

## Relationship between the magnitude of Sakurajima eruptions and the disturbance of GPS-TEC

\*Kiyoto Shoji<sup>1</sup>, Hiroyuki Nakata<sup>1</sup>, Toshiaki Takano<sup>1</sup>, Hiroyo Ohya<sup>1</sup>, Takuya Tsugawa<sup>2</sup>, Michi Nishioka<sup>2</sup>

1. Graduate School of Science and Engineering, Chiba University, 2. National Institute of Information and Communications Technology

It is reported that ionospheric disturbances are caused by ground and atmospheric perturbations, e.g. earthquakes, typhoons and volcanic eruptions. Even though the volcanic eruptions excite the atmospheric waves, there is little reports of ionospheric disturbances caused by volcanic eruptions. Therefore, in this study, we analyzed the ionospheric disturbances caused by volcanic eruption using Total Electron Content (TEC) determined by GNSS system.

We analyzed TEC data observed in GNSS Earth Observation Network (GEONET) which is maintained by Geospatial Information Authority of Japan. We assumed that the ionospheric pierce points (IPP) are located at the altitude of 300 km. The 30-second TEC data are obtained in about 1200 points of GEONET. The mask angle is 30 degrees. We analyzed four events of Sakurajima eruptions (7:45 UT on Oct.-3-2009, 1:07 UT on Sep.-19-2012, 20:25 UT on Dec.-9-2012 and 20:21 UT on Feb.-12-2014). The magnitudes of the eruptions are estimated by the infrasound meter located at Higawa-Korimoto. The TEC disturbances are larger in the larger magnitude of the events.

It is expected that the TEC disturbance is inversely correlated with the distance from the crater as the energy of the atmospheric wave spreads according to the distance from the crater. Examining the relationship between TEC disturbances and the distances of IPPs from the crater. There was an inverse correlation with the distance in one events out of four events. However, no correlation was found in the other three events. This may be due to the directions of the magnetic field and the wave normal of the disturbance to the GPS satellite-receiver. In order to correct these effect, we calculated two coupling coefficients of the directions of the atmospheric wave from the calculation results of the acoustic ray tracing the one is related to the direction of the magnetic field, and the other is to the direction between the transmitters (satellites) and GNSS receivers. After this connection, an inverse correlation between TEC disturbances and the distance from the crater was appeared in three events.

However, some data showed higher values than the expected values. In the IPPs where the corrected values are high, the correction coefficients are very small. Therefore, the cause of the high values is too effective correction.

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