Geophysical Research Abstracts
Vol. 18, EGU2016-5380, 2016
EGU General Assembly 2016
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Monitoring of the volcanic plume based on the post-fit phase residual of PPP analysis and SNR data

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A volcanic explosion is one of the largest energy-release phenomena on earth. For example, vulcanian eruptions usually eject large amounts of rock mass, tephra, and volcanic ash. Ash fall from such events can seriously affect the structural integrity of buildings, in addition to disrupting land and air traffic. Therefore, the monitoring and prediction of ash fall is very important. In this study, using data from a dense GNSS network, we investigated the spatiotemporal development of the volcanic plume ejected by the vulcanian eruption in Sakurajima, southwestern Japan on July 24, 2012. We extracted the post-fit phase residuals (PPR) of ionosphere-free linear combinations for each satellite based on the precise point positioning approach. Temporal and spatial PPR anomalies clearly detected the movement of the volcanic plume. The maximum height of the crossing points of anomalous PPR paths was determined to be approximately 4000 m. We then compared the PPR with the signal-to-noise ratio (SNR) anomalies. Only the path passing just above the crater showed significant change in the SNR value, suggesting that the volcanic ash and the water vapor within the volcanic plume became separated after reaching a high altitude because of ash fall during the plume's lateral movement.
In the presentation, we will introduce the eruption in Shin-dake (Kuchinoerabu island, southwestern Japan) on May 29, 2015 based on the SNR data.