

2025 Workshop: Geospace Model-Data Comparisons

Long title

Bridging Models and Observations: Strategies for Quantitative Data-Model

Comparisons

CEDAR-GEM

Conveners

Bea Gallardo-Lacourt

Emma Spanswick

Gareth Perry

Anthony Sciola

Adam Michael

Dong Lin

bea.gallardolacourt@nasa.gov

Description

During geomagnetic storms, the magnetosphere-ionosphere-thermosphere (MIT) system becomes energized and engages in complex, multi-scale interactions between the physical domains. Mesoscale processes, both singularly and collectively, can profoundly impact the global evolution of the geospace system. This is particularly true in the magnetosphere's nightside transition region as well as the low and mid-latitude ionosphere-thermosphere region that it maps to. Recent advances in the resolving power and coupling complexity of global geospace modeling have enabled investigations into the drivers and impacts of these phenomena. In order to understand the system-level behavior of storm-time geospace it is necessary to combine observational data in various forms with global models in ways that both validate the models and use them to contextualize the observations.

The NASA DRIVE Center for Geospace Storms (CGS) aims to develop a physics-based, predictive community model of storm-time geospace that couples all key regions while resolving critical mesoscale processes. The extensive network of in-situ and ground-based instrumentation across the MIT system provides a valuable foundation for improving data-model comparisons. However, leveraging these observational resources effectively requires a strategic approach and sustained

collaboration between the modeling and data communities, as well as the development of methods to validate the system-level behavior of geospace models. This workshop will focus on the key question: How can we best utilize existing observational data to develop robust, quantitative methods for model validation and comparison to assess how well the models reproduce the characteristic behavior of the system? As part of an ongoing collaboration between CGS and the GEM MESO focus group, this session will engage (and connect?) both the GEM and CEDAR communities in this endeavor. We aim to bring together the modeling and data communities to foster discussions on best practices, current challenges, and future opportunities for advancing geospace model/data comparisons, which is key to using simulations to understand the physical processes driving the system.

Justification

This workshop is part of an ongoing discussion series hosted by the MESO Focus Group in collaboration with CGS. It provides a platform for exploring data and modeling challenges across the entire geospace system, from the thermosphere to the magnetosphere.

This session is particularly valuable for both the modeling and observational communities as we work toward answering a key scientific question: How can we leverage currently available data to develop quantitative methods for model validation and comparison?

The session will feature short presentations followed by time for open discussion, fostering collaboration and idea-sharing among participants.

Related to CEDAR Science Thrusts:

Encourage and undertake a systems perspective of geospace

Explore exchange processes at boundaries and transitions in geospace

Explore processes related to geospace evolution

Fuse the knowledge base across disciplines in the geosciences

Manage, mine, and manipulate geoscience/geospace data and models

Workshop format

Short Presentations

Include a virtual component?

Yes

Keywords

Geospace Modeling, Model-Data Comparison, Geomagnetic Storms, Mesoscale Processes

Focus Group and Group Leader

MESO, Bea Gallardo-Lacourt

[View PDF](#)