PHYSICS&ASTRONOMY
THE UNIVERSITY OF TEXAS AT SAN ANTONIO

Dissertation Defense

Jeffrey Broll

Date: **: Thursday, April 19 2018**

Time: **3:00 pm**

Location: **AET 3.328**

Campus: **Main Campus**

Advisor: **Dr. Stephen Fuselier**

Abstract

Ion Dynamics at Earth's Bow Shock and Magnetopause

We present results on ion dynamics at two boundary layers of fundamental importance to the study of geospace plasma physics: the bow shock, formed by supersonic solar wind flow around Earth, and the magnetopause, where shocked solar wind stands off against magnetospheric plasma. These results improve our understanding of the location of reconnection at Earth's dayside magnetopause.

The first part of the work shows that He^{++} participates nontrivially in dissipation at Earth's quasiperpendicular bow shock. While He^{++} is too heavy to participate in the primary dissipation mechanism, it has been known to behave similarly through some unknown process. We employcomputer simulations and data from the Magnetospheric Multiscale mission to settle this long-standing issue. This has further implications for wave activity in the downstream magnetosheath and suggests that minor ions should not be dismissed as negligible test particles even when their kinetic scales exceed the boundary thickness.

The second part of the work develops an innovative remote-sensing technique for locating magnetopause reconnection from in-situ observations of its exhaust, using data from the ESA Cluster mission and computer simulations. This work increases the science yield of magnetopause measurements away from active reconnection and providing more data to confirm or refute proposed factors governing reconnection location.

The final part explores the fate of exhaust distributions employed in the second part and implications for the deposition of exhaust ion energy into the magnetosphere, using data from Magnetospheric Multiscale and theoretical considerations to determine how reconnection exhaust is integrated into the magnetosphere.

Belinda Tucker • 210.458.8517 • Belinda.Tucker@utsa.edu

http://physics.utsa.edu/