2026 Workshop: TIDs

Long title
Traveling Ionospheric Disturbances (TIDs): Generation Mechanisms and Impacts on the IT system
Conveners
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Description

Traveling ionospheric disturbances (TIDs) are quasi-periodic variations in the Earth's ionosphere that propagate horizontally across large distances. They are commonly observed in the upper atmosphere across at all latitudes, local times, seasons, and levels of solar activity. These disturbances are often caused by gravity waves originating from a variety of sources, such as solar and geomagnetic activity, lower atmospheric weather patterns, seismic activity, and more. Despite sharing similar observational signatures, TIDs stem from diverse generation mechanisms, resulting in varied characteristics even when originating from the same source. The focus of this workshop is to understand the distinct TID generation mechanisms and their consequential effects through discussions on the observation and modeling of TIDs, with a particular focus on leveraging multi-instrument observational approaches. We aim to gain insights into the impacts from the Perkins instability and sporadic E phenomena as well as explore the influence of TIDs on the ionospheric-thermospheric (I-T) system as a whole and potential implications for operational systems, such as high-frequency (HF) propagation.

Agenda

Current order subject to change

1. Pavel Inchin “MSTIDs: From Forcing to Probing”
2. Jonathan Snively “Scalable modeling of the ascents and evolutions of acoustic and gravity waves from the middle atmosphere to the thermosphere-ionosphere”

3. Matt Zettegren “Multiscale numerical modeling of effects of weather-generated acoustic and gravity waves on the ionosphere”
4. Dev Joshi “Characterization and Modeling of MSTID in HF observations”
5. Angeline Burrell (Fabrizio Sassi) “Topside Ionospheric Response to Large-Scale Traveling Ionospheric Disturbance”
6. Yang Pan “Detection of Concentric Traveling Ionospheric Disturbances in CONUS using Advanced YOLO model”

Justification

As mentioned above, TIDs are ubiquitous in the ionosphere yet there remains considerable uncertainty regarding their origin and influence. TIDs have often been characterized simply by their time of occurrence (night vs day) yet this does not differentiate their generation mechanisms. A recent International Space Science Institute (ISSI) working group highlighted numerous gaps in our understanding of TIDs. Their generation mechanisms, relative importance of different drivers in their generation, spatial variability, and categorization are all areas that need further investigation. In order to better understand TIDs, efforts must be directed towards discerning their generation mechanisms through both observations and modeling.

Related to CEDAR Science Thrusts:
Explore exchange processes at boundaries and transitions in geospace
Develop observational and instrumentation strategies for geospace system studies
Workshop format
Short Presentations
Keywords
TIDs, MSTIDs, Gravity Waves
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