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Vlasov simulation study of the nonlinear evolution of the whistler instability in Kappa distributed space plasma

Bengt Eliasson (1), Marian Lazar (2,3), and David Speirs (1)

(1) Stratjclyde University, Physics Department, Glasgow, United Kingdom (bengt.eliasson@strath.ac.uk), (2) Centre for Mathematical Plasma Astrophysics, Celestijnenlaan 200B, 3001 Leuven, Belgium, (3) Institut fur Theoretische Physik, Lehrstuhl IV: Weltraum- und Astrophysik, Ruhr-Universitat Bochum, D-44780 Bochum, Germany

We present a Vlasov simulation study [1] of the linear and non-linear evolution of the whistler (or electromagnetic electron cyclotron, EMEC) instability in space plasma, where the electrons initially follow a Kappa distribution with high-energy tails. The whistler instability takes place when the temperature perpendicular to the ambient magnetic field is larger than the parallel temperature. It is found that the back-reaction of the large amplitude whistler waves leads to a heating of the electrons in the parallel direction until marginal stability is established. A novel result is that the spectral index Kappa remains almost unchanged in the process. A set of simulations are carried out for different values of the spectral index, and with parameters relevant for the solar wind plasma.

[1] B. Eliasson and M. Lazar, Phys. Plasmas 22, 062109 (2015).