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A statistical survey of terrestrial hectometric radiation generated in the topside auroral ionosphere

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The terrestrial auroral ionosphere emits electromagnetic waves in the MF and HF bands (about 1-5 MHz), some of which can reach to the ground level or escape to space. Ground-based observations indentified two types of MF/HF auroral radio emissions: auroral roar and MF burst. Both auroral roar and MF burst are usually attributed to mode-conversion radiation from upper hybrid waves generated by interaction with auroral electrons in the bottomside ionosphere. Several papers reported satellite observations of MF/HF auroral radio emissions radiating from the topside ionosphere to space: 2-MHz, 4-MHz noise [*James et al.*, 1974], terrestrial hectometric radiation (THR) [*Oya et al.*, 1985, 1990], and topside ionospheric MF/HF radio emission [*Bale*, 1999]. Recently, *Sato et al.* [2010] showed typical spectrum and polarization features of THR emissions by case studies using the Akebono satellite data. However, there is no consensus regarding their statistical characteristics and relations with auroral roar and MF burst, both of which are observable from the ground.

We analyze long-term data of the Akebono satellite, which has been operated since its launch on February 1989, for the statistical characteristics of THR emissions. The initial result is as follows: The frequency distribution shows a bimodal pattern which has a dip near 2.3-3.0 MHz and broad peaks near 1.4 MHz and 3.6 MHz. While the lower-band THR ($<$ 2.5 MHz) has a higher occurrence rate than the upper-band THR ($>$ 2.5 MHz), both have a similar distribution pattern of magnetic local time (MLT) and invariant latitude (ILAT). THR emissions are detected at any hour in MLT, and the higher occurrence is concentrated to the afternoon and nightside sectors between 12 and 01 MLT. The ILAT distribution is concentrated to the auroral latitude between 45 and 90 deg with a peak near 70-75 deg. THR emissions are detected over the entire altitude range of the Akebono satellite pass (275-10500 km). This result suggests that THR emissions are generated in the topside auroral ionosphere in the nightside sector. We will show the statistical characteristics of THR emissions, such as polarization and distributions in altitude, frequency spectrum, bandwidth, MLT, and ILAT, to examine the source region and propagation features of the THR emissions.

Keywords: auroral ionosphere, auroral radio emissions, radio propagation, plasma instability