Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Statistical Description of Merging Magnetic Islands[1] DAVID WU, California Institute of Technology, MUNI ZHOU, NUNO LOUREIRO, Plasma Science and Fusion Center, Massachusetts Institute of Technology, DMITRI UZDENSKY, Center for Integrated Plasma Studies, Physics Department, University of Colorado, Boulder — The physical picture of interacting magnetic islands provide a useful paradigm for certain plasma dynamics in a variety of physical environments, such as the solar corona, heliosheath and the Earths magnetosphere. The dynamics of magnetic islands has been treated with a statistical approach by previous works, where the evolution of the island distribution function in the phase space of islands characteristic properties is governed by an integrodifferential equation. In this work, we take a similar approach to study the inverse energy transfer through the coalescence of magnetic islands in 2D, enabled by magnetic reconnection. An island kinetic equation is derived with a special collisional integral to incorporate the physics of merging behavior. The numerical solution of our island kinetic equation provides the evolution of the island distribution functions. The time evolution of important quantities such as the magnetic energy, energy integral scale and number of islands agrees with our simplified analytical prediction. Properties of the distribution function and the magnetic energy spectrum are also studied.

[1]Work funded by NSF CAREER award No. 1654168 and Caltech's SURF program

David Wu
Caltech

Date submitted: 20 Sep 2019 Electronic form version 1.4