Difference of lithofacies of Ikeda pyroclastic-flow deposit based on the basement topography

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[Intruduction]

The Ikeda caldera was formed by the phreatic eruption, and following fallout pumice and Ikeda pyroclastic flows.

The lag breccia exists near Ikeda caldera. A massive pyroclastic-flow deposit and a laminated pyroclastic-flow deposit occur in topographically lower and higher areas, respectively. In this study, we discuss the influence of the basement topography for sedimentation of the pyroclastic flow.

[Lithofacies of Ikeda pyroclastic flow deposits]

Ikeda pyroclastic-flow deposits vary in the sedimentary structure according to the basement topography. They are classified into two lithofacies.

The first is the massive deposit that is named the massive layer (ML) and ponds in topographic depressions and is widespread. The components are rhyolitic pumice, lithic fragments and volcanic ash. ML is widely distributed in the north, west and south of the caldera. According to the boring data of the south of the caldera, the thickness is about 90~100 m (Kawabe and Sakaguchi, 2005). The massive pyroclastic-flow deposits composed of the lower coarse grained pyroclastic-flow deposit and the upper fine grained pyroclastic-flow deposit (Iwakura et al., 2001)

The second is the stratified or cross-stratified deposit that is named the laminated layer (LL) and is distributed in topographically higher area of the northwest and west of the caldera. The components are rhyolitic pumice, lithic fragments and volcanic ash. LL overlies Kikai-Akahoya tephra and the paleosol lying between them. In near-vent exposure (about 1 km from the caldera rim), LL has the thickness of about 8 m, is rich in coarse pumice, and lacks fine ash. Moreover, it locally contains laterally-discontinuous lenses of coarse pumice and the banding is marked by variations in the content of coarse pumice and the maximum pumice size. At the exposure of 1.5 km from the caldera rim, thickness of LL is about 1 m. The matrix is rich in fine ash. It locally contains thin layer or laterally-discontinuous lenses of coarse ash. At the outcrop of 3 km from the rim, LL contains little pumice, and is rich in fine ash. The thickness and the grain size of LL decrease rapidly with distance from source.

[Grain-size characteristics of ML and LL]

The grain-size characteristics were obtained by sieve analyses of LL (15 horizons of 9 sites) and ML (19 horizons of 13 sites). The cumulative curves of LL overlap with that of ML ,and the points of LL and ML in $Md\varphi$-$\sigma\varphi$plot are plotted similar area. Difference of grain-size characteristics of ML between upper and lower unit corresponds to that of LL between upper and lower part. Therefore, the grain-size characteristics of LL and ML are similar.

[Discussion]

We propose that LL and ML are heteropic facies of Ikeda pyroclastic-flow eruption on the basis of the following four reasons. First, the pumice which is included in both LL and ML contains hornblende as phenocryst. Second, the components of LL and ML are same. Third, LL and ML do not occur at the same exposures and the both overlie Kikai-Akahoya tephra and underlie Ikedako-Ash. Ikeda pumice fall deposit exists directly under ML but does not exist under LL because the dispersal axis of the Ikeda pumice fall is eastward. Fourth, sieve analyses showed that grain-size characteristics of LL were very similar to that of ML. Ikeda pyroclastic flow that had been caused by eruption column collapse moved into topographic depressions in response to gravity and deposited ML, because it was dense density current. Simultaneously, dilute flow occurred at the collapsed region at the same time and surmounted topographic obstacles and deposited LL, because it was low density current.