あけぼの衛星によってプラズマ圏磁気赤道付近で観測される静電的電子サイクロトロン高調波について

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Electrostatic electron cyclotron harmonic waves observed by the Akebono satellite near the equatorial region of the plasmasphere

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In the plasma wave observation data provided by the plasma waves and sounder experiment (PWS) on board the Akebono satellite which has been carried out more than 17 years, electrostatic electron cyclotron harmonic (ESCH) waves are frequently observed in the low latitude region (less than 45 degrees MLAT) of the plasmasphere within an altitude range from about 3000 km to the apogee of the satellite (initial apogee was 10,500 km). Even in a moderate or low geomagnetic activity, intense ESCH waves often appear near the equatorial region of the plasmasphere above the upper hybrid resonance (UHR) frequency at the lowest harmonic number branch of the fQn ESCH waves. We identified these plasma waves as the equatorial plasmasphere fQn waves (EP-fQn). The spectra of the EP-fQn waves are characterized by a narrow band structure. The maximum intensity is nearly coincident with the upper limit of the PWS receiver in the low gain mode. From the statistical analysis results, the EP-fQn waves are observable in all the local time sectors; however, the occurrence probability shows clear enhancement in the early morning sector of 01-03 h MLT in the plasmasphere. The EP-fQn wave activities are suppressed within a period of strong magnetic disturbances as well as solar minimum phase. The linear dispersion relation analysis using a two component plasma model reveals that supra-thermal plasma with the energy of about 750 eV and with a large temperature anisotropy (A=T-perp/T-parallel-1>40) must be present in order to realize an appearance of a positive growth rate at the observed frequency and propagation angle of the ESCH waves. Since the hot plasma with such high anisotropy has not been detected, the validity of the present two component plasma model remains an open question. The occurrence feature of the ESCH waves showed that there is a constant activation or a constant flow-in of free energy to generate the strong plasma instability of ESCH waves near the post-midnight sector of the plasmasphere. Existence of ESCH waves revealed more active and turbulent nature of the plasmaspheric plasma than it has been believed.