

最近約1万4千年間の摩周火山のテフラ層序と噴火様式

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Tephrostratigraphy and Eruption Style of Mashu Volcano,
During the Last 14,000 years, Eastern Hokkaido, Japan

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The eruptive history of Mashu volcano, located at the southeastern rim of Kutcharo caldera in eastern Hokkaido, Japan, has been divided into three stages: stratovolcano building, caldera-forming and central cone building. Tephrostratigraphy and eruption styles of the latter two stages were reinvestigated in conjunction with petrological analysis. We found new evidence of several eruptions from the volcano. These data, combined with recent ^{14}C ages and the presence of wide-spread tephtras, allow us to evaluate the temporal evolution of eruptive activity and styles of Mashu volcano during the last 14,000 years.

After the formation of the stratovolcano, activity of the caldera forming stage started with plinian eruption (Ma-l) about 14 cal ka. Approximately 7.5 cal ka, climactic caldera-forming activity began with a phreatomagmatic eruption (Ma-j) followed by plinian falls (Ma-i~g), and a catastrophic pyroclastic flow (Ma-f) occurred resulting to the formation of the summit caldera, 7.5×5.5 km in diameter. Total volume of the climactic eruption deposit is estimated to be 18.6 km^3 . Temporal variation of pumice/lithic fragment and white (silicic)/gray (mafic) pumice ratio with eruption sequence suggest withdrawal of a zoned magma chamber with more silicic magma overlying more mafic one through the newly opened and enlarging vent. In the central cone building stage, at least eight eruptions (Ma-e, Ma-e', Ma-d, Ma-c4~-c1 and Ma-b, in ascending order) have occurred repeatedly during the last 6,000 years. The latest eruption (Ma-b: ca. 0.9 cal ka) was the largest one in this stage. Although most of the tephra layers in this stage are composed of pyroclastic fall deposits, thin pyroclastic flow deposits can also be recognized from the two eruptions (Ma-e and -d).

Juvenile materials in the Mashu tephtras are commonly pyroxene dacite ($\text{SiO}_2 = 64\text{--}72$ wt.%, $\text{K}_2\text{O} = 0.5\text{--}0.7$ wt.% in whole-rock compositions). The pumice of the caldera-forming stage are nearly aphyric (1~6 wt.%), whereas those of the central cone building stage are more porphyritic (13~24 wt.%). They can be also distinguished in SiO_2 -oxides diagrams.

Most of Mashu tephtras consist of gray fine ash layers including blocky lithic/pumice fragments and accretionary lapilli, indicative of magma-water interactions. In the case of large eruptions, such as the climactic caldera-forming eruption (Ma-j~f) and Ma-b, eruptive styles changed from the wet to dry due to increase of the magma/water ratio. The long-term magma discharge rate was 0.8 and $0.3 \text{ km}^3 \text{ DRE/ky}$ during the last 14,000 and 6,000 years, respectively. Mashu volcano can be interpreted as one of the most productive and active volcanoes in Japan during Holocene.

Key words: Mashu volcano, tephrostratigraphy, zoned magma chamber, magma water interaction, active volcano

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