NONLINEAR DYNAMICS OF A MAGNETOSPHERIC VLF BACKWARD-WAVE OSCILLATOR: POSSIBLE INFLUENCE OF BOUNCE OSCILLATIONS OF ENERGETIC ELECTRONS

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We present some results of numerical simulations within the framework of a simplified nonlinear model of the backward-wave oscillator (BWO) regime in a whistler-mode magnetospheric cyclotron maser. In particular, we study the possible influence of bounce motion of energetic electrons in a geomagnetic trap on the nonlinear stage of generation of VLF chorus emissions in the Earth's magnetosphere. If the particles coming back to the generation region due to their bounce motion preserve the phase bunching they acquired during the previous pass through this region, then falling tones can be generated in the system. The obtained result can be explained by the fact that in the presence of an initial phase bunching, the interaction is more intense in the region where the particles move towards the decreasing geomagnetic field and, hence, are adiabatically accelerated along their motion. This increase in the parallel velocity corresponds to a decrease in the cyclotron-resonance frequency and thus a lower frequency is generated at a later stage of interaction. These results allow us to assume that the generation of chorus elements with falling frequency can take place if the the amplitude of bounce oscillations of the electrons generating chorus is close to the characteristic length of the generation region.

wave-particle interactions, VLF emissions, energetic particles

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