Correlation between density and magnetic fluctuations associated with dissipation of quasi-parallel Alfven waves

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Quasi-parallel Alfven waves are ubiquitous in space. They play important roles in various physical processes in the solar wind, solar corona, interstellar medium, hot accretion flows, turbulent heating in magnetosheath, among others. Such quasi-parallel Alfven waves may be regarded as one of the most robust fluctuations in a collisionless magnetised plasma, as they can propagate long distance before they are eventually dissipated by various collisionless damping processes. It is extremely important to understand how such dissipation takes place, since the loading of momentum, energy, and helicity conveyed by the Alfven waves is completed when the waves damp away.

In this presentation, we discuss the dissipation of quasi-parallel Alfven waves associated with envelope modulation, caused by nonlinear wave-wave interaction among the Alfven waves. The envelope modulation leads to (nonlinear) Landau damping, and also to generation of acoustic waves, which are subject to (linear) Landau damping. Analysis of density fluctuations generated through the envelope modulation of Alfven waves may play crucial roles in discussion of plasma turbulence data, obtained by in situ measurement or by remote sensing.