Topside Plasma Bubbles, Seen as He⁺ Density Depletions, and Equatorial F-region Irregularities: Longitudinal Statistics

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The present study deals with the seasonal and longitudinal (s/l) variations of the plasma bubble occurrence probability. Topside ionosphere plasma bubbles, seen as He⁺ density depletions of the topside ionosphere (~1000 km) deeply inside the plasmasphere (L~1.3-3) [1, 2], are considered. He⁺ density depletions were obtained from ISS-b spacecraft data (1978-80, F10.7~200) for the post-sunset hours under winter, summer and equinoctial condition in the interval of 25÷50° INVLAT for Southern and Northern hemispheres. The obtained statistics were compared with the s/l statistics of the equatorial F-region irregularities (EFI), based on the AE-E (McClure et al., [3]), OGO-6 (Basu et al., [4]) and ROCSAT (Su et al., [5]) data. Moreover, ESF and RSF (range spread-F) statistics, obtained by Maruyama and Matuura [6, 7] from ISS-b data, and plasma bubble statistics, obtained by Watanabe and Oya [8] from Hinotori data (1981, 650 km), were taken for comparison. EFI, ESF (RSF) and plasma bubble statistics were obtained above the equatorial region within ±20° DIPLAT under the same solar activity conditions. It was revealed that the main statistical maxima of the mentioned above equatorial F-region irregularities are well enough reflected in the s/l statistical plots of the He⁺ density depletions of the both hemispheres. The best conformity was obtained during the equinox periods, the worst one - during solstice periods, when the most dramatic insolation differences take place for the different hemispheres.

Keywords: He⁺ density depletions; plasma bubbles; topside ionosphere.

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