Preeruptive processes of the eruption of high-silica rhyolite from Toya caldera, Japan

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It is important to understand preeruptive processes and their time scales to predict volcanic eruptions. For this purpose, detailed petrographic study, including zoning profile analysis and diffusion modeling, is necessary [1]. For example, on the basis of petrographic and geodetic observations of the 2011 sub-Plinian eruption of Shinmoedake, Japan [2], injection of mafic magma into the mushy dacitic magma reservoir is estimated to have occurred about 1 year before the eruption, forming a mobile layer (mixed andesitic magma). Subsequent overturn of the reservoir occurred about 3 days before and triggerred the eruption.

Here we discuss pre-eruptive processes and the time scales of the VEI 7, 112-115 ka Toya caldera eruption, which produced nearly aphyric high-silica rhyolite. Cognate sodic plagioclase (type-A) and low-Mg magnetite phenocrysts in the rhyolite are homogeneous and show no reverse zoning, indicating that magmatic disturbance occurred less than a few days before the eruption. Calcic plagioclase phenocrysts (type-B) derived from a mafic magma have a mantle around a homogeneous core, indicating years for crystal growth. Intermediate plagioclase phenocrysts (type-C) show disequilibrium texture (e.g., dissolution). These observations suggest (1) mafic injection into the silicic magma reservoir on the order of years before eruption, (2) formation of the intermediate zone of disequilibrium at the contact, and (3) sudden eruption of the silicic magma with small amounts of the intermediate and mafic magmas.

[1] e.g., Costa et al. (2008) *Rev. Min. Geochem.* **69**, 545-594. [2] Tomiya et al. (2013) *Bull.Volcanol.* **75**:750.