Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Role of the Plasmoid Instability in 2D and 3D Magnetohydrodynamic Turbulence[1] CHUANFEI DONG, LIANG WANG, Princeton Plasma Physics Laboratory, YI-MIN HUANG, Princeton University, LUCA COMISSO, Columbia University, AMITAVA BHATTACHARJEE, Princeton Plasma Physics Laboratory — Magnetohydrodynamic (MHD) turbulence plays a fundamental role in the transfer of energy in a wide range of space and astrophysical systems, from the solar corona and accretion disks, to the interstellar medium and galaxy clusters. An important feature of MHD turbulence is the tendency to develop sheets of strong electric current density. These current sheets are natural sites of magnetic reconnection, leading to the formation of plasmoids that eventually disrupt the sheet-like structures in which they are born. In this study, we investigate the role of the plasmoid instability in both 2D and 3D MHD turbulence by means of high-resolution direct numerical simulations. At sufficiently large magnetic Reynolds number, the combined effects of dynamic alignment and turbulent intermittency lead to a copious formation of plasmoids in a multitude of intense current sheets. The disruption of current sheet structures facilitates the energy cascade towards small scales, leading to the breaking and steepening of the energy spectrum in the plasmoid-mediated regime. [1] C. F. Dong, L. Wang, Y.-M. Huang, L. Comisso, A. Bhattacharjee, Role of the Plasmoid Instability in Magnetohydrodynamic Turbulence, Phys. Rev. Lett. 121, 165101 (2018).

[1]This work is supported by NSF grants AGS1338944 and AGS-1460169.

Chuanfei Dong
Princeton Plasma Physics Laboratory

Date submitted: 03 Jul 2019 Electronic form version 1.4