Propagation properties of auroral kilometric radiation via cyclotron maser mechanism

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Earth's Auroral Kilometric Radiation (AKR), whose sources are confined in density cavity along the auroral field line, has been observed from spacecraft in the frequency range from 50 to 700 kHz with right- and left-hand polarization. From the theoretical point of view, it is widely accepted that the cyclotron maser instability (CMI) plays a role in generating primary in the right-hand extraordinary (R-X) mode of AKR. Also, it is associated with waves of higher growth rates as their wave normal angles are larger. However, because the AKR source region is located in a limited area near gyro-frequency along the magnetic field line and is surrounded with cold density enhancements, it is obvious that these geometry and plasma parameters contribute to AKR growth. In this study, we focus on their contributions to the growth of AKR via numerical simulation. We have used a 2-1/2D electromagnetic electron hybrid code in which we consider the cold electrons to be a fluid, the hot electrons to be finite-size relativistic particles, and the ions to be a charge-neutralizing stationary component. Such velocity distributions as loss-cone, ring-shell and horseshoe, are assumed in the middle of the simulation region, whereas denser cold plasma surrounds this region whose right and left boundaries are terminated by wave absorption regions. The vertical direction corresponds to Earth magnetic field. In terms of various parameters such as the size of confined AKR region and cold density ratio in and out of auroral cavity, we will report the results of the computation regarding propagation and growth of waves.