2026 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
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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.

1. Quantify the variability of relevant neutral and ionospheric state parameters on different spatio-temporal scales, from regional to global, and from hours to inter-annual to climate: what are the observational baseline data sets we have, what are the gaps and will future space-based and ground-based measurements be able to close those gaps.

2. Develop a set of metrics to evaluate data-model comparisons.

3. Evaluate state-of-the-art models across different spatio-temporal scales and assess the impact of data assimilation on model performance.

4. Identify the important mechanisms that connect terrestrial variability with space weather on daily, sub-seasonal, inter-annual scales; examine how they vary with altitude and geographic regions.

Agenda

TBD. Contact joberhe@clemson.edu if you would like to present.

File upload
GC intro talk during 2024 plenary (4.87 MB)
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.

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Workshop format
Short Presentations
Other
Keywords
weather, space weather, observational baseline, model performance
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