima into a dense and modern one since 2002. And, we are succeeded in discovering a distinct inflation event and the following deflation one between April 2004 and the present, which is supposed to be one of the preparation processes of the volcanic eruption.

The earthquakes in Izu-Oshima are classified into two groups. One is the burst activity surrounding area of the island, and the other is a stationary activity whose hypocenters are located inside of the caldera. The focal depth of the later one is shallower than 3km. We found out that the seismicity inside of the caldera is well related to the ground deformation of the island.

The seismicity in the caldera of Izu-Oshima increased at the beginning of April, 2004. It is normally 1 event/day in average, and rose up to several events/day during three months between April and July. Simultaneously with increasing seismicity, the ground inflation over the whole island is observed. The geographical pattern of ground displacement inferred from GPS array is very simple, and it is well match with a model of the magma intrusion at the depth of around 4km beneath the northern rim of the caldera. The estimated volume of the intrusion is $2 \times 10^{16} \text{m}^3$. The depth of the estimated inflation source agrees with the depth of seismic velocity discontinuity inferred from controlled source seismic profiling. Therefore, it is reasonable to suppose that the magma rises to the layer with density gap at the depth of 4km, and settles there because it loses its buoyancy.

After August 2004, the seismicity in the caldera decreased to the rate of 0.3 events/day, and the ground is deflated at the same time. They are still in the same condition until the present. The geographical pattern of the ground deflation is different from that of the inflation. The pattern of the deflation is more complex, and total amount of the deformation is smaller. Therefore, the model that the source inflates and then deflates at the same place and amount is rejected evidently. The total volume change is not compensated, and it exactly increases. The location of the deflation source is not well resolved from the present network, but it is acceptable that the source is located at the hypocentral area in the caldera from the deformation pattern.

A cycle of inflation and deflation shown here may be repeated several times during these ten years. It is also proved by the long-term GPS observation carried by GSJ. From the facts mentioned above, we proposed that the accumulation of the magma at Izu-Oshima is not monotonically continuous but intermittent, and it is composed of two phases; inflation process and deflation process. It looks that the volcano sighs for the next volcanic eruption.

Acknowledgements; we are grateful to GSJ for providing the GPS data of their network.