

Geology and petrology of Taisetsu volcano group, Japan; Evolution of magma and activity ages.

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Taisetsu volcano group is located in the northern part of the Taisetsu-Tokachi volcanic chain, which is situated at the southern end of Kuril arc. The volcano group started its activity ca. 1 Ma and is composed of andesitic lava domes and stratovolcanoes.

Geological studies of the whole area in Taisetsu volcano group were carried out by Konoya *et.al.* (1966) and Katsui *et.al.* (1979). In these studies, the volcanic stratigraphy was investigated mainly based on the preservation state of the terrain, however, radiometric age data and petrological features were not considered. K-Ar ages reported in survey by NEDO (1990) are inconsistent with the stratigraphy, resulting in difficulty of re-examination of the stratigraphy. We performed a detailed geological survey, petrological study and K-Ar dating of the whole area of the volcano group, in order to investigate the structure of volcanic edifice, the formation history and the magma transition.

According to the preservation state of the terrain, petrological features and K-Ar ages of 26 samples, the activity of the volcano group can be divided into two stages; Older stage and Younger stage. During Older stage (ca. 1-0.7 Ma), fluidal andesite lavas were effused from several eruption centers to form flat-shaped volcanic edifices. These volcanic edifices are arranged in a N-S direction, and have been dissected by erosion. During Younger stage (< ca. 0.2 Ma), several stratovolcanoes and lava domes were formed in the northern - central part. Many of these volcanic edifices have the steep terrain, and are distributed irregularly. Younger stage is subdivided into three sub-stages (Y1, Y2 and Y3) in the difference of eruption style. In Y1 (0.16-0.06 Ma), stratovolcano and several lava domes were formed in the northwestern - central part. In Y2 (ca. 30 ka), the volcanic activities were the most explosive in the history. A plinian column and related pyroclastic flows were occurred, and formed the Ohachidaira caldera with 2 km in diameter. In Y3 (< ca. 30 ka), main eruption centers moved to the southwestern part of the caldera, and formed several stratovolcanoes and a lava dome.

K-Ar ages of the samples in Older and Younger stage are in the range of 1.02-0.66 Ma and 0.16-0.06 Ma, respectively. No ejecta are found between 0.66 Ma and 0.16 Ma, suggesting that there is a dormant period for ca. 0.5 Myrs in the history.

Petrological features of the ejecta of Taisetsu volcano group have greatly changed between the Older stage and Younger stage. All of the rocks are basaltic-andesite to dacite. These rocks contain Pl, Cpx, Opx and Mt as phenocrysts, associated with minor amounts of Ol, and Qz phenocrysts in some rocks. In addition, the rocks of Older stage do not contain Hb phenocrysts, while those of Younger stage usually include Hb phenocrysts. The host rocks from Older stage is characterized by high contents of incompatible element such as P₂O₅, Zr, Y, Nb, compared with those of Younger stage. The magma discharge step diagram of the volcano group was constructed based on the age data and estimated eruptive volume. The eruption rate of Older stage was >0.08 km³/ky, while Younger stage is >0.28 km³/ky. For Older stage, the eruption rate is maximized with 0.36 km³/ky in the period from 0.82 Ma to 0.74 Ma. For Younger stage, the eruption rate of each sub-stage is as follows; >0.20 km³/ky for Y1, >1.2 km³/ky for Y2, and >0.30 km³/ky for Y3. In addition, for the Y1, the eruption rate is the highest in 0.11 Ma to 0.09 Ma with 0.76 km³/ky.

Based on incompatible element contents and occurrence of Hb phenocryst in andesite, we consider

that magma type had changed largely during the possible long dormancy from 0.66 Ma to 0.16 Ma. This may be related to the tectonic change at the junction between NE Japan and Kuril arcs.

Keywords: Volcano, Eruption rate, Formation history, Transition of magma, Taisetsu volcano group