2024 Workshop: midlatitude and subauroral aeronomy

Long title
Understanding middle and subauroral ionospheric variability and storm science through long-duration and short-term observational campaigns
Conveners
Shun-Rong Zhang
Phil Erickson
Wenbin Wang
Bharat Kunduri
shunrong@mit.edu
Description

The ionosphere and thermosphere at middle and subauroral latitudes serve as a compelling platform to investigate significant coupling processes involving chemistry, dynamics, and electrodynamics under the influences of space and terrestrial weather. Aeronomy research in middle and subauroral latitudes encompasses a wide range of CEDAR research areas. The following perspectives are of particular interest:

(1) Ionosphere-thermosphere climatology: an array of known anomalies exist in association with the seasonality, temporal evolution, geomagnetic configuration, and regional characteristics of the upper atmosphere.

(2) Short-term variability: perturbations caused by wave and impulsive forcing from the lower atmosphere to Earth's surface, by transient solar-terrestrial processes (such as solar flares and eclipses), as well as those not immediately known, form a comprehensive opportunity to investigate short-term ionospheric variability associated with day-to-day variability, atmospheric waves, traveling ionospheric disturbances, sporadic E, descending layers, and irregularities.

(3) Geospace storm perspective: Geospace regions serve as the interface region and pathway that connects the high-latitude energy deposition and low-latitude stops. Storm time disturbance winds, compositions, and electrodynamics have fundamental influences on the I-T system. Beyond this, unique M-I-T coupling

processes exist at mid-latitudes: substantial subauroral electrodynamics (SAPS), density gradient structures (SED, midlatitude main trough, etc), and optical anomalies (SAR arc and STEVE).

This session invites researchers to engage in discussions on middle and subauroral latitude science, exploring the diverse perspectives mentioned earlier. Presentations can focus on periods of observational campaigns coordinated regionally or globally for variability or storm studies. Presentations are also sought to showcase recent research and advancements in this field utilizing both observations and model simulations. Additionally, studies focusing on closely related regions are encouraged. To foster dynamic and fruitful discussions, presenters are strongly encouraged to limit their presentations to 6-7 slides.

Agenda

Monday: 1600-1800 PST (10 min for each talk) Room **Westcoast**

Zoom link:
https://mit.zoom.us/j/95464244264

Sebastijan Mrak (APL) [midlatitude irregularities during the Starlink storm]

Dong Lin (NCAR HAO): [SARs generated by inner magnetospheric heat flux]

Evan Thomas (Dartmouth) [PEF events observed at Christmas Valley SuperDARN radars]

Titus Yuan (USU) [Lidar observations during the May 2024 storm]

Bea Gallardo-Lacourt (NASA): [Unexpected STEVE observations at high-latitude during quiet geomagnetic conditions]

Cheng Sheng (UTA): [GITM simulations of NO production inside a SAID channel]

Jing Liu (MIT Haysack) [TIDs/GWs]

Jiaojiao Zhang (NSSC) [SAPS observed from Chinese longitude SuperDARN radars]

Shasha Zou (UMich) [SED observation and simulation]

Phil Erickson (MIT Haystack): [SED statistics]

Shunrong Zhang (MIT Haystack) [MHR long-duration run]

Justification

Middle and subauroral latitude aeronomy is a complex and dynamic field covering a broad range of fundamental CEDAR research topics. Despite advanced modern observational coverage in space and time that has enabled new discoveries, significant actively studied (and sometimes controversial) problems still exist, and even the most sophisticated models struggle to deal with some of them in a rea sonable manner.

Related to CEDAR Science Thrusts:
Encourage and undertake a systems perspective of geospace
Explore exchange processes at boundaries and transitions in geospace
Include a virtual component?
Yes
Keywords
mid- and subauroral aeronomy, geospace storm effect, upper atmospheric variability and disturbance and irregularities, upper atmospheric climatology
View PDF