

Precursory eruption for a large ignimbrite eruption; example of Osumi pumice fall deposit from Aira caldera

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Caldera collapse and emission of voluminous ignimbrite follow the decompression process of magma chamber during precursory eruption. Rapid withdrawal of massive magma from a chamber causes decompression of magma chamber and results collapse of the roof of magma chamber. A massive eruption from Aira caldera at 29 calBP produced a massive ignimbrite which covered the southern half of Kyushu Island, and formed the structure of Aira caldera. A voluminous pumice fall deposit (Osumi pumice fall deposit, ~100 cubic kilometer in bulk volume; Kobayashi et al. 1983) was erupted prior to the emission of Ito ignimbrite and caldera collapse. The eruption of Osumi pumice fall caused the decompression of the magma chamber to induce the collapse. We are analyzing the sequential change of pumice fall deposit to understand the mechanism of large scale eruption associating caldera formation and voluminous ignimbrite. Osumi pumice fall deposit shows clear upward coarsening as pointed by Kobayashi et al. 1983, and is directly covered by the ignimbrite. An outcrop at ~15km from the vent along the distribution axis shows ~10 m thick of the deposit. The lowest part within ~2 m from the base is finer than the overlying unit, and thin finer bed exist at ~4.5 m from the base. Other part is homogeneous and no clear fall unit is recognized. Maximum size of pumice is 3 cm at the base and increases up to 8 cm at the top of the deposit. Total amount of lithic fragments is ~5 % in volume. The lithic fragments consist of shale and sandstone derived from the basement (Shimanto Group) and Quaternary volcanic rocks (rhyolite-dacite lava, and aiesite lava and scoria). The ratio of basement fragments against the surface volcanic rock decreases from the base to the top. These observations suggests the model that the enlargement of the conduit caused the increase of the eruption rate and results the rapid decompression of the magma chamber to induce the collapse of the magma chamber roof.

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