

## A petrological test of the earthquake-trigger model of the Mt. Fuji Hoei eruption

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It is fairly widely recognized that huge earthquakes may trigger volcanic eruptions. The statistic validity of this “hypothesis” is, however, under debate. Besides, only little is understood about the triggering mechanisms and resulting incubation period from the earthquake to the eruption. The Hoei eruption of the Fuji volcano in 1707 A.D. occurred 49 days after the Hoei M 8.7 earthquake, and thus often referred as a typical example of the earthquake-triggered eruption. This clear paleographic record of the incubation period provides us an excellent opportunity to test the cause-and-effect link between the huge earthquake and magmatic eruption. Fujii (2002) proposed a triggering mechanism of the Hoei eruption, in which basaltic magma injected into the shallow dacitic magma chamber and induced volatile exsolution. In this study, we elucidate the timescale from magma injection to eruption from the mineralogical record in the Hoei erupted materials, and compare the result with the known interval of 49 days.

We found reverse zonings of plagioclase phenocrysts in the basaltic scoriae. The phenocrysts were considered to have been derived from the dacite magma because their core compositions are consistent with those in the silicic magma initially erupted in the Hoei sequence. Based on the measured MgO concentration profiles, we can estimate the timescale of magma mixing and then test the scenario that the Hoei eruption was triggered by the Hoei earthquake. The temperature of basaltic magma of the Hoei eruption was estimated to be 1080-1180 (Sato & Hara, 1990). With this temperature range, the timescales of magma mixing were calculated to be 45.9, 9.6 and 2.2 days at 1080, 1130 and 1180 °C, respectively. Because these estimated timescales are shorter than 49 days, the mixing should have started after the Hoei earthquake. On the other hand, the estimated timescales are longer than the duration of the Hoei eruption, showing that the mixing was not syn-eruptive but preeruptive. These results support a model that the Hoei earthquake triggered the injection of basaltic magma into the shallow dacite magma chamber, leading to the Hoei eruption.

Keywords: Fuji Volcano, Hoei Eruption, Hoei Earthquake, Eruption Trigger, Tracer Element Diffusion