Plasmoid Instability in General Current Sheets

Luca Comisso (Princeton University)

We present the recent formulation of a general theory of the onset and development of the plasmoid instability [1]. We consider the general problem of a reconnecting current sheet that can evolve in time, rather than assuming a fixed Sweet-Parker current sheet. The new theoretical framework has lead to completely new results, which have shown that previously obtained power laws are insufficient to capture the correct properties of the plasmoid instability. The new scaling laws are shown to depend on the Lundquist number, the noise of the system, the characteristic rate of current sheet evolution, as well as the thinning process. The detailed dynamics of the instability is also elucidated, and shown to comprise of a long period of quiescence followed by sudden growth over a short time scale.

[1] L. Comisso, M. Lingam, Y.-M. Huang, A. Bhattacharjee, Phys. Plasmas 23, 100702 (2016)