PDF versions of previous colloquia and more information can be found in “events” at http://gcosmo.bao.ac.cn/

国台学术报告 NAOC COLLOQUIUM

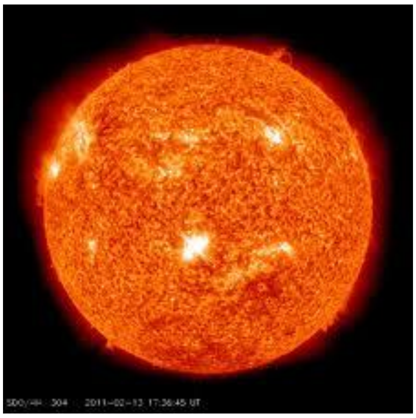
2013 年 第 31 次 / Number 31, 2013

TIME: Thursday, 2:30 PM, June 06, 2013 LOCATION: A601 NAOC

Particle energization in low-Mach-number fast-mode shocks in solar flares

Prof. Chuang Ren (University of Rochester)

Dr. Chuang Ren is an Associate Professor in Departments of Mechanical Engineering and Physics & Astronomy and a Scientist at Laboratory for Laser Energetics of University of Rochester. He graduated from Tsinghua University with B.S. (1990) and M.S. (1993) in Physics. He received his Ph.D. in Physics from University of Wisconsin-Madison in 1998. He held postdoctoral and staff researcher positions at UCLA from 1999 to 2004.



Abstract

During solar flares, low-Mach-number and weakly compressive fast-mode shocks can occur in magnetic reconnection outflows[1] in solar flares and are considered to be a site of electron energization responsible for the observed hard x-rays by the YOHKOH and the RHESSE measurements. In this talk we will present some recent 2D particle-in-cell simulations of collisionless low Mach/high beta shocks and the particle acceleration processes therein.[2,3] These simulations show that collisionless plasma instabilities in the shock transition region provide the necessary dissipation for shock formation. Both electrons and ions are found to participate in the shock-drift-acceleration (SDA), which operates differently in purely- and quasi-perpendicular shocks. SDA is most effective in accelerating electrons in quasi-perpendicular shocks. The transition energy between the thermal and non-thermal spectrum and the spectral index from the simulations are consistent with some of the X-ray spectra from RHESSI in the energy regime of E = 40 ~ 100 keV. At higher energy, acceleration mechanisms other than SDA are needed. This work was supported by DOE under Grant No. DE-FG02-04ER54789 and Cooperate Agreement No. DE-FC52-08NA28302, by NSF under Grant PHY-0903797, and by NSFC under Grant No. 11129503.

[1] J. C. Workman, E. G. Blackman, and C. Ren, "Simulations reveal fast mode shocks in magnetic reconnection outflows," Phys. Plasmas 18, 092902 (2011)

[2] J. Park, J. C. Workman, E. G. Blackman, C. Ren, and R. Siller, “Particle-in-cell simulations of particle energization from low Mach number fast mode shocks,” Phys. Plasmas 19, 062904 (2012)

[3] J. Park, C. Ren, J. C. Workman, and E. G. Blackman, “Particle-in-cell simulations of particle energization via shock drift acceleration from low Mach number quasi-perpendicular shocks in solar flares,” ApJ 765, 147-157 (2013)

All are welcome! Tea, coffee, biscuits will be served at 2:15 P.M.