Geophysical Research Abstracts
Vol. 18, EGU2016-16195, 2016
EGU General Assembly 2016

From Alfvén waves to kinetic Alfvén waves in an inhomogeneous equilibrium structure

Francesco Pucci (1,2), Christian L. Vasconez (1,3), Oreste Pezzi (1), Sergio Servidio (1), Francesco Valentini (1), William H. Matthaeus (4), and Francesco Malara (1)

(1) Dipartimento di Fisica, Università della Calabria, I-87036, Rende (CS), Italy., (2) Center for Mathematical Plasma Astrophysics, Department of Mathematics, University of Leuven, Leuven, Belgium, (3) Observatorio Astronomico de Quito, Escuela Politecnica Nacional, Quito, Ecuador., (4) Department of Physics and Astronomy, University of Delaware, DE 19716, USA.

Kinetic Alfvén waves are believed to primary form fluctuations in a hydromagnetic turbulence at scales of the order of the ion inertial length. We study a model where an initial Alfvén wave propagates inside an equilibrium structure which is inhomogeneous in the direction perpendicular to the equilibrium magnetic field. In a previous paper [1] this situation has been considered in a particular configuration where the initial wavevector is parallel to the magnetic field and the wave is polarized perpendicular to the inhomogeneity direction. Here, we consider other configurations, with a different polarization and possible initial oblique propagation. We employ numerical simulations, using both a Hall-Magnetohydrodynamics and a Hybrid Vlasov-Maxwell model.

Results show that in all the considered cases the time evolution leads to the formation of Kinetic Alfvén waves within the inhomogeneity regions, which are identified by a comparison with analytical linear theory results. Then, in this context the formation of Kinetic Alfvén waves seems to be a general phenomenon which could be also extended to more complex situations, like turbulence. Kinetic simulations show that Kinetic Alfvén waves modify the ion distribution function, generating temperature anisotropy of both parallel and perpendicular to the local magnetic field as well as particle beams aligned along the local magnetic field. These results could be relevant both in the solar corona and in large-scale structures of the solar wind, where Alfvénic fluctuations are present along with large-scale inhomogeneities.

[1] C. Vasconez *et al.*, Kinetic Alfvén waves generation by large-scale phase-mixing, The Astrophysical Journal **815.1**, 7 (2015).