2024 Workshop: Traveling Ionospheric Disturbances (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

Date: Thursday, June 13, 2024

Time: 13:30 - 15:30 PDT

Location: Room – Pacific A&B

Wyndham San Diego Bayside Hotel

1355 North Harbor Drive, San Diego, CA 92101

This session is combined with the Hazards session.

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13:30-13:33 **Sovit Khadka** (*Orion Space Solutions*): Preamble of the Workshop Session

13:33-13:46 **Sharon Vadas** (*NorthWest Research Associates*): TIDs Induced by the Secondary Gravity Waves (GWs) from the Tonga Eruption on 15 January 2022 and the Spectrum of GWs Generated by a Tsunami

13:46-13:59 **Sebastijan Mrak** (*Johns Hopkins University*): Uncertainties in GNSS-TID Processing and Impacts on Scientific Interpretations of TIDs

13:59-14:12 **Björn Bergsson** (*Embry Riddle Aeronautical University*): Characterizing Ionospheric Responses to Convectively Generated AGWs using TEC and Weather Radar Observations

14:12-14:25 **Kuldeep Pandey** (*New Jersey Institute of Technology*): Differential Mode Delays of HF Radio Waves in Presence of TIDs

14:25-14:38 **Paul Bernhardt** (*University of Alaska*): Surprising Impact of Man's Activities on the Radiation Belts

14:38-14:51 **Rezy Pradipta** (*Boston College*): Observations of Ionospheric Disturbances Associated with the 4 August 2020 Port Beirut Explosion by DMSP and Ionosondes

14:51-15:04 **Jonathan Snively** (*Embry-Riddle Aeronautical University*): AIRWaveS: Atmosphere-Ionosphere Responses to Wave Signals

15:04-15:17 **Kenneth Obenberger** (*Air Force Research Laboratory*): Remote Sensing Small Explosives with an Ionospheric Radar

15:17-15:30 **Dustin Hickey** (*U.S. Naval Research Laboratory*): Observations of MSTIDs Driven by the Lower Atmosphere

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.

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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
Keywords
TIDs, MSTIDs, Gravity Waves,
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