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Simulation study of whistler-mode wave propagation in the dipole coordinate

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In the Earth's inner magnetosphere, whistler-mode chorus emissions are observed mostly on the dawn side and are enhanced during geomagnetically disturbed periods. Chorus emissions are narrow band emissions observed in the typical frequency range of 0.2 to 0.8 ¥Omega$_{e0}$ with a gap at the half ¥Omega$_{e0}$, where ¥Omega$_{e0}$ represents the electron gyrofrequency at the magnetic equator. Components of emissions in the frequency range lower and higher than 0.5 ¥Omega$_{e0}$ are respectively called the lower-band and upper-band chorus emissions. The gap at 0.5 ¥Omega$_{e0}$ has been understood by the difference of the propagation characteristics of whistler-mode waves of frequency higher or lower than 0.5 ¥Omega$_{e0}$ propagating along the field aligned ducts of enhanced/depleted plasma density [e.g., Bell et al., 2009]. The difference of the characteristics of upper-band and lower-band chorus emissions has been explained by the different propagation properties of whistler-mode waves of different wave frequency. For the discussion of the properties of whistler-mode wave propagation in the dipole magnetic field, we have developed a simulation code with a dipole geometry.

In this presentation we show initial results of the simulation of the whistler-mode wave propagation in the inner magnetosphere. We assume the wave source of monochromatic whistler-mode waves in the equatorial region of the magnetosphere. By assuming a cold plasma density distribution with a spatial gradient in both latitudinal and radial direction in the dipole magnetic field, we study the difference of propagation properties of whistler-mode waves of different wave frequency.