

Comparative study on degree of fragmentation of crystals contained in pumice fall and lava flow

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Degree of fragmentation of crystals contained in the eruptive products relates with difference in eruptive style and magnitude of eruption. Comparative study on the degree of fragmentation between crystals contained in pumice grain, free crystals in the Plinian pumice fall deposits, and crystals in lava flow, was carried out for the eruptive products of two andesitic volcanoes, Asama and Sakurajima. In order to get information on degree of fragmentation of plagioclase, ratio of length of broken surface (b) to the total circumference of a crystal (a) b/a value in the 2-D picture was measured. Concerning the products of explosive, pyroclastic eruption, Plinian pumice falls and lava flows which show welded nature (so-called, clastogenic lava) of two eruptions of Asama 1783 and Sakurajima 1914 are used. Average b/a for crystals contained in the pumice grains ranges from 0.3 to 0.4. Those for free crystal is around 0.45 and for clastogenic lava flow is around 0.5. Highly fragmented crystals, whose average b/a are more than 0.5, tend to increase for finer grains of free crystals. On the other hand, b/a values are not so high for the lava which were generated as coherent flow. In case of effusive lava outflow of Sakurajima 1915 (T2), small amount of broken crystals are contained and b/a values are small. It suggests that small-scale fragmentation of crystals occurred prior to eruption in the conduit or deeper level. Lavas of Sakurajima 1914 (East T1) and 1946 eruptions show intermediate b/a value. Vulcanian eruptions repeated during flowage of these lava. Additional fragmentation of crystals due to Vulcanian explosions is expected in the shallow level. Extensive fragmentation of magma during Plinian eruption might have generated abundant broken crystals and concentration of broken free crystals throughout deposition to the proximal area to form clastogenic lava. Correlation between average b/a and size of plagioclase for free crystals and clastogenic lavas indicates that single crystal experienced plural fragmentations through explosive, pyroclastic eruption.