Geophysical Research Abstracts
Vol. 20, EGU2018-2874, 2018
EGU General Assembly 2018

Solar wind temperature anisotropy instabilities: the interplay of electrons, ions and their suprathermal populations

Shaaban Mohammed Shaaban (1,2), Marian Lazar (1,3), and Stefaan Poedts (1)

(1) Centre for mathematical Plasma-Astrophysics, KU Leuven, Belgium (shaaban.mohammed@kuleuven.be), (2) Theoretical Physics Research Group, Physics Dept., Faculty of Science, Mansoura University, Egypt (shmohammed@mans.edu.eg), (3) Institut für Theoretische Physik, Lehrstuhl IV: Weltraum- und Astrophysik, Ruhr-Universität Bochum, Germany

Binary collisions are inefficient in the solar wind, where the so-called collisional age of electrons and protons (ions) is predominantly less than 2 collisions in a transit time from the Sun to 1 AU. Deviations from thermal equilibrium, like temperature anisotropies observed in space plasmas should be constrained by the selfgenerated instabilities. However, for the upper bound of the proton anisotropy $A_p > 1$ the existing studies which ignore the influence of anisotropic electrons and suprathermal populations, predict the EMIC to be faster than mirror instability in the relaxation of proton anisotropy. In the present work we invoke a realistic kinetic approach using bi-Kappa distribution function to reproduce nonthermal features of both the electron and proton species, i.e., temperature anisotropies and suprathermal populations. A numerical analysis is performed to resolve the linear dispersion and stability for an arbitrary propagation in a magnetized plasma. Mutual effects of anisotropic electrons and protons and their suprathermal components are unveiled by a detailed parametric study of the instability conditions. The results demonstrate that these sources of free energy provide natural conditions for an efficient mirror instability to develop faster than predicted before, and compete with the EMIC instability.