2022 Workshop: Low/Mid-Latitude ITM Physics

Long title
Low- and Mid-Latitude Ionosphere-Thermosphere-Mesosphere (ITM) Physics
Conveners
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Description

In the last 15 years, lidar observations have evolved from being limited to relatively narrow altitude ranges (~80–105 km and the lower mesosphere and stratosphere) to the significantly extended altitude ranges of neutral profiling from near the ground up to ~200 km and ion detection up to ~300 km in altitudes. They have also evolved from nighttime only to covering the full diurnal cycle. These recent results demonstrate the huge potentials that lidars and their future generations will bring to the ionosphere-thermosphere-mesosphere (ITM) physics. Coordinating development of lidar, radar, and other instruments as well as strategical deployment of these instruments will enable cutting-edge science and provide fuel to discovery science in the next decades. This workshop solicits presentations focusing on the recent progress in ITM studies in the low and mid-latitudes as well as discussions on the future vision on how to develop observational and instrumentation strategies to advance ITM physics. Topics include, but are not limited to, electrodynamics and neutral dynamics that help interpret the neutral and ionic metal species and their transport in the D, E, and F regions, observations and modeling of constituents, thermal structures, neutral tidal winds and gravity waves, and ionospheric-magnetospheric observations (such as TIDs, airglow emission, and sporadic E layers, etc.). We also welcome numerical modeling and theoretical studies that can help interpret observations and understand the underlying ITM physics.

Justification

This workshop aims to bridge the neutral atmosphere communities with the ionosphere and magnetosphere communities to tackle some fundamental science

questions and make new paths for the future. The science and technical challenges include
1) How are thermosphere-ionosphere metal layers (both neutral and ionic) formed in the mid and low latitudes? What factors determine the ion and neutral transport from the D-E regions to the ionospheric F region?
2) What are the roles of plasma-neutral coupling and tidal winds in shaping the compositions and structures in the space-atmosphere-interaction region?
3) What new understandings of low and midlatitude electrodynamics and neutral dynamics can be gained through collaborative studies?
4) How to advance remote sensing technologies, especially lidars, and deploy them strategically to transform the CEDAR research on the ITM physics?

Summary

Friday (June 24) @ Topaz 3

https://cuboulder.zoom.us/j/91008874788

10:00 – 10:03 **Xinzhao Chu** - Introduction

10:03 – 10:16 **Larisa Goncharenko** - Global Teleconnections between QBO Dynamics and ITM Anomalies

10:16 – 10:29 **Yingfei Chen** - Regular occurrence of Boulder TINa dawn layers and their correlation with sunrise time

10:29 – 10:42 **Eliana Nossa** - In the Search of the Origin of the Lower E region Layers over Arecibo - Theoretical and Experimental Analysis

10:42 – 10:55 **Chihoko Cullens** - Medium-scale perturbations observed by ICON-MIGHTI observations and comparison with high-resolution WACCM-X

10:55 – 11:08 **Federico Gasperini** - Low-Latitude Ionosphere-Thermosphere Coupling via Ultra-Fast Tropical Waves from ICON and SORTIE Observations

11:08 – 11:20 **Shikha Raizada** - Significance of a low-latitude and tropical site like Arecibo for Mesosphere-thermosphere-ionosphere investigations

11:20 – 11:33 **Fan Yang** - Atmospheric stabilities in the mesopause region (85-100 km) at Andes Lidar Observatory in Cerro Pachon, Chile

11:33 – 11:46 **Ben Martinies** - Quiet-time variability of the ionosphere and thermosphere using data from GOLD and ICON

11:46 – 11:58 **Rafael Mesquita & Astrid Maute** - The Electrojet Zeeman Imaging Explorer (EZIE) mission

11:58 -- 12:06 **Sreelakshimi Jayaraman** -- Study of zonal wind effect on the equatorial return currents using ICON/MIGHTI and Swarm observations

12:06 - 12:16 **Alex Chartier** — Long distance propagation of very high frequency shipping information links associated with sporadic E

Each speaker please leaves at least 1-2 min for Q & A. For example, a 13-min talk should finish the talk at 11-12 min, and then leave 1-2 min for questions.

Related to CEDAR Science Thrusts:
Develop observational and instrumentation strategies for geospace system studies
Fuse the knowledge base across disciplines in the geosciences
Keywords
ITM physics, ion and neutral transport, wave dynamics, future lidars
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