南・東南アジアにおける赤道電離圏擾乱のGNSS・レーダー観測

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GNSS and radar observations of equatorial ionospheric irregularities in South and Southeast Asia

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Using a dual-frequency GNSS (Global Navigation Satellite System), TEC (Total Electron Content), which is integration of the plasma density along a ray path from the GNSS satellite to receiver, can be obtained. In Malaysia, 78 GPS receivers have been operating as MyRTKnet, which belongs to the Department of Survey and Mapping (JUPEM), Malaysia. GPS data in Indonesia, Singapore, and Thailand are provided by IGS (International GNSS Service) and SuGAr (Sumatran GPS Array) networks through the Scripps Orbit and Permanent Array Center. Using these GPS data, two-dimensional maps of the TEC have been made to investigate generation, development and propagation of equatorial plasma bubbles [Buhari et al., JGR, 2014]. We are planning to install multi-frequency GNSS receivers at Chiang Mai, Thailand and Biak, Indonesia in order to conduct geomagnetic conjugate observation and study longitudinal dependence of the plasma bubbles.

Using VHF radars, the ionospheric irregularities have been observed. EAR (Equatorial Atmosphere Radar) in Indonesia and Gadanki radar in India have measured 150-km FAI (Field-Aligned Irregularity) echo during daytime. The Doppler velocities measured by both radars are compared, and found that average of the Doppler velocities are consistent with each other whereas they differ on day-to-day basis [Patra et al., JGR, 2012, 2014]. This difference may arise from the longitudinal and/or latitudinal dependences of the neutral dynamics due to gravity waves and planetary waves. The Doppler velocity of the 150-km echo could represent ExB drift in the F region over magnetic equator, which affect electro-dynamics in the equatorial ionosphere. We will discuss advantage of the 150-km echo measurements at magnetic equator in the Indonesian and Indian longitudinal sectors.