Geophysical Research Abstracts, Vol. 8, 01734, 2006
SRef-ID: 1607-7962/gra/EGU06-A-01734

Hybrid simulations of electromagnetic alpha/proton instabilities in the fast solar wind

Q. M. Lu

CAS Key Laboratory of Basic Plasma Physics, School of Earth and Space Sciences, University of Science and Technology of China, Hefei, Anhui 230026, P. R. China

qmlu@ustc.edu.cn Fax:+86-551-3607615 Phone:+86-551-3607657

In situ plasma measurements in the fast solar wind have revealed a variety of nonthermal features of ion velocity distributions. One of the features is that minor ions such as alpha particles flow faster than the proton center-of-mass velocity, and the observed average of the alpha/proton relative drift speed is about V_A (V_A is the Alfven speed). Hybrid simulations are performed to investigate the electromagnetic alpha/proton instabilities in the fast solar wind, and in the simulations the alpha particles contain 5% of the total ion number density with the relative drift speed $2.0V_A$. The results show that two wave modes are found to be unstable: magnetosonic and Alfven waves modes. The magnetosonic instability has the maximum growth rate in the direction of the ambient magnetic field and the Alfven mode propagates oblique to the field, which is consistent with the linear Vlasov theory. We also study the competitions between the magnetosonic and Alfven wave modes under different parameters, such as the temperature anisotropies of the proton and alpha particles, the angle between the propagation direction of the wave modes and the ambient magnetic field, etc.