GC2024-STP027

On the dispersion properties of coupled Alfven and slow waves in two-dimensionally inhomogeneous model of the magnetosphere

Aleksandr V. Petrashchuk[1] , Dmitri Y. Klimushkin[1] , Pavel N. Mager[1]

[1] Institute of Solar-Terrestrial Physics, Siberian Branch of the Russian Academy of Sciences

av.petrashchuk@mail.ru

The report carried out a numerical analysis for coupled Alfven and slow ones in the azimuthal small-scale approximation with the dipole geometry of the field lines of the Earth's magnetosphere. Plasma inhomogeneity is taken into account in two projections: across the magnetic shells and along the field lines. Taking into account the plasma pressure and the curvature of the magnetic field lines in this case leads to the coupling of Alfven and slow modes, while the contribution of the fast mode can be neglected due to small perturbation scale in the azimuthal direction. It was found that the wave is localized in two frequency ranges limited by each other. One of them is limited by the resonant frequency on one side and the other by the cutoff frequency on the other. In this case, the high frequency range is adjacent to the Alfven mode, and its properties in this case change greatly due to interaction with the slow mode. Depending on the plasma pressure and its gradient, a divergence of plasma displacement may appear, as well as a compression component of the magnetic field. In the low-frequency wavelength range, the slow mode may lose its cutoff frequency under very strong and negative pressure gradients. This means that the radial component of the wave vector tends to zero at the imaginary frequency. The work was financially supported by the Ministry of Science and Higher Education of the Russian Federation.