

Examinations of the ionospheric perturbation associated with H-IIA rockets launching

*Junpei Yamazaki¹, Hiroyuki Nakata¹, Hiroyo Ohya¹, Toshiaki Takano¹, Keisuke Hosokawa², Ichiro Tomizawa²

1. Graduate School of Engineering, Chiba University, 2. Department of Communication Engineering and Informatics, University of Electro-Communications

It is reported that ionospheric perturbation are caused by natural hazards, such as giant earthquakes, volcanic eruptions and so on. This is because the infrasound waves generated by natural hazards propagate to the ionospheric. Since rocket launches also generate the atmospheric waves, it is reported that passage and exhaust plumes generate TEC perturbations determined by GEONET data(Lin et al.,2014,2017).

On the other hand, there is few studies about ionospheric perturbation associated with rocket launch away from rocket's trajectory. Then, in this study, we analyzed ionospheric perturbations associated with H IIA(No.25 and 26) relatively far trajectory from the Japanese islands using HF Doppler sounding. The perturbations of Doppler shifts associated with H-IIA No.25 were observed at Kakioka and Sugadaira observatories and those of H-IIA No.26 were observed at Kakioka,Fujisawa and Sugadaira observatories about 35 minutes after the launch. It is confirmed that this delay corresponds to the propagation time of the infrasound wave from the launch site to observation points once reflected on the ground. The frequencies of the disturbance of Doppler shift were 5~10 mHz. Similar disturbances were reported in Lin et al (2014) which examined the TEC disturbances associated with Taepodong. The Doppler shift perturbation is clear when the infrasound wave reached the observation point after reflection on the ground as compared to the case where the infrasound wave reached the observation point directly. When the infrasound wave directly reaches the observation point, it passed through about 200~250km altitude. Where the amplitude of infrasound waves with several 10mHz tend to attenuate. Therefore, ionospheric perturbation at the moment corresponding to the arrived at the direct wave become small.