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Nonlinear distortion of the Pc5 FLR structure and ponderomotive redistribution of the magnetospheric ions

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Global Pc5 oscillations are the most powerful wave phenomenon in the magnetosphere. Usually they have structure of the field-line resonances (FLRs). Large amplitude of these waves provides conditions for their impact on the magnetosphere particles through nonlinear processes. Pc5 acceleration of the radiation belt electrons up to relativistic energy is the subject of wide discussion. Another wave-particle mechanism involving Pc5s, ponderomotive action of Pc5 Alfvenic waves on the magnetosphere background plasma, is less known. To search experimentally for the nonlinearity of FLR structure we used observations of Pc5 pulsations at a meridional chain of subauroral stations and found a shift of latitudinal maximum of the amplitude profile with change of oscillation intensity. This allowed us to estimate the nonlinearity degree and assess the rate of plasma density increase at the field line top due to ponderomotive lifting of ions. Value of the nonlinearity coefficient corresponds to the moderate nonlinear increment of plasma density within 0.3–0.5 of its undisturbed value under typical intensity of global Pc5. Previous analytical [Guglielmi, 1997] and numerical [Allan, 1993] estimates have predicted higher values of the ponderomotive disturbance of plasma density. Causes of this discrepancy between the theory and experiment are discussed.
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