

Volcanic history of the Takahara Volcano, Northeast Japan arc: Inference of the caldera activity

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Introduction

Caldera activity has large effect on environmental and geomorphic change. Therefore, clarification of the volcanic history and evolution of magmatic processes is necessary for a long-term prediction.

In Southern part of the Northeast Japan arc, which is south than Fukushima, most of the caldera activity is before Calabrian, and they are not remarkable expect Takahara volcano after Middle Pleistocene.

Takahara volcano currently formed in northern Kanto plain about 140 kilometers away from the Tokyo, and the Shiobara caldera about 7 kilometers in diameter existence in northern foot of Takahara volcano, which formed at 0.3Ma in former research. Then, large andesitic stratovolcano with an altitude of nearly 2,000 meters formed after 0.2-0.3Ma. A part of caldera is filled with the lava from stratovolcano. The central part of stratovolcano eroded very much, it is suggest that there is no eruption from summit recently. By contrast, a dacitic central cone formed in the Shiobara caldera at Holocene and fumarolic activities around central corn are still continuing. Thus, the two types volcanism recognized in Takahara volcano. However, the volcanic history is not clarification because there is only insufficient informational about stratigraphy and radiometric age.

The purpose of this study, therefore, to clarify volcanic history and evolution of magmatic system of Takahara volcano based on the whole rock chemical analysis and radiometric age determination of Takahara volcanic rocks.

Results

In the pre-caldera stage (<0.6Ma) of Takahara volcano, tholeiitic basalt to andesite volcano was mainly formed with multiple magmatic systems.

In the caldera forming stage (0.6-0.3Ma), The marker tephra and radiometric age of ignimbrites from Takahara volcano indicated that several ignimbrites erupted in 0.6Ma and 0.3Ma which is a formation factor of Shiobara caldera. When the caldera formed for the first time about 0.6Ma, the two ignimbrites erupted from multiple magma chambers has different chemical composition, which are called Kanawazaki PFD and Katamata PFD. These ignimbrites widely covered the Nasunogahara region in northern Kanto plain.

After that, basalt to rhyolite lava flows erupted from tholeiitic magma chamber. At the second time of the caldera formation, Tanohara PFD erupted about 0.3Ma. Then, the magmatic system extremely changed at post caldera stage (>0.3Ma), and andesitic to dacitic stratovolcano built by newly supplied calc-alkaline magma. The eruption style of stratovolcano is non-explosive because it is composed mainly of lava flows and intercalated with small-scale scoria beds.

The center corn erupted at the Holocene is characterized by biotite. It was not contained in volcanic rocks of post-caldera stage indicates that the high water content magma recently is supplied.

These results infer that the difference in eruption styles was caused by complex magmatic systems in Takahara volcano.