The relationship between the morphology of entablature and the magma cooling process in the Genbudo lava, Iwate Prefecture

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Two different types of columnar jointing, colonnade and entablature, develop in a single layer of lavas and welded tuffs. In general, the width of a column in colonnade is larger and straight, whereas the width of a column in entablature is relatively smaller and curved. The causes of these two structures have been discussed for many years, but have not been yet fully understood.

The Genbudo lava exposed along the Kakkonda River in Shizukuishi-cho, lwate Prefecture is located in the southwestern part of lwate volcano. This is considered to be belonging to the younger Amihari volcanic group by Nakagawa (1987). The thickness of the Genbudo lava is about 70m or more. The upper 50 m of the lava is composed of the entablature, the lower 20 m is of the colonnade. We conducted the outcrop and textural observations of the entablature on the lava to consider the origin of the entablature.

In the colonnade, the three-dimensional shape of the part surrounded by fractures is a hexagonal column. On the other hand, in the entablature, the three-dimensional shape of the part surrounded by fractures is not a column but a curved plate with a thickness of about 5-10 cm. When observing a curved plate, the shape of the largest surface of the plate is fan-shaped, and small fractures occur at the edge of the fan at intervals of about 2 to 4 cm. These small fractures develop almost perpendicular to the larger fracture that defines the edge of the fan. In addition, the edge of the fan with small fractures exhibits blacker than the other parts.

Thin sections of each part of the lava were prepared, and the groundmass textures were observed using a polarizing microscope and SEM-EDS. We found that the crystallinity of each part decreases in the following order: Colonnade > Entablature in the area away from the small fractures > Entablature in the area where the small fractures develop.

This suggests that in the entablature, when the lava was still unconsolidated, quenching occurred along the existing fracture.

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