Stratigraphy and magma transition during Ground crater stage of Tokachi-dake volcano, Central Hokkaido

Shinya Fujiwara[1]; Mitsuhiro Nakagawa[2]; Setsuo Hasegawa[1]

[1] Earth and Planetary Sci., Hokkaido Univ; [2] Earth & Planetary Sci., Hokkaido Univ.

Tokachi-dake volcanic group is situated at southwestern end of Daisetsu-Tokachi volcanic chain in Central Hokkaido. Recent eruptive history of Tokachi-dake during the last 3000 years has been re-examined. The volcanic activity can be divided into four stages, which had occurred from distinct craters (Fujiwara et al., 2004). The Ground Crater stage was most explosive and voluminous activity among the stages. However, eruptive age and sequence of eruptions have been still ambiguous. For example, previous reported 14C ages suggested that the explosive activity occurred in 3000 and 2300 y.B.P. However, there exists no evidence for 700 years' dormancy in the pyroclastic deposits. In addition, there exists controversial whether lava effusion had occurred after the explosive eruption.

Our re-examination concludes that the activity of the Ground crater stage can be divided into 2 phases, explosive and effusive phases. After a long dormancy (more than 10 ky), successive explosive eruptions occurred at the northwest of the summit of the volcano to form the Ground crater. The eruptions produced pyloclastic falls and flows. The fall deposits are divided into two units, lower (Tk-G) and upper ones (G-AS). The essential materials of the Tk-G are scoria, pumice and banded pumice, whereas those of the G-AS are scoria only. Although the Tk-G was widely spreaded on the eastern region of the volcano, the G-AS was distributed around the crater as agglutinate. The pyloclastic flows are also divided into lower (Gs-lower) and upper units (Gs-upper). Considering type and chemical compositions of essential materials from those pyroclastic deposits, two units of the fall deposits correspond to those of the flow deposits respectively, suggesting that explosive eruptions produced both fall and flow deposits simultaneously. We re-measured radiocarbon ages of these pyroclastic deposits, indicating that the eruptions occurred in 3100y.B.P. without considerably hiatus. After the explosive phase, andesitic lava effused from northern part of Ground crater. This lava flow has been considered to effuse from another crater, but there is no evidence that the crater generated lava flow. In addition, whole-rock chemical compositions of this lava flow are the same as those of the pyloclastc deposits of the Ground cater. Thus, we conclude that the activity of the Ground Crater stage started with explosive eruptions followed by lava effusion.

The existence of banded pumice suggests that magma mixing was major magmatic processes in the Ground crater stage. Whole-rock chemical compositions of eruptive materials show linear trends on all of the Harker diagrams, indicating mixing of two end-member magmas. During the initial eruptions (Tk-G and Gs-lower units), juvenile materials show bimodal compositional distribution, scoria (53-55wt.% SiO2), pumice (57-59wt.%). However, in following eruption (G-AS and Gs-upper) and lava effusion, pumices disappeared and chemical compositions of scoria and lava concentrated around 55wt.%. This suggests that magma mixing processes had begun and progressed during the activity of the Ground Crater stage.