

Statistical comparison between plasma bubble day-to-day variability and neutral atmosphere by using GPS scintillation and GAIA model

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Equatorial plasma bubble is one of the most intense irregularities in the ionosphere. The occurrence of the plasma bubble is considered related to weak changes of the underlying atmosphere which is called large-scale wavelike structure (LSWS). The LSWS is expected formed by penetration of the atmospheric wave into the ionosphere. But its real effect is not yet known in detail. The purpose of this research is to investigate the correlation between the neutral atmosphere and day-to-day variability of equatorial plasma bubbles mainly in the Southeast Asia region. We based on the study by Yamamoto et al (2018) that showed relationship between 40-km height temperature variation and S4 index over Kototabang, Indonesia. In this study we tried to extend the observation region and also tried to elucidate atmospheric waves that are related to the plasma bubble. For indicating activity of the plasma bubble, we used S4 index of GPS scintillation measured by ISEE, Nagoya Univ. at Kototabang, Indonesia. Atmospheric data were taken from GAIA database prepared by NICT. We analyzed data from 2003, 2004, 2012, and 2013 where the solar activity was high. Overall correlation between S4 index and the atmospheric temperature showed similar feature throughout these years. However, even when we tried to extract atmospheric wave components from the GAIA data, the correlation between the wave parameter to S4 index did not show large change. This means that the elucidation of the atmospheric wave component was not very successful so far. Further analyses are required.

Reference

Yamamoto, M., Y. Otsuka, H. Jin, Y. Miyoshi (2018) Relationship between day-to-day variability of equatorial plasma bubble activity from GPS scintillation and atmospheric properties from GAIA assimilation, Progress in Earth and Planetary Science, Vol. 5, page 26, doi: 10.1186/s40645-018-0184-7.