

Comparison of seismic waveforms in process of past eruptions at Ontake volcano

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We estimated the focal depth using the maximum amplitude ratio of seismic station "Kaida" (Nagoya.Univ) to station "Tanoharaue" (JMA) about the past eruptions in 2007 and 2014, and evaluated the characteristics of seismicity before and after the eruptions in 1991, 2007 and 2014.

On the eruption of September 27 2014, volcanic earthquakes increased from September 10. In addition to A-type earthquakes (HFs), BH-type earthquakes (MFs) were frequently observed. Most of BH-type earthquakes (ratio; approx.. 4) occurred at shallower depth than the one (ratio; approx.. 2) during the dormant period. Volcanic tremor (ratio; approx..6) was observed at approximately 10 minutes ahead of the eruption occurred at another shallower depth, and HFs and MFs (ratio; approx..10) occurred at much shallower depth, which led to the eruption. After the eruption, MFs (ratio; approx..3) occurred at deeper depth once, then BL-type earthquakes (LFs) (ratio; over approx..8) occurred very often. After that, volcanic earthquakes with large amplitudes temporarily decreased, but they (mostly HFs) distribute dispersedly after the mid-October. Also, volcanic tremors (ratio; almost 3) at deeper depth in comparison with the previous ones occurred in a short period.

In case of 2007 eruption, many MFs (ratio; almost 3) from December 2006 to January 2007 occurred at deeper depth, compared to the ones in 2014. The burst of MFs and tremors occurred at shallower depth with large amplitude ratio, which was synchronized with Very-Low-Frequency earthquake (VLF). After the tremors at shallower part occurred for half a month, seismicity became temporarily dormant. After LF occurred on May 2 2007, a very small-scale eruption occurred in the course of the occurrence of LFs and tremors at shallower part (ratio is larger).

In case of 1991 eruption, though amplitude ratio has been unexamined, waveform classification suggests that HFs occurred mostly as well as the other cases before the burst of earthquakes, in which most of earthquakes were MFs, including LFs and tremors. After approximately 1 month from these burst, a very small-scale eruption occurred. After that, tremors, MFs and LFs were observed for almost about 2 months.

As demonstrated above, seismicity before past eruptions are divided into two patterns: 1) shallower LFs, HFs and tremors (ratio is larger) were observed compared to the dormant period prior to eruption, 2) no or little shallow LFs, HFs and tremors were observed. In either pattern, the increase on MFs was confirmed prior to the eruptions. The presentation also investigated the similarities in each eruption process, using seismic waveforms in 2014 eruption and seismic data during other eruptions.

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