2025 Workshop: ITM long-term variation

Long title
Long-term variation in the ionosphere-thermosphere-mesosphere (ITM) system
Conveners
Chih-Ting Hsu
Wenbin Wang
Liying Qian
Shunrong Zhang
Dupinder Singh
Joe McInerney
Dong Lin
chihting@ucar.edu
Description

This session invites both observational and modeling studies of the long-term variation of the ionosphere-thermosphere-mesosphere (ITM) system (from seasonal to solar-cycle timescales). The ITM system is strongly coupled with the geospace environment above it and the lower atmosphere below. The complex external coupling processes and the internal physical and chemical processes lead to significant global variations in different time scales, from seasonal to decades. However, the discontinuous observation in the long term makes it challenging to investigate the long-term changes in the ITM system and its causes. In recent years, the advancements in numerical models and computing systems and the increasing amount of observations have helped improve our understanding of the variations of the ITM system. In this workshop, we will discuss the variation of the ITM system across different time scales and the mechanisms behind them.

Agenda

1:30 PM - 1:35 PM **Introduction**

1:35 PM - 1:50 PM Dupinder Singh - foF2 Trends at Low Latitudes

1:50 PM - 2:05 PM Titus Yuan (invited) - Long-term trend of the midlatitude mesopause region revealed by Na lidar

2:05 PM - 2:20 PM Shunrong Zhang - Global climatology and evolution of medium scale traveling Ionospheric disturbances

2:20 PM - 2:35 PM Robert Sewell - Thermospheric Density, composition, and temperature from GOES-R/SUVI solar occultations

2:35 PM - 2:50 PM Nick Pedatella - Impact of increasing greenhouse gases on the ionosphere and thermosphere response to a geomagnetic storm

2:50 PM - 3:05 PM Joe Mclnerney - Results from 20th and 21st Century Simulations using WACCM-X

3:05 PM - 3:20 PM Chih-Ting Hsu - Long-term Trend of Thermospheric Compositions from Whole Atmospheric Simulation and Satellite Observation

3:20 PM - 3:30 PM **Discussion**

Join Zoom Meeting
https://ucar-edu.zoom.us/j/96432465590?pwd=QomtibBUXAbagzCMTGgEaQjsxM59...

Meeting ID: 964 3246 5590
Passcode: CEDAR2025

Justification

The ITM system shows significant global scale variations in different time scales, including seasonal variation, solar-cycle variation, and decades-long variation. The coupling between internal processes and external forcings from above and below leads to these complex variations in the ITM system. The long-term variation of the ITM system will cause changes of neutral density in the upper atmosphere and further impose a strong impact on satellite drag and orbit determination. Understanding the contribution of different internal processes and external forcings to the long-term variation the ITM system is critical due to the blooming development of the aerospace industry nowadays.

Related to CEDAR Science Thrusts:
Explore processes related to geospace evolution
Fuse the knowledge base across disciplines in the geosciences
Workshop format

Short Presentations

Keywords

Seasonal variation, solar-depending variation, long-term variation in the upper atmosphere.

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