Seismo-acoustic signals before ash emissions at Aso volcano, Japan

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Aso volcano located in southwest Japan has continued ash venting since July in 2019. We could not identify any stop of emission of ashes for more than several months. At the beginning of this eruption activity, however, clear hiatuses of the emission could sometimes be seen. Before each onset of individual ash venting, characteristic seismo-acoustic signals were recorded. The features are as follows: About half a day before the eruption onset, the amplitude of the continuous tremor (few-10 Hz) gradually increased. Almost at the same time, occurrences of infrasound pulses started to appear. These infrasound pulses have a dominant frequency of 3-10 Hz. To extract individual infrasound pulses from the raw records, the author used the Matched-Filter method with Network Correlation Coefficient. Consequently, a total of 2000-3000 pulses were identified for each event. Both the occurrence frequency and amplitude of the pulses showed a gradual increase with time. They were synchronized with an increase of tremor's amplitude. Two hours before the eruption, infrasound pulses and seismic tremor share a time of peak activity within 10-30 min difference: the peak in the seismic activity, then the infrasound activity. Immediately after the peaks were recorded, the activities decreased sharply and followed by the start of the eruption after a 30-min hiatus. According to the analysis of the tremor's amplitude by the Amplitude Source Location method, the source location of the continuous tremor source is situated at a shallow portion beneath the active crater, <300 m, however slightly off in the horizontal direction (Ichimura et al., 2019, EPS). For cases in 2019, temporal variation of ratios of the amplitude in a network of the station was clearly identified. This observation suggested that the source had moved toward the crater by the time of the eruption. It seems to relate an increase of gaseous fluid flux into the crater. Thus intermittent small gas explosions with infrasound pulses might have occur in the crater. However, each explosion was confirmed not to be associated with a Very-Long-Period earthquake or an explosion earthquake. The following points are also unclear: 1) How to start the ash emission itself after a 30-min hiatus, and 2) physical meaning of such hiatus of seismo-acoustic activity. Understanding these processes will be a clue for our further advancement toward the prediction of an eruption.

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