

## Immediate Estimations of Volcanic Plume Heights without Visual Observations at Sakurajima Volcano

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Volcanic plume heights are estimated immediately in our study even when it is invisible, for example in bad weather or at night. The eruptions at Sakurajima Volcano are classified into three types according to the amplitude of infrasonic waves. The first is irrelevant to the amplitude of infrasonic waves, which is 0-20Pa. The second is featureless and the amplitude is 20-100Pa. The last has positive correlation between volcanic plume height and the amplitude of infrasonic waves which is 100Pa-. Volcanic plume heights are calculated by (1)the highest temperature of volcanic plume,(2)wind velocity at 850hPa surface and (3)the integration value of the amplitude of seismic waves in the first case, (1)the highest temperature of volcanic plume, (2)the amount of strain changes of quadrature component to source and (3)the biggest amplitude of infrasonic waves by in the second case, (1)the biggest amplitude of infrasonic waves and (2)the amount of strain changes of parallel component to source by in the last case.

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