Intense ionospheric irregularities following the eruption of Hunga Tonga-Hunga Ha'apai on 15 January 2022 - its unusual behavior and impacts on GNSS

*斎藤 享[1]、吉原 貴之[1]、高橋 透[1]
*Susumu Saito[1], Takayuki Yoshihara[1], Toru Takahashi[1]

1. 国立研究開発法人海上・港湾・航空技術研究所電子航法研究所
1. Electronic Navigation Research Institute, National Institute of Maritime, Port and Aviation Technology

On 15 January 2022, various ionospheric disturbances were observed over Japan. Traveling ionospheric disturbances (TIDs) which were shown to be associated with the volcanic eruption of Hunga Tonga-Hunga Ha'apai, Tonga (Saito, EPS, 2022). Following the TIDs, another types of ionospheric disturbances accompanying enhanced small-scale irregularities represented by the rate of the total electron content (TEC) index (ROTI) were observed at several locations over Japan at geographic latitudes as high as 38N (33.8 in the magnetic latitude).
The region of the ROTI enhancement where small-scale irregularities exist are well coincided with the region of TEC enhancement. These characteristics of the irregularities appeared to be similar to those associated with the storm-enhanced density (SED) or storm-induced plasma stream (SIPS) observed in the geomagnetic storms (Saito et al., JPGU, 2022).
By using high-sampling rate (1 Hz) data obtained from the GNSS Earth Observation Network (GNSS) operated by the Geospatial Information Authority of Japan (GIS), we investigated the motion of the small-scale irregulrities. Furthermore, the short-scale ionospheric TEC variation which may disrupt high-precision/high-integrity GNSS-based navigtion systems are evaluated
The possible mechanisms inferred from the drift of irregularities and impacts on GNSS-based navigation systems are be discussed.

キーワード：電離圏不規則構造、電離圏シンチレーション、火山噴火、衛星航法
Keywords: Ionospheric irregularities, Ionospheric scintillation, Volcanic eruption, GNSS

