Geophysical Research Abstracts
Vol. 19, EGU2017-11796, 2017
EGU General Assembly 2017

Statistical and kinetic properties of solar wind reconnection exhausts: new results and implications for the development of the THOR mission

Jonathan Eastwood (1), Rishi Mistry (1), Tai Phan (2), Heli Hietala (3), Colby Haggerty (4), Mike Shay (4), and Paul Cassak (5)

(1) Imperial College London, Department of Physics, London, United Kingdom (jonathan.eastwood@imperial.ac.uk), (2) Space Sciences Laboratory, University of California, Berkeley, California 94720, USA, (3) Department of Earth, Planetary, and Space Sciences, University of California, Los Angeles, California 90095, USA, (4) Bartol Research Institute, Department of Physics and Astronomy, University of Delaware, Newark, Delaware 19716, USA, (5) Department of Physics and Astronomy, West Virginia University, Morgantown, West Virginia 26506, USA

The solar wind provides a unique laboratory in near-Earth space for studying the physics of magnetic reconnection. In particular, reconnection exhausts are not limited in scale by macroscopic structure, as is the case in the Earth's magnetosphere, allowing us to study structures that form as a consequence of reconnection far downstream of the actual reconnection site.

Solar wind reconnection exhausts are a potentially important site for plasma heating and particle acceleration, but observations show that there is considerable variability in their properties. Here we report on the statistical properties of solar wind reconnection exhausts using Wind and Cluster spacecraft data, and examine how the density and temperature of the exhaust is controlled by the guide field and the plasma beta. We also present evidence for the existence of kinetic-scale physics in reconnection exhausts far downstream from the X-line.

These observations are at the limit of currently available instrumentation, and so many questions still remain unanswered. We present an assessment of some open questions in solar wind reconnection physics, particularly relevant for the problem of particle acceleration and heating, and we discuss the excellent prospects for future progress as a result of the proposed THOR mission.