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Welded Pyroclastic Deposits in the Summit Area of Fuji Volcano and their Eruptive Style

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Welded pyroclastic deposits are exposed on the crater wall of Fuji Volcano. Three cooling-units are recognized ; SWD1,2 and 3 on the decending order from the surface. These units show systematic vertical change in the degree of welding. These units consist of reddish brown pyroclastics respectively, although, colour sometimes changes horizontally to dark grey. SWD1 is composed of spatters with several centimeters in diameter and it characteristically contains abundant angular pale-grey lithic fragments. The average grain size of SWD2 and 3 are smaller than that of SWD1. Although SWD2 and 3 show remarkable stratification, columnar joints develop throughout their thickness, suggesting that these stratified layers are compound cooling-units. There is no evidence showing a time gap between SWD1-2 and 2-3. Therefore, these SWD1-3 are considered as the products of a one-cycle eruption. SWD1 covers the surface topography with nearly uniform thickness. On the other hand, horizontal variation in thickness is remarkable for SWD2. In addition to the thickness, surface height of SWD2 varies widely around the crater rim. In the northern crater rim, SWD2 forms a spatter cone.

Pyroclastic material of SWD1,2 and 3 show the following common petrologic features. Plagioclase phenocrysts with an average length of 2 mm and smaller olivine phenocrysts are contained in the cryptocrystalline groundmass. Most plagioclases show a honey-combed structure which is one of the features of clastogenic deposits. It is characteristic that most phenocrysts are fragmental in shape. The whole-rock SiO_2 content varies from 50.6 to 53.1 wt.% and FeO*/MgO from 1.7 to 2.2. There is no significant difference in the chemical composition between SWD1,2 and 3.

Previously, it has been believed that the proximal deposits are related to the repetition of forming a lava lake (Tsuya,1971). However, the above features suggest that they are deposits of pyroclastic origin. Most of SWD1,2 and 3 are considered as pyroclastic fall deposits which abutted on the inside wall of a pre-existing crater. Deposition onto the pre-existing crater rim also occurred. On the other hand, the totally flat surface of SWD2, which can be recognized partly inside the crater in the NW and S directions. They form shelfs which protude from the crater wall suggesting that they are remnants of a lava pond. Since it shows a welded nature on the side wall of the shelf, it is indicative that pyroclastic materials fell back from lava fountain and filled the crater to make the lava pond. This is quite similar to an example of the 1959 eruption at Kilauea Iki, Hawaii. On an analogy from the Hawaiian eruptions, the origin of SWD can be explained by an intense high fountain of lava.

On the NE crater rim, the outer-slope side portion of the SWD2 spatter cone topographically seems to have disappeared. Very shallow depression on the outer slope exsists just below the crater rim. From these facts it is expected that a certain amount of welded pyroclastic materials has flowed down to the lower flank. Gravitational unstability during and/or after the deposition onto the crater rim is considered to have played a role for secondary flowage on the steep outer slope of up to 30 degrees.

It is thus concluded that the intense lava fountaining occurred at least three times, generating the welded pyroclastic deposits of SWD1,2 and 3, throughout the latest large-scale eruption at the summit area. There is an idea that the welded deposit of the summit area correlates with a distal scoria fall deposit, a so-called Yu-2 (Miyaji,1988). We have no information which directly shows the age of SWD1,2 and 3 in this study. A stratigraphic correlation between the deposits of the proximal area and those of the distal area, is needed to precisely determine the age of SWD1,2 and 3.