

# **2025 Workshop: Impact of Terrestrial Weather on the Space Weather of the ITM**

Long title

Impact of Terrestrial Weather on the Space Weather of the Ionosphere-  
Thermosphere-Mesosphere

Grand Challenge

Conveners

Jens Oberheide

Shantanab Debchoudhury

Larisa Goncharenko

Guiping Liu

Sarah McDonald

Fabrizio Sassi

Jiarong Zhang

Deepali Aggarwal

Bjoern Bergsson

Mack Jones

Zishun Qiao

joberhe@clemson.edu

Description

Processes generated by terrestrial weather in the lower atmosphere (i.e., troposphere and stratosphere, altitudes less than ~50 km) are recognized by the scientific community as sources of variability in both the structure and composition of the ionosphere-thermosphere-mesosphere (ITM) region. The ITM is a confluence of energy and processes that interconnect Earth's atmosphere with space. Exposed to persistent wave forcing from terrestrial weather sources, and solar and magnetic forcing, the ITM is a domain of compelling scientific inquiry that connects thermodynamics, fluid dynamics, electrodynamics and plasma physics. Predicting its mean state and variability, the "space weather" is of significant national interest for space situation awareness including the very low earth orbit (VLEO) as the new frontier of space operations. Advancing the understanding of whole atmosphere interconnections between terrestrial and space weather requires coordinated modeling and observational efforts along with the implementation of new

technologies across different spatial and temporal scales. Of particular interest are wave-induced vertical coupling processes that alter the ITM state in multiple ways, including their influence on structure, composition, circulation, and electrodynamics. Recent efforts through NASA's Living With a Star program and ISSI workshops, to name just a few, clearly show that progress has been made but that significant gaps in our understanding remain. This GC workshop aims to seek the expertise of the broader CEDAR community to help revealing the critical links between weather and space weather through addressing four specific goals.

This is year 2 of the GC workshop.

#### Justification

The workshop goals are not only at the heart of CEDAR's coupling and system science spirit but will also help to define more clearly the state-of-the-art in the light of future EZIE, DYNAMIC and GDC missions. Moreover, this workshop will provide an opportunity for NSF/CEDAR ground-based observatories to join forces with a broader community to synergistically enable a transformed view of terrestrial weather-space weather connection.

#### Related to CEDAR Science Thrusts:

Encourage and undertake a systems perspective of geospace

Explore exchange processes at boundaries and transitions in geospace

Develop observational and instrumentation strategies for geospace system studies

Fuse the knowledge base across disciplines in the geosciences

Manage, mine, and manipulate geoscience/geospace data and models

Workshop format

Short Presentations

Other

Include a virtual component?

No

Keywords

weather, space weather, observational baseline, model performance

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