V. Yu. Trakhtengerts. *Ion cyclotron maser and the dynamics of the magnetospheric ring current.* It is well known that the properties of the earth's magnetosphere as a maser system largely determine the dynamics of the high-energy component of the plasma and of the electromagnetic radiation in the circumterrestrial space. The magnetospheric maser is based on the magnetic force tube filled with the background plasma, which together with the ionospheres of the conjugate hemispheres (playing the role of mirrors) serves as a resonator for Alfvén and whistler waves. The active material in the magnetospheric maser, called the Alfvén maser (AM), consists of high-energy electrons and ions, which are produced by different acceleration mechanisms during magnetic disturbances. High-energy particles, as a rule, have a nonequilibrium (anisotropic) momentum distribution, a result of which is the development of cyclotron instability in the AM. There is a variant of the AM that is distinguished by a special uniqueness—the ion cyclotron maser (ICM), whose operation is closely associated with the dynamics of the so-called magnetospheric ring current. The ring current is formed during magnetic storms at distances of 3–5 earth radii from the center of the earth and contains from 20 to 60% of the total energy of the magnetic storm. This energy is confined primarily in hot electrons with energy $W > 50$ keV.

The excitation of electromagnetic waves in the ICM plays an extremely important role in the dynamics of the ring current. The cyclotron instability, arising when high-energy protons from the sun are injected into the magnetosphere, sharply limits the lifetime of these particles in a geomagnetic trap. At the same time, as the cyclotron instability develops, heavy ions from the ionosphere (oxygen and helium) are efficiently accelerated[2] and an overall heating of the background plasma also appears—phenomena that are typical for the ring current during the principal phase of a magnetic storm.

For a low level of magnetic activity, when the source of high-energy protons is weak and the degree of departure from equilibrium (anisotropy) of the active material is small, the processes in ICM proceed somewhat differently. Under these conditions the heavy ions apparently have an insignificant effect on the cyclotron instability, and the ionospheric mirrors play the main role in the dynamics of the ICM.[3] These mirrors in the studied frequency band of 0.1–5 Hz are in many ways reminiscent of Fabry-Perot resonators. Their reflection characteristic as a function of frequency has a resonance character, which, combined with the nonlinear restructuring of these mirrors during the operation of the ICM, leads to excitation of unique spiking regimes of radiation generation with frequency drift within the spike.[3–5] An extensive class of geomagnetic pulsations of the Pc-1 type observed in the magnetosphere can be linked to these regimes.

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