2022 Workshop: Cross-Scale Electrodynamics Requirements

Long title
Cross-Scale Electrodynamics in M-I-T Processes: Observational requirements and instrumentation strategies
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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 science in these regions forward. Modelers and data analysts are encouraged to discuss how observations are currently used and what additional observations would enhance their science. Instrument developers can present ideas for new instrumentation or advancements for existing systems.

Agenda

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

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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 substorm onsets, which have scales on the order of the width of the magnetotail. Dynamics as seen in the aurora are associated with narrow flow channels of varying widths that can extend and evolve over distances that can well exceed 1000 km and interact with each other and with the large-scale convection. 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 people who use observations with those who generate them we can guide those investments.

Related to CEDAR Science Thrusts:
Explore exchange processes at boundaries and transitions in geospace
Develop observational and instrumentation strategies for geospace system studies
Keywords
Cross-scale coupling, system science, electrodynamics, instrumentation, modeling
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