Geophysical Research Abstracts
Vol. 16, EGU2014-7331, 2014
EGU General Assembly 2014

The Self-Consistent Generation of Current Sheets by Alfven Wave Collisions in Plasma Turbulence

Gregory Howes
University of Iowa, Physics and Astronomy, Iowa City, United States (gregory-howes@uiowa.edu)

Turbulence plays a key role in the evolution of space and astrophysical plasmas, mediating the transfer of energy from large-scale turbulent motions to small scales where the turbulent energy is ultimately converted to plasma heat. The cascade of energy from large to small scales is mediated by the nonlinear interactions between counterpropagating Alfven waves, or Alfven wave "collisions," the fundamental building block of astrophysical plasma turbulence. At small scales, simulations of magnetized plasma turbulence inherently generate current sheets down to the scale of the electron Larmor radius, and these current sheets play an important, but as yet only partially understood, role in the kinetic dissipation of turbulence under the weakly collisional plasma conditions relevant to the solar wind and solar corona. Here I demonstrate from first principles how Alfven wave collisions lead to the generation of current sheets at small scales. The result is the first model of plasma turbulence that self-consistently ties together the physics of Alfven waves and small-scale current sheets.