

Reconstruction accuracy of eruptive sequence inferred from the pyroclastic fall deposits of the Asama-Maekake volcano

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The pyroclastic fall deposits of the Asama-Maekake volcano, such as A (1783AD), B' and B (12th century), and C (4th century), are mainly composed of pumice layers. On the other hand, ash fall derived from the recent vulcanian eruptions (e.g., 2004 and 2009 eruptions) is too small in scale to be preserved as a geologic unit. Ash particles from such small-scale eruptions are mainly lithic fragments originating from solidified lava in a shallow level of the conduit. After the 1783 eruption, repeated vulcanian eruptions have formed ash and soil mixtures on the flank of the volcano. Similar ash and soil mixtures are also recognized beneath A, B, C, and D pyroclastic fall deposits, respectively. These ash and soil mixtures contain lithic fragments as the ash component, indicating that vulcanian eruptions occurred repeatedly in the period between large-scale eruptions, similarly to the period after the 1783 eruption. Lithic ash layers are also interbedded with pumice fall layers of B', B, and E pyroclastic fall deposits. There seem to be some cases of intermittent vulcanian and sub-plinian eruptions in the course of the large-scale eruption.

In the case of the 1783 eruption, detailed reconstruction of the eruptive sequence is possible on the basis of correlation between the stratigraphy of the eruptive products and old documents. The large-scale sub-plinian eruption is considered to be associated with the formation of a pyroclastic cone in a proximal area owing to vigorous fountaining. Subsequently, large-scale clastogenic lava flows are generated throughout its climactic eruption. On the other hand, little information is available for eruptions before 1783 because of limited exposure and few old documents. Although the reconstruction accuracy for the eruptions in the 12th century is not as good as that for the 1783 eruption, these eruptions might have occurred with a different sequence from the 1783 eruption. Intermittent events of ash and pumice fall occurred in the initial stage of these eruptions. Phreatomagmatic eruption also occurred in the early stage of the 1128 eruption, resulting in a B' pyroclastic fall deposit. The existence of many units of pyroclastic flows in the 1108 eruption indicates that pyroclastic flow occurred on multiple occasions. Since the stratigraphic relationship between the B pyroclastic fall and these pyroclastic flows is unclear, the sequence of the eruption is still in question. Furthermore, little information is available for eruptions predating the 12th century.

Comparative study of the distributions of pyroclastic fall deposits using isopach maps reveals that some fall units from B' and B are larger in scale than that of the climactic pyroclastic fall deposit of the 1783 eruption. In addition, the A' pyroclastic fall deposit is estimated to be comparable to or smaller than the preclimactic fall unit of the 1783 eruption. Although the isopach maps of A, B', B, C, and E could be prepared, the accuracy of the isopach maps for the C and E pyroclastic fall deposits is insufficient. The preparation of an accurate map is difficult for deposits of older age. Consequently, at this point, the 1783 eruption is the only example in which the temporal variation in eruptive style and in eruptive volume can be discussed with high accuracy in the history of the Asama-Maekake volcano.