

The origin of the intensity modulation of Z-mode radiation observed in the geomagnetic equatorial region of the plasmasphere

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By using plasma wave and sounder experiments (PWS) on board the Akebono satellite Z-mode plasma waves are frequently observed in the geomagnetic equatorial region of the plasmasphere. Close association of these Z-mode waves with the intensified UHR mode waves named EPWAT phenomena suggests that the radiation is generated from the UHR mode waves by the mode conversion process through the inhomogeneity of the plasma density. In the present study, such a hypothesis has been examined by using a method to determine the k-vector of Z-mode waves from by analyzing the spin modulation effect of the observed electric field components as well as the spatial variation of the intensity of observed Z-mode waves. The results have shown that the Z-mode waves originate from the intensified UHR mode waves (EPWAT events) in the magnetic equatorial region and propagate to the higher latitude regions.

Intensity modulation phenomena of such Z-mode waves with a period of about 50sec have also been detected after the passage of the plasma disturbance associated with an SC event. The variations of the intensity of Z-mode waves are well correlated with the low frequency perturbation of the electric field detected by the EFD (Electric Field Detector) onboard the Akebono satellite. A possible origin of such intensity modulation of Z-mode wave is, then, attributed to the excitation of UHR mode waves, caused by the periodic injection of the hot plasma and/or the periodic acceleration of the electrons by the standing Alfvén waves with a period of 50sec, the generation of which is triggered by the arrival of the hydromagnetic disturbances associated with the SC.