

Characteristics of tilt changes during eruption at Sakurajima: analysis of tilt data at Amidagawa station, Japan Meteorological Agency (JMA)

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Tilt change records have been used to clarify the source mechanism of volcanic eruptions and magma processes beneath the volcanoes. This study gives focuses on the characteristic behaviors in temporal tilt changes during eruptions and its relations to the extrusion volume.

This study uses NS component of tilt data at Amidagawa station, which is installed 3 km away from the Syowa crater, because the data clearly records the clear tilt changes accompanied with each explosion. After eliminating tidal components in the observed tilt record using Baytap08 (Tamura et al., 2013), we selected explosive eruptions whose plume height is higher than 2000m in April and May of 2015, based on the explosion list by Kagoshima Meteorological Office. We further chose 24 eruptions in which uplift and subsidence of the crater directions are clearly observed.

In all of the events, we can see the following characteristics in tilt changes; tilt uplift rapidly toward the crater 1~2 minutes before the explosion; the uplift continues for a while, and turns to subsidence tens of seconds to a few minutes after the onset of explosion. Uplift tilt change toward the crater just after the explosion suggests that vertical upward force affect inside the conduit accompanying ash extrusion, and subsidence can be considered to represent deflation of conduit and magma chamber due to magma extrusion. Amount of tilt change of uplift, subsidence were from 2nrad to 10nrad, from 2.5nrad to 37nrad, respectively. Similarly, duration of them were from 1minute to 3.5minutes, from 10minutes to 140 minutes.

We do not see clear correlations between amount of tilt change, duration and plume height, column volume. Then, we give a focus on the amount of tilt change per unit time (tilt rate), and we find the tilt changes are classified into 2 type of subsidence; one subside rapidly within 10 minutes (Type A), and another subside gradually (Type B). Relations between tilt rate just after the start of deflation, plume height, column volume show positive correlations especially for Type A. Similar results are obtained for the uplift tilt rate.

Keywords: Tilt, Plume height, Sakurajima, Explosion