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# Excitation of magnetosonic waves and nonlinear structures by the ion cyclotron ponderomotive force in the inner magnetosphere

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The nonlinear interaction of the electromagnetic ion cyclotron (EMIC) frequency waves with plasma particles in the inner magnetosphere is studied. The emission is considered to be circularly polarized electromagnetic waves propagating along the almost constant dipole geomagnetic field in the equatorial region of the inner magnetosphere. Under the action of the ion cyclotron ponderomotive force excitation of the magnetosonic waves through the amplitude modulation of the EMIC waves is investigated. Two dimensional nonlinear Schrodinger equation for the EMIC waves is derived. In the stationary case two solutions of the nonlinear Schrodinger equation with distinct natures are found. For sufficiently small amplitudes of the EMIC field, there exists a two-dimensional bright soliton, whereas for larger amplitudes the solution is oscillating. The generation of both vortices and of a quasi-static magnetic field across the geomagnetic field lines is discussed. The acceleration of protons by the vortex is considered. The relationship between EMIC waves and seismic phenomena is also discussed.