HEAVY ION EFFECTS ON MAGNETOPAUSE TRANSPORT PROCESSES

JAY R. JOHNSON 1, Simon Wing 2, Yu Lin 3, and Eun-Hwa Kim 1

1. Princeton University, Plasma Physics Laboratory, Princeton, NJ, USA
e-mail: jrj@pppl.gov, ehkim@pppl.gov
2. Johns Hopkins University, Applied Physics Laboratory, Laurel, MD, USA
e-mail: simon.wing@jhuapl.edu
3. Auburn University, Auburn, AL, USA
e-mail: ylin@physics.auburn.edu

Recent ion composition measurements near the magnetopause have shown that heavy ionospheric ions can dominate the mass density as much as 30 percent of the time. Magnetopause transport processes, such as reconnection, Kelvin-Helmholtz instability, and kinetic-scale Alfvenic fluctuations, can all be significantly affected by the presence of heavy ions. Heavy ions modify the onset and growth of the tearing mode as well as reduce the steady state reconnection rate by lowering the Alfven speed. Increased mass density reduces the effect of magnetic tension and therefore lowers the Kelvin-Helmholtz instability threshold and increases the growth rate. The presence of heavy ions can also increase the efficiency of mode conversion of compressional Pc3 waves to transverse, field-aligned Alfven modes with small-scale structure perpendicular to the magnetopause. We show that nonlinear heating and transport associated with mode converted waves will preferentially affect the heavy ions. Because heavy ions can significantly influence physical processes at the magnetopause associated with mass, momentum, and energy transport; we discuss how they could be used as a tool to probe those physical processes responsible for the transport.

Magnetopause and Boundary Layers, Solar Wind/Magnetosphere Interactions, Heavy Ions

Jay R. Johnson, Princeton Plasma Physics Laboratory, Princeton University, PO Box 0451, Princeton, NJ 08543-0451, tel: 1-609-243-2603, fax: 1-609-243-2662, e-mail: jrj@pppl.gov