



Institute for Space Weather Sciences Colloquium

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Dr. Yu Lin, Auburn University

Magnetic Flux Ropes at the Magnetopause and the Associated Ion Transport

Magnetic flux ropes exist widely in solar and space plasmas. In the terrestrial magnetosphere, they are generated during magnetic reconnection at the magnetopause (causing flux transfer events) and in the magnetotail, and are believed to play essential roles in transport of plasma and electromagnetic energy between the solar wind and the magnetosphere. In the solar atmosphere, twisted flux ropes are a fundamental structure in pre-eruption magnetic field and the eruptions.

In this talk, I will discuss the physics of flux ropes at the magnetopause based on three-dimensional global hybrid (fully kinetic ions + electron fluid) simulations of the magnetosphere, in its dynamic interaction with the solar wind. Specifically, I will discuss the formation of flux ropes by time-dependent reconnection, as well as their global configuration and dynamic interaction. The simulation results will be compared with in-situ observations from NASA's Magnetospheric Multiscale (MMS) mission. In addition, reconnection leads to the direct entry of charged particles from the solar wind into the cusp magnetosphere and ionosphere. A dispersive signature of low energy cutoff is observed in the energy spectrum of the cusp precipitating particles. Such signature is believed to be a fingerprint of the magnetopause reconnection. I will discuss how our global simulations will provide a theoretical support to the Tandem Reconnection And Cusp Electrodynamics Reconnaissance Satellites (TRACERS) mission, in which two spacecraft will fly through the cusp to determine the spatial and temporal variations of reconnection at the magnetopause.

Yu Lin received her Ph. D. in space physics from University of Alaska Fairbanks in 1993. She joined the Auburn University in 1994 as an Assistant Professor of Physics, becoming full professor in 2003.

She received ONR Young Investigator Award (1995-1998) and the NSF CAREER Award (1995-2000). She received the inaugural Katherine E. Weimer Award for outstanding achievement in plasma science research by a woman physicist in early years of her career by APS, Division of Plasma Physics (DPP) in 2002. She was honored as Alumni Professor at Auburn University (2013 – 2018). She received the Dean's Research Award at the College of Science and Mathematics, Auburn University in 2021. She is an APS Fellow since 2007.

