2023 Workshop: Auroral Science with Heterogeneous Datasets

Long title
Auroral science and studies of coupled MIT dynamics using hybrid heterogeneous data, data assimilation, and data-driven models
Conveners
Leslie Lamarche
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Description

Zoom Link:
https://sri.zoomgov.com/j/1603613649?pwd=a2hFRGdzb0RXdW5jZjdOZlV3K2xyQT...

This workshop focuses on the ionospheric responses in the auroral zone contributing to system-science characterizations of the coupled magnetosphere-ionosphere-thermosphere (MIT). We emphasize development of new tools for incorporating data from distributed, heterogeneous, multiple-platform data sources, and the incorporation of these into state-of-the art models and data assimilation approaches. Specific topics of interest include (but are not limited to):
- New observations of auroral dynamics, and new science from combining observations in novel ways
- System science related to non-ideal arcs and the dynamics that govern them
- 3D and time-dependent modeling, and associated visualization, of non-idealized auroral arc structures through physics-based and data-driven models
- Coupling dynamics both across spatial and temporal scales and altitude regimes
- Machine learning studies using available databases to explore relationships between ionospheric flow maps, FAC patterns, and conductivity patterns
- Mapped reconstructions of physically relevant parameters for arc dynamics, including currents and TEC, particularly in the context of input to models
- Reconstructions of ionospheric energy inputs using multiple, distributed, and heterogeneous measurements including simultaneous use of in situ and remote

sensing techniques
- Multiscale simulations encapsulating small- and regional- scales in global models
In addition to these topics, the workshop welcomes presentations on general topics combining data from arrays of high-latitude sensors, modeling auroras and their effects, and data inversions as applied to MI coupling problems. We particularly welcome talks related to the Swarm campaign that took place over the Poker Flat Rocket Range in February and March of 2023.

Agenda

13:30 Leslie Lamarche - Introduction (5 min)

13:35 Anthea Coster - Combining GNSS, Optical All-Sky Imagers, and SuperDARN convection patterns to study Auroral and Sub-storm activity in the Arctic/Antarctic (15 min)

13:50 Olga Verkhoglyadova - Towards Quantification of Risk to GNSS Signals due to Space Weather: Multi-modal, multi-platform data integration to study the multiscale ionosphere (15 min)

14:05 Dong Lin - Dragon King: The Auroral Precipitation Model in the Multiscale Atmosphere-Geospace Environment (MAGE) Model (5 min)

14:10 Katrina Bossert - A global view of the CO2 aurora: AIRS observations of the 4.3um auroral emission (5 min)

14:15 Shasha Zou - VISTA TEC database and patch scintillation (5 min)

14:20 Bill Rideout - Heterogeneous Datasets in Madrigal (5 min)

14:25 Eric Donovan - Heterogeneous Data Tools in Aurora-X (5 min)

14:30 Leslie Lamarche - Summary/Further Questions/Discussion (5 min)

14:35 Collaborative presentation of Swarm-over-Poker 2023 Dataset, moderated by Kristina Lynch (40 min)

Event Data Contributors:

- Alex Mule, Dartmouth
- Vincent Ledvina, UAF/GI

- Hayley Clevenger, ERAU
- Doga Ozturk, UAF/GI
- Mark Conde, UAF/GI
- Anthea Coster, MIT Haystack
- Gytis Blinstrubas, IIT
- Jade Morton, UC
- Cameron Westerlund, UAF/GI
- Shasha Zou, UM

Campaign Study Contributors:

- Hayley Clevenger, ERAU
- Meghan Burleigh, NRL
- Cameron Westerlund, UAF/GI
- David Knudsen, Calgary
- Alex Mule, Dartmouth
- Seebany Datta-Barua, IIT

15:15 Panel Discussion, moderated by Leslie Lamarche (15 min)

Panelists:

- Kristina Lynch
- Meghan Burleigh
- Mark Conde
- Alex Mule
- Asti Bhatt

Justification

This workshop will bring together community efforts to study auroral dynamics from a variety of perspectives. It will highlight new and developing tools for system science studies. The auroral examples and science questions explored here have substantial synergy with other projects; they illustrate many of the systems science questions highlighted in recent CEDAR community documents, in the context of auroral ionospheric physics. It will examine results from the recent Swarm campaign which coordinated observations of auroral arcs with a wide variety of instrumentation hosted at the Poker Flat Rocket Range.

Related to CEDAR Science Thrusts:

Encourage and undertake a systems perspective of geospace

Develop observational and instrumentation strategies for geospace system studies

Keywords

aurora, coupling, heterogeneous data

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