

Statistical characteristics of MF/HF auroral radio emissions emanating from the topside ionosphere

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The terrestrial auroral ionosphere is a natural emitter of electromagnetic waves in the MF/HF ranges (up to 6 MHz) as well as well-known intense auroral kilometric radiation (AKR) and auroral hiss in the VLF/LF ranges. We report on the statistical properties of Terrestrial Hectometric Radiation (THR), MF/HF auroral radio emissions emanating from the topside ionosphere, using a long-term data set obtained from the Plasma Waves and Sounder (PWS) experiment mounted on the Akebono satellite during 2 solar cycles. THR typically occurs in either or both of two frequency bands near 1.5-2.0 MHz and 3.0-4.0 MHz, whose polarization features correspond to the L-O and R-X mode. Statistical studies using the Akebono/PWS data reveal clear bimodality in the frequency distribution of THR with two broad peaks near 1.6 MHz and 3.6 MHz. Occurrence rate of THR-L (lower than 2.5 MHz) is higher than that of THR-H (higher than 2.5 MHz). Solar activity dependence and seasonal variations of THR appearance are manifested; THR occurrence rate drops from a few percent during solar maxima to 0.1 percent or less during solar minima and is the highest in summer and the lowest in winter. This study also shows the spatial distribution of occurrence rate of THR-L and THR-H. In the morning to postnoon sectors (3h-15h MLT), the spatial distribution of both types of THR is confined to magnetic latitudes higher than 70 deg, while during nighttime (15h-3h MLT) it spreads to lower magnetic latitudes (~30 deg) at higher altitudes. The explanation of this distribution is that THR is generated in the night-side auroral latitudes near 1000-km altitude and propagation effect makes an emission cone.