

Cross-Scale Electrodynamics Requirements

Thursday June 23, 2022

Time	Speaker	Title
10:00 – 10:10	Bill Bristow	Introduction
10:10 – 10:25	Eric Donovan (Zoom)	The need for better resolution convection measurements
10:25 – 10:40	Cheng Sheng	Observational requirements for modeling multi-scale disturbances during geomagnetically active times
10:40 – 10:55	Josh Semeter	Maximizing the science return from optical imaging
10:55 – 11:10	Don Hampton	Resolving detailed auroral electron characteristics from ground-based optics: successes and limitations.
11:10 – 11:25	Michael Madelaire	The Electrojet Zeeman Imaging Explorer (EZIE) mission
11:25 – 11:40	Andrew Kiene	Data synthesis with SuperDARN LDFF: Current state and future opportunities
11:40 – 11:55	Xinzhao Chu	Lidar observations for the study of ion-neutral coupling
11:40 – 12:00	TBD	Submissions and Discussion

Conveners:

Bill Bristow, Simon Shepherd, Mike Ruohoniemi, Larry Lyons, Yue Deng, Cheng Sheng

Description:

This workshop will focus on the science and observational requirements related to the cross-scale coupling of Magnetosphere-Ionosphere-Thermosphere (M-I-T) processes. Our goal will be to bring together M-I-T researchers who use observations in their work with instrument developers to discuss the observations and technical capabilities that are needed to push the science forward. Modelers and data analysts are encouraged to discuss how observations are used currently and what additional observations would enhance their science. Instrument developers can present ideas for new instrumentation or advancements for existing systems.

Justification:

The electrodynamics of the M-I-T region exhibit coupling on scales that range from kilometers to many thousands of kilometers. At the lower end of this range, auroral arcs have widths on the

order of a kilometer or less and connect to the substorm onsets, which have the scale on the order of the width of the magnetotail. The related ionospheric effects couple to the neutral atmosphere through heating that occurs on the scale of the arcs over regions as large as the auroral oval, generating waves that carry and deposit energy over distances of thousands of kilometers. Variability over a wide range of spatial and temporal dimensions is known to greatly impact energy flow through the M-I-T regions and Joule heating. The existing observational infrastructure can address some fraction of the spectrum of scales with varying degrees of coverage in time and space. Future investment in infrastructure should be focused on areas that have the most potential for advancing geospace science. By connecting the people who use observations with those who generate them, we can guide those investments.

Related CEDAR Thrusts:

This workshop directly addresses Strategic Thrust #4 - Develop Observational and Instrumentation Strategies for Geospace System Studies, and ties to Thrusts #1, #2, and #3.

Keywords:

Cross-scale coupling, system science, electrodynamics, instrumentation, modeling