

ISS-IMAPにより観測された赤道プラズマバブルの季節-経度依存性 Seasonal-longitudinal dependence of the occurrence of equatorial plasma bubbles observed by ISS-IMAP

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After sunset in the equatorial region, the small irregularities in the ionosphere grow large-scale depletion of the plasma as Equatorial plasma bubbles (EPBs). Because field-aligned irregularities inside EPBs affect radio waves and degrade the satellite-ground communications, it is very important to examine the dependence of their occurrence on parameters. The global observation of Equatorial plasma bubbles (EPBs) is inevitable. Since the Pacific Ocean spreads widely in the equatorial region, however, the observation of EPBs from the ground cannot be made at any longitude of equatorial region. On the other hand, the observation from the sky is very effective. In this study, the occurrence of EPBs are examined using airglow images obtained by Ionosphere, Mesosphere, upper Atmosphere, and Plasmasphere mapping on board International Space Station (ISS-IMAP). The seasonal-longitudinal dependence of their occurrence is also discussed. To do so, EPBs are chosen from 630-nm airglow images. Since the depletion of electron density is associated with EPBs, EPBs are visualized as dark trajectory. The orbital period of ISS is about 93 minutes and orbit inclination is 52 degrees. Moreover, the observation of airglow has made during the night. The observation is not uniform in longitude. Thus, the occurrence rate of EPBs is calculated by the number of EPBs over the duration of the observation in the latitude between from -30 to 30.

The occurrence rate determined by ISS-IMAP data is high at all longitude in the equinoctial seasons. This result is consistent with the occurrence rate determined by the plasma density data on DMSP satellite [Burke et al., 2004]. The orbital altitude of DMSP is 840 km, which is higher than the observation altitude of ISS-IMAP, which is about 250 km. This result implies that the altitudes of EPBs are not strongly dependent on the solar activity. On the other hand, the occurrence rate by ISS-IMAP is high at the American region as equinoctial seasons, which is not consistent with DMSP observation. As for the events observed during summer in the American sector, most of the events occurred simultaneous with geomagnetic storm. Since it is reported that penetration electric fields near dusk are eastward and enhances in the stormtime occurred in summer, it is considered that penetration electric fields prompt growth of EPBs especially in summer.

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