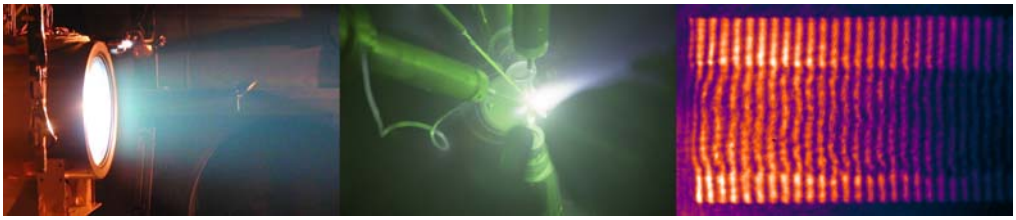

Michigan Institute for Plasma Science and Engineering Seminar

Onset of Fast Magnetic Reconnection in Laboratory and Space Plasmas

Prof. Amitava Bhattacharjee
University of New Hampshire

Thursday, 14 January 2010 - 3:30 pm
Room 2246 Space Research Building
Joint Seminar with Dept. of Atmospheric, Oceanic and Space Sciences
(Refreshments will be served before seminar.)

Abstract

The onset of fast magnetic reconnection is widely studied in laboratory experiments, in situ satellite measurements in the Earth's magnetosphere, and solar flares. These observations place strong constraints on theory, which must explain not only a fast reconnection rate but also a sudden increase in the time-derivative of the reconnection rate. We will show by means of theory and high-resolution simulations that such dynamics can be accounted for in one unifying framework by means of the Hall MHD model. The problem takes on additional complexity when it is applied to large systems, which have been the subject of considerable interest recently. Thin current sheets in systems of large size that exceed a critical value of the Lundquist number are unstable to a super-Alfvénic tearing instability, referred to as the plasmoid instability because it is a copious source of plasmoids (or magnetic islands). As a result of this instability, the system is shown to realize a fast nonlinear reconnection rate that is independent of the Lundquist number of the plasma.

About the Speaker:

Dr. Amitava Bhattacharjee is Paul Professor at the Space Science Center and the Department of Physics at the University of New Hampshire. He received his Ph.D. at Princeton University in theoretical plasma physics from the Department of Astrophysical Sciences. He and his students and postdoctoral colleagues have authored over 200 publications with broad applications to laboratory (including fusion), space, and astrophysical plasmas. He is a Fellow of the American Physical Society, and the American Association of Advancement of Science. He has recently served as Chair of the Division of Plasma Physics of the American Physical Society, and as Senior Editor of the Journal of Geophysical Research – Space Physics.