Geophysical Research Abstracts
Vol. 18, EGU2016-2031, 2016
EGU General Assembly 2016

Particle Acceleration At Shock Waves and Downstream Small-Scale Flux Ropes

Gary Zank (1), Peter Hunana (1), Parisa Mostafavi (1), Jakobus le Roux (1), Gary Webb (1), Olga Khabarova (2), Gang Li (1), Alan Cummungs (3), Edward Stone (3), and Robert Decker (4)

(1) Center for Space Plasma and Aeronomic Research (CSPAR) and Department of Space Science, University of Alabama in Huntsville, USA (garyp.zank@gmail.com), (2) Heliophysical Laboratory, Institute of Terrestrial Magnetism, Ionosphere and Radiowave Propagation RAS (IZMIRAN), Russia, (3) California Institute of Technology, USA, (4) Johns Hopkins University/Applied Physics Lab., USA

An emerging paradigm for the dissipation of magnetic turbulence in the supersonic solar wind is via localized small-scale reconnection processes, essentially between quasi-2D interacting magnetic islands or flux ropes. Charged particles trapped in merging magnetic islands can be accelerated by the electric field generated by magnetic island merging and the contraction of magnetic islands. We discuss the basic physics of particle acceleration by single magnetic islands and describe how to incorporate these ideas in a distributed "sea of magnetic islands" by developing a transport formalism. We discuss particle acceleration in the supersonic solar wind and extend these ideas to particle acceleration at shock waves. Shock waves generate naturally vortical turbulence and particle acceleration at shocks is likely therefore to be a combination of classical diffusive shock acceleration and acceleration by downstream magnetic islands or flux ropes. These models are appropriate to the acceleration of both electrons and ions. We describe model predictions and supporting observations made at the heliospheric termination shock.