Study of the current-driven electromagnetic ion-cyclotron instability in the plasma of auroral magnetosphere

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This study considers the wave characteristics and generation mechanism of bursts of polarized transverse electromagnetic waves at frequencies close to the proton gyrofrequency. The current-driven instability in the magnetospheric plasma located in the region of intensive upward directed field-aligned electric current (FAC) above the auroral ionosphere is investigated. To do this, the dispersion equation is solved numerically for the case of electromagnetic ion-cyclotron (EMIC) waves propagating in arbitrary direction with respect to the mean magnetic field. The behaviour of the wave vector and increment of growth is estimated in dependence on the frequency and polarization of the waves. The results of the calculations are discussed for different observational points in the auroral magnetosphere in dependence on the FAC intensity.

An extended, but not localized region of the plasma instability is found by numerical calculations, it stretches in the auroral magnetosphere. It is found that in the plasma of the auroral magnetosphere strong plasma instability may occur so that the value of the growth rate of the waves is of the order of the wave frequency. Besides, the plasma instability is excited at less values of the wave number if the magnetospheric altitude becomes larger.