Evaluation of GNSS-TEC receiver performance for sounding rocket installation

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Earth's atmospheric region ionized electrons by X-rays and ultraviolet rays involved in sunlight is called ionosphere. Ionospheric disturbance causes some problems, e.g., which are terrestrial satellite communication impairment and positioning error of GNSS. For elucidating the generation mechanism of the ionospheric disturbance, we need to observe spatial structure of ionospheric electron density. Ionosphere observation is generally implemented with remote sensing method such as Ionosonde, GNSS-TEC and others. Ionosonde can observe the electron density vertical structure below the altitude of electron density peak in F region, and GNSS-TEC can obtain the total electron content along the radio wave propagation path. However, these methods cannot observe the spatial structure. In this paper, we propose a rocket GNSS-TEC tomography method as a new approach to the ionosphere observation. In this method, we install the GNSS-TEC receiver onboard a sounding rocket, and it is flying the boundary region between the ionospheric E and the F region. It is possible to acquire the TEC data only for the F region.
In case of a combining antenna system installed on the side on sounding rocket, it is simulated that the received signal becomes unstable since the sounding rocket spins at the speed of 1 to 2 Hz. Therefore, we built a structure model of the sounding rocket, and conducted a ground-based rotation experiment. In this experiment, the GNSS carrier phase data was approximately obtained for the steady rotation speed, but TEC value had the variation more than 60 TECU. As the results, we understood that a combining antenna system cannot useful for a rocket GNSS-TEC.

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