Enhancement of short period GPS-TEC oscillations over rainfall area

*Toshihiko Iyemori[1], Akiyasu Yamada[1], Tadashi Aoyama[2], Kornyanat Hozumi[3], Yoshihiro Yokoyama[4], Yoko Odagi[1], Sano Yasuharu[5], Vijak Pangsapa[6], Thanawat Jarupongsakul[6], Akinori Saito[1], Masato Iguchi[1]

1. Kyoto University, 2. F-Factory Co., Ltd., 3. National Institute of Information and Communications Technology, 4. Swedish Institute of Space Physics, 5. Asahi University, 6. Faculty of Science, Chulalongkorn University

Rainfall effects to the amplitude of short period GPS-TEC oscillations are investigated by using the precipitation data obtained on the ground and estimated from satellite observations (JAXA/GSMaP) and the GPS-TEC data obtained at a tropical station, PHIM, in Phimai, Thailand, and the data obtained at a mid-latitude station, NAKG, in Tokara Nakanoshima Island, Japan. A statistical analysis of the TEC power spectral density (PSD) in the period range from 50 seconds to 1200 seconds over PHIM clearly shows an enhancement in the cases of rainfall from that in no-rainfall cases, in particular, on the dusk side. The enhancement is observed both acoustic wave periods less than 5-6 minutes and internal gravity wave periods more than 10 minutes. On the other hand, the PSD does not show such clear enhancement over NAKG on the dusk side, although it shows a small enhancement on both dayside and night side. Some clear PSD bulges near the three main vertical acoustic resonance periods (i.e., around 270, 230 and 200 seconds) appear in the average PSD profile of the TEC at PHIM, which suggests that the resonance effect contribute to some extent the PSD enhancement under rainy condition.

Keywords: rainfall, GPS-TEC oscillation, vertical acoustic resonance

