2018 Workshop: Thermospheric Neutral Wind Dynamics

Long title
Neutral Wind Dynamics and Coupling Between the Thermosphere and Ionosphere in the low- and mid-latitude regions
Conveners
Patrick Dandenault
Levan Lomidze
Mark Conde
Miguel Larsen
Description

The ionosphere and thermosphere compose a dynamic, nonlinear and closely coupled system. Changes in thermospheric neutral winds, temperature, and composition have profound effects on both regions via momentum, chemical, and energy coupling. This session focuses on recent advances in understanding thermospheric and ionospheric structures and variability on various spatial and temporal scales during both disturbed and quiet conditions as a result of different driving forces. Particular emphasis will be placed on neutral winds, including their observations, modeling, and role in ionosphere-thermosphere variability. Model-data comparisons of various ionospheric and thermospheric parameters that explore the role of neutral and plasma dynamics and structure are welcome. The session will also address thermospheric wind climatology, including variations on global and local scales, with solar cycle, seasonal, and diurnal time scales. We invite presentations based on observations, modeling, and data assimilation techniques of driver specifications and forecasting.

Agenda

Eight Short Presentations, 15 minutes each, 2 hours total.

List of the 8 speakers and their talks:

(1) 10:00 - 10:15 - Kate Zawdie - "*The Impact of Gravity Wave Signatures in Thermospheric Winds on the Ionosphere.*"

(2) 10:15 - 10:30 - Levan Lomidze - "*Drivers of Ionospheric Equinoctial Asymmetry.*"

(3) 10:30 - 10:45 - Dustin Hickley - "*The impact of the midnight temperature maximum on airglow depletions.*"

(4) 10:45 - 11:00 - Brian Harding - "*Lessons learned from a year-long comparison of wind data with a first principles model at low and mid latitudes.*"

(5) 11:00 - 11:15 - Colin Triplett - "*Results of Introducing a Ultra-Fast Kelvin Wave into the TIE-GCM and implications for ICON Mission.*"

(6) 11:15 - 11:30 - Mark Conde - "*Sensitivity of mid-latitude storm effects to thermospheric winds.*"

(7) 11:30 - 11:45 - Phil Richards - "*Neutral winds and the summer midnight electron density anomalies.*"

(8) 11:45 - 12:00 - Miguel Larsen - "*Dynamic instabilities in the lower thermosphere.*"

Justification

CEDAR Science Challenge and Justification for the workshop The challenge of this ‘short presentation’ workshop will be to describe the current state of the art for methods of specifying and predicting thermospheric neutral winds. Wind-based drivers and coupling between the thermosphere and ionosphere will be the focus.

(1) How the questions will be addressed. How well do existing and new thermospheric wind models match wind observations? What is the current state of the art for thermospheric wind modeling? What is the current state of the art for data assimilation techniques of wind driver specifications and forecasting?

(2) What resources exist, are planned, or are needed? Existing and new experts in this area have been contacted about presenting in this session. Large wind data sets from FPI instruments have been made available and will be used.

(3) How progress should be measured. a) Comparison of the latest wind models with wind observations. b) Comparison of winds from data assimilation specifications and prediction with wind observations. c) Using the winds from (a) and (b) above as drivers of first-principle models (FPM): when estimated winds drive an FPM, how does a modeled ionosphere compare to the observed ionosphere in terms of hmF2,

NmF2, electron density profiles, etc.?

Relevant CEDAR Science Challenge(s): • Strategic Thrust #1: Explore system characteristics of the space-atmosphere interaction region in terms of nonlinearities, preconditioning and memory, feedback, instabilities, emergent behavior, and cross-scale coupling. • Strategic Thrust #2: Exchange of mass, momentum and energy at transitions within the ITM and through boundaries that connect with the lower atmosphere and the magnetosphere. • Strategic Thrust #3: Geospace Evolution, reliable identification of long-term trends • Strategic Thrust #6: Evolve data assimilation schemes to integrate data with physics-based models for improved predictive capability.

View PDF