DPP09-2009-000692

Abstract for an Invited Paper
for the DPP09 Meeting of
the American Physical Society

Effects of Line-tying on Magnetohydrodynamic Instabilities and Current Sheet Formation[1]

YI-MIN HUANG, Center for Integrated Computation and Analysis of Reconnection and Turbulence, University of New Hampshire

The effects of line-tying on magnetohydrodynamic instabilities are an important issue for astrophysical plasmas, such as the solar corona or astrophysical jets, where magnetic field lines are deeply anchored at a dense medium. Recently, several laboratory experiments aimed at studying line-tying effects have been initiated. In this talk, the effects of line-tying on the ideal kink mode and resistive tearing mode will be presented. In general, line-tying has a stabilizing effect on the linear instability, and it also smooths out the internal layer of the linear eigenfunction. What is more interesting, however, is the nonlinear evolution of the unstable modes. It is well known that the ideal internal kink mode and ideal coalescence instability evolve nonlinearly into tangential discontinuities, or current sheets, in the absence of line-tying. Whether the same result remains true in the presence of the line-tying remains an open question. Current sheet formation in line-tied systems is essential in Parker's scenario of coronal heating. New theoretical results on nonlinear current sheet formation will be presented.

[1]In collaboration with A. Bhattacharjee and Ellen G. Zweibel.