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On beam-induced kinetic Alfven waves and rapid dissipation of circularly polarized Alfven waves: A 2-D hybrid simulation

Yasuhiro Nariyuki[1*], Tohru Hada[2], Ken Tsubouchi[3]

[1]Kochi National College of Tech., [2]E.S.S.T., Kyushu Univ., [3]NICT

Beam-induced instabilities are one of the most fundamental relaxation processes in collisionless plasmas. The ion beams parallel to the ambient magnetic field are often observed in the solar wind, foreshocks, and in the earth's magnetosphere. Waves excited by these beams are important from the point of view of heating core plasmas and also making nonthermal particles.

We numerically discuss the dissipation of circularly polarized Alfven waves in solar wind plasmas including beam components by using a 2-D hybrid simulation code. Numerical results suggest that, both in the 1-D and 2-D simulations, the presence of large amplitude Alfven waves strongly suppresses the beam instabilities. Furthermore, the Alfven waves are rapidly dissipated in the presence of the beam-induced kinetic Alfven waves, which can exist only in the 2-D system.

Keywords: Alfven wave, ion beam, kinetic Alfven wave, solar wind, foreshock, solar corona