

Estimating the date of the 2007 eruption of Mount Ontake Volcano using waveform correlation

*Shuhei Nishijima¹, Toshiko Terakawa¹, Shinichiro Horikawa¹

1. Graduate School of Environmental Studies, Nagoya University

Mt. Ontake volcano erupted on late March, 2007. However, we do not know the exact time of the eruption with a Volcanic Explosivity Index 0 because of little visual evidence. I tried to estimate the date of the 2007 eruption, using a waveform correlation method. A previous study reports that focal mechanisms of volcanic earthquakes associated with the latest eruption in 2014 changed from normal/strike-slip faulting with east-west tension to reverse faulting with east-west compression. Based on this fact, I selected 10 and 8 volcanic events for the pre- and the post-periods of the 2014 eruption as template events. I applied the technique to continuous seismic waveforms from 22 December 2006 to 31 March 2007. I detected 2375 (pre-eruption type) and 1659 (post-eruption type) events corresponding to the pre- and the post-eruption events, respectively. I found that events with east-west tension (pre-eruption type) became active at the early stage until a very long period (VLP) event occurred on 25 January, and during the period from 5 to 19 February. On the other hand, the activity of events with east-west compression (post-eruption type) became dominant for 11 days after the VLP event occurred, and during the period from 20 February to 24 March. Subsequently, neither type of events became dominant. The activity of pre-eruption type events synchronized with the period when the length of the baseline in the east-west direction across Mt. Ontake increased. This suggests that events of pre-eruption type are related to the magma intrusion process beneath the volcano. The activation of events of post-eruption type following to the VLP event, which is well modeled by a tensile crack with a strike of N20W, may be related to contraction processes after the event released water vapor from the volcano. Based on the changes in types of detected events as well as the seismicity, I concluded that Mt. Ontake would have erupted on 20 February or between 11 and 12 March, 2007.

Keywords: volcano, Matched Filter Method