

Advective diffusion of eruption column captured by GNSS slant path delay in Sakurajima volcano

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We assess the ability of GPS data to detect volcanic plumes at Minami-dake of Sakurajima Volcano. In this study, we describe the July 24, 2012 activity at Minami-dake of Sakurajima Volcano. We analyzed the data from more than 20 continuous GPS stations, which located on the volcano flanks, and neighboring region. We used GIPSY-OASIS II version 6.3 software. We extracted the post-fit phase residual in the ionosphere-free linear combination for each pair of GPS satellites and ground stations for the detection of eruption column. The wet zenith tropospheric delays and its gradient at all the GPS sites were estimated at all processing epochs (30 seconds). Firstly, we analyze the all of the GPS data in July 23, 2012 for the reference. Obtained post-fit phase residual of the reference days showed the noise-level for the path delay effects caused by the volcanic plume. This reference post-fit phase residual contained many noise sources such as multipath effects. The noise level of the post-fit phase residual strongly depends on the each GPS satellite and ground station pair. Finally, we analyzed the data of the July 24, 2012. The post-fit phase residual clearly shows large disturbance just after the eruption. For example, the phase residual between SVN34 satellite and GEONET 0720, which located in the east coast of Sakurajima, suddenly increased just after the eruption. The obtained residual amount reached 80mm. It is clearly larger than the noise level measured on the reference days. Furthermore, other GPS satellite and ground station pairs also clearly showed significant amounts of disturbance. These results suggest that the eruption column moved to the westward by the wind after the eruptive event.

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