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Anharmonicity of the Alfven resonances in the magnetosphere

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The theory of ponderomotive forces predicts the anharmonicity of Alfven waves. The goal of our work is to find an experimental evidence of the anharmonicity of Alfven oscillations of the Earth's magnetosphere by using the ground based observation of the ULF waves in the Pc5 frequency band. The new techniques for search of the effects of anharmonicity are offered – the method of ULF range finding, the spectral-polarization method, the synchronous detection method, and the specific method the idea of which consists in the analysis of the amplitude dependence of the Alfven resonances by using the data of ULF observation along the meridian chain of the magnetic stations. The methods were employed for the study of anharmonicity of MHD oscillations with use of the networks of magnetometer stations IMAGE, the observatories Borok, Mondy and Uzur. The coefficients of nonlinearity of the magnetosphere are estimated by using the proposed methods. It is shown that the phenomenon of gigantic anharmonicity which is predicted by some theories is absent in fact. It is shown that the anharmonicity of the Alfven oscillations in combination with nonlocal boundary condition over the Earth's surface leads to the amplitude dependence of the surface impedance if it is calculated by using the classical magneto-telluric (MTS) method. This parasitic nonlinearity of the surface impedance may be especially pronounced at the condition that the global Pc5 oscillations are used for MTS. The work was partly supported by grants RFBR 07-05-00696, 09-05-00048.