2024 Workshop: ITM climate and trends

Long title
Climate and Trends in the system of the ionosphere-thermosphere-mesosphere
Conveners
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Description

This session invites both observational and modeling studies of climate and trends (longer than a solar cycle) of the ionosphere-thermosphere-mesosphere (ITM) in different timescales. The ITM system is strongly coupled with the geospace environment above it and the lower atmosphere below it. The complex external coupling processes and the internal physical and chemical processes lead to significant global variations in different time scales, including those 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 the causes of it. In recent years, the advantage of numerical simulations and the increasing number of observations have helped improve our understanding of the variation of the ITM system on these time scales. In this workshop, we will discuss the variations of the ITM system on climate and trends time scales and the mechanisms behind them.

Agenda

Zoom Link:

https://uwmadison.zoom.us/j/96810403500

1:30 PM - 1:35 PM (5) **Introduction**

1:35 PM - 1:55 PM (15+5Q&A) Ben Santer (invited) - *Exceptional Stratospheric Contribution to Human Fingerprints on Atmospheric Temperature*

1:55 PM - 2:07 PM (10+2Q&A) Melissa Varga from the Union of Concerned Scientists(invited) - *Science Rising*

2:07 PM - 2:27 PM

Pedrina Terra dos Santos -*Climate Center for Open Research and Education – CCORE: A unique Resource on Climate Research at a Strategic US Location*

Christiano Garnett Marques Brum - *Long-Term Changes Detected Over the Caribbean Region*

2:27 PM - 2:39 PM (10+2Q&A) Dupinder Singh - *Long-Term Ionospheric Trends Linked to Earth's Magnetic Field Variations Revealed by Global Ionosonde Data and Empirical Modeling*

2:39 PM - 2:51 PM (10+2Q&A) Michael Hartinger - *International Polar Year 2032-2033 Concept Note and Related Early Planning*

2:51 PM - 3:03 PM (10 + 2Q&A) Marty Mlynczak (invited) - *Requirements for Long-Term Geospace Climate observations*

3:03 PM - 3:10 PM (5 + 2Q&A) Chen Wu - *Seasonal Dependency of the Solar Cycle, QBO, and ENSO Effects on the Interannual Variability of the Wind DW1 in the MLT Region*

3:10 PM - 3:25 PM

Chih-Ting Hsu - *Modeling the Influences of Changes in Earth's Magnetic Field and Greenhouse Gas Concentrations on the Climatology of Upper Atmosphere*

Joe McInerney - *WACCM-X Simulations Under Solar Minimum Quiet Geomagnetic Conditions for the 20th Century and Projections into the 21st Century*

3:25 PM - 3:30 PM (4) **wrap-up and open discussion**

Justification

The ITM system shows significant global variation in different time scales, including seasonal variation, solar-cycle variation, and decades-long trend. The coupling

between internal processes and external forcings from above and below leads to these complex variations in the ITM system. The variation and the long-term trend of the ITM system cause the change of neutral density in the upper atmosphere and further show a strong impact on the satellite drag and orbit determination. Therefore, understanding the contribution of different internal processes and external forcings to the variation and long-term trend of the ITM climate is critical due to the blooming development of space technology that we increasingly rely on.

Related to CEDAR Science Thrusts:
Explore exchange processes at boundaries and transitions in geospace
Explore processes related to geospace evolution
Manage, mine, and manipulate geoscience/geospace data and models
Workshop format
Short Presentations
Keywords
Seasonal variation, solar rotational variation, solar cycle variation, ITM climate, long-term trends
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