2024 Workshop: Distributed Observatory Investigations

Long title
Recent investigations of low and mid-latitude ionospheric dynamics and disturbances using distributed observatories
Conveners
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Description

This session is dedicated to presenting and discussing recent scientific results obtained with distributed observatories (DO) and investigations that combine space-based measurements and the innovative use of DO. These observatories can consist of networks of GNSS receivers, all-sky imagers, magnetometers, Fabry-Perot instruments, coherent radars, ionosondes, and oblique sounder receivers that are being used to probe the low and middle-latitude ionospheres. These networks of large and small instruments have the advantage of probing regions and, in other cases, capturing the global states of the thermosphere and ionosphere and can lead to the nowcasting and forecasting of the ionosphere dynamics and the onset of plasma irregularities. For this reason, they are of crucial importance in advancing our knowledge of plasma electrodynamics and its stability. A network of instruments can also corroborate or provide additional insight into numerical simulations. This workshop welcomes presentations on the use of networks of instruments to search for the causes of ESF, such as atmospheric inputs, including traveling ionospheric disturbances (TID) that can seed plasma bubbles and the role of Sudden Stratospheric Warming (SSW) events that enhance the semidiurnal lunar tide and modify the electrodynamics of the E and F regions and create systematic variations of the migrating/non-migrating tides. In addition, intense magnetic storms bring prompt penetrating electric fields that map to the equator and a disturbance dynamo field that can destabilize or mitigate ionospheric disturbances. The observation capability provided by distributed observatories, designed and built in the last ten years, is unprecedented and needs to be described in detail. This

session will also explore what is required to fully utilize all these resources to conceive, design, and construct a forecasting tool for plasma electrodynamics and scintillations at low and mid latitudes.

Agenda

Endawoke Yizengaw **The Impact and Sources of Radio Frequency Interference on GNSS Signals**

Chau et al: Distributed specular meteor radar systems for studies of MLT dynamics: Planetary scales and mesoscales

Asti Bhatt: MANGO network status and enabled science

Josemaria Gomez Socola, "Dynamics of low-latitude F-region irregularity drifts inferred from closely-spaced low-cost scintillation receiver measurements"

J. B. Snively, P. A. Inchin, and M. D. Zettergren: An Overview Dataset for Rapid Analysis of Ionospheric Dynamics from GNSS TEC

Cesar Valladares: Using a network of GNSS receivers in South America to diagnose equatorial irregularities.

Luis Navarro: "Thermospheric dynamic studies using the Fabry-Perot Interferometer

Ercha Aa: Understanding the midlatitude bubble-like ionospheric super-depletion structure (BLISS)

Shasha Zou: EIA and EPB Observations and Simulations During the April 23, 2023 Storm

Justification

During the last ten years, the necessity of having extended and continuous measurements and thoroughly probing the IT system has become evident. Moreover, numerical models of the coupled thermosphere and ionosphere have also produced regional, global, and conjugate models of the ionospheric behavior that need to be validated to develop an improved space weather forecast. Distributed observatories offer a method to test and outline strategies to improve the nowcast and forecast of space weather phenomena. For these reasons, we have decided to have a forum to reach the general USA space weather and aeronomy communities

to report our scientific advances and gather feedback from our colleagues. In addition, this workshop will address several points described in Strategic Thrust #1 and Thrust # 6.

Related to CEDAR Science Thrusts:
Develop observational and instrumentation strategies for geospace system studies
Manage, mine, and manipulate geoscience/geospace data and models
Workshop format
Short Presentations
Keywords
Distributed Observatories, Gravity Waves, Traveling Ionospheric Disturbances, Scintillations
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