2023 Workshop: midlatitude aeronomy

Long title
Middle and subauroral latitude aeronomy
Conveners
Shun-Rong Zhang
Philip Erickson
Wenbin Wang
Bharat Kunduri
shunrong@mit.edu
Description

The ionosphere and thermosphere at middle and subauroral latitudes provide a platform to showcase substantial coupling processes involving chemistry, dynamics, and electrodynamics under the influences of space and terrestrial weather. Horizontal and vertical coupling between and within ions and neutrals drive the complexity of system science, which remains a challenging research frontier. Although advanced observational coverage in space and time has enabled new discoveries, significant debatable and controversial problems still exist, and even the most sophisticated models struggle to deal with some of them in a reasonable manner. Middle and subauroral latitude aeronomy covers broad CEDAR research areas. Of particular interests are the following perspectives:

(1) Ionosphere-thermosphere climatology: an array of anomalies has been identified and defined 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 wealth set of short-term ionospheric variability associated with day-to-day variability, atmospheric waves, traveling ionospheric disturbances, sporadic E, descending layers, and irregularities.

(3) From a geospace storm perspective, this region serves 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, the unique M-I-T coupling processes lead to substantial subauroral electrodynamics (SAPS), density gradient structures (SED, midlatitude main trough, etc), and optical anomalies (SAR arc and STEVE).

This session offers a platform for researchers to come together and discuss middle and subauroral latitude science from the various perspectives mentioned earlier. Presentations are solicited to highlight recent research and progress made in this field using both observations and model simulations. While the main theme of the session is middle and subauroral latitude science, studies that focus on closely-related regions are also welcome. To promote lively and productive discussions, we strongly encourage presenters to limit their presentations to 6-7 slides.

Agenda

1600-1800PM (**Harborside**)

[**zoom link: https://mit.zoom.us/j/91673640584 US : +1 646 558 8656 or +1 669 900 6833**]

12 min for each talk (including discussion)

[0] 1600-1602: Opening

(1) 1603 - 1615: John Meriwether: FPI Network for GW study

(2) 1615 - 1627: Asti Bhatt: Studying mid-latitude aeronomy with a nested network of ionospheric-thermospheric imagers

(3) 1628 - 1640: Qian Wu: New FPI observation from Alberta Canada.

(4) 1640 - 1652: Scott England: GOLD TAD and GNSS TID Observations

(5) 1653 - 1705: Michael Ruohoniemi: Storm-time MSTIDs using SuperDARN and TEC observations

(6) 1705 - 1717: Russell Cosgrove: An electromagnetic calculation of electric field mapping that finds very unexpected results

(7) 1718 - 1730: Matt Young: Simulating E-region plasma instabilities in an arbitrarily oriented magnetic field

(8) 1730 -1742: Jun Liang: TIMED/SABER observations of NO intensification associated with STEVE

(9) 1743 - 1755: Wenbin Wang: Post-sunset ionospheric electron density depletion from low to high latitudes: MAGE simulation of Sept 2017 Storm

[final discussion]

Justification

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

Related to CEDAR Science Thrusts:
Explore exchange processes at boundaries and transitions in geospace
Develop observational and instrumentation strategies for geospace system studies
Workshop format
Short Presentations
Keywords
mid- and subauroral aeronomy, geospace storm effect, upper atmospheric variability and disturbance and irregularities, upper atmospheric climatology
View PDF