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Four-Minute Total Electron Content Fluctuations over Japan after the 2022 Hunga Tonga Hunga Ha'apai Volcanic Eruption

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Ionospheric disturbances following impulsive events, such as earthquakes, volcanic eruptions, and powerful explosions, have been observed using various techniques. Fluctuations in the Total Electron Content (TEC) and magnetic field with a period of approximately 4 minutes are frequently observed following such ground-based disturbances. These 4-minute fluctuations are believed to be caused by the resonance of acoustic waves between the surface and lower thermosphere.

After the volcanic eruption of Hunga Tonga-Hunga Ha'apai on January 15, 2022, various ionospheric variations were observed. In this study, we analyzed TEC data collected from a dense Global Navigation Satellite System (GNSS) observation network operated by SoftBank Corp. Time resolution of the TEC data is 1 second. We observed intermittent TEC variations with a period of approximately 4 minutes over Japan between 11:30 and 13:30 UT on January 15, 2022. Our research aims to investigate the two-dimensional structures of these 4-minute TEC variations.

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