Geophysical Research Abstracts, Vol. 7, 01804, 2005
SRef-ID: 1607-7962/gra/EGU05-A-01804

Parallel electric field in the auroral ionosphere: excitation of acoustic waves by Alfvén waves

P. Israelevich (1) and L. Ofman (2)

(1) Department of Geophysics and Planetary Sciences, Raymond and Beverly Sackler Faculty of Exact Sciences, Tel Aviv University, Ramat Aviv, 69978, Israel (peter@luna.tau.ac.il) (2) 2Department of Physics, The Catholic University of America and NASA Goddard Space Flight Center, Code 682, Greenbelt, MD 20771, USA

We investigate a new mechanism for the formation of parallel electric field observed in the auroral ionosphere. For this purpose, the excitation of acoustic waves by propagating Alfvén waves was studied numerically. We find that the magnetic pressure perturbation due to finite amplitude Alfvén waves causes the perturbation of the plasma pressure that propagates in the form of acoustic waves, and gives rise to a parallel electric field. This mechanism explains the observations of the strong parallel electric field in the small-scale electromagnetic perturbations of the auroral ionosphere. For the cases when the parallel electric current in the small-scale auroral perturbations is so strong that the velocity of current carriers exceeds the threshold of the ion sound instability, the excited ion acoustic waves may account for the parallel electric fields as strong as tens of mV/m.