EGU2020-18638
https://doi.org/10.5194/egusphere-egu2020-18638
EGU General Assembly 2020

Quantitative observations and numerical modeling of charge development in volcanic eruption clouds

Andre Geisler[1], Benjamin Seelmann[1], Matthias Hort[1], Joachim Bülow[1], Lea Scharff[1], Masato Iguchi[2], and Daisuke Miki[2]

[1]Institute of Geophysics, University of Hamburg, Hamburg, Germany
[2]Sakurajima Volcano Research Center, DPRI, Kyoto University, Kagoshima, Japan

In February 2019 we completed the installation of a ten instrument network at Sakurajima volcano, Japan. The network includes three Doppler radar systems to record eruption velocities and amount of ejected material at Minamidake crater. Those instruments are located to the East of the volcano at a distance of about 4.5 km to the vent. We also installed three field mills to measure the electric field that is generated during an eruption due to charging of the volcanic plume. Those instruments are located to the East, North and West of the volcano at different distances. The network is completed by a weather station to monitor environmental conditions, an absolute pressure sensor for recording infrasound data, and a broadband seismometer. As an additional instrument we installed a thunderstorm detector BTD300.

In a first step we use the infrasound data (complemented by four stations from the japanese network) to generate an event catalog. The main reason for doing this is the fact that the Japanese Meteorological Society (responsible for monitoring) only reports eruptions higher than 1000 m above the vent, but there are certainly more but smaller eruptions. The event catalog based on infrasound data is complemented by the events detected by our radar systems and the field mills. In the presentation we will discuss the detection limits of the network as well as the observed electrification of the volcanic cloud that may lead to lightning, which leaves a clear signal in the electric field data. We will present some initial numerical simulations on where the strongest electric field in an eruption column occurs and discuss the impact of charging due to fractoemission and triboelectrification. Using the measured data and our initial numerical model calculations we explore which dynamic conditions appear to be favorable for lightning to occur and which not.