2019 Workshop: DASI and IS radars

Long title
Distributed Arrays of Small Instruments and Incoherent Scatter Radars
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Description

To study, understand, and forecast the behavior and coupling of the ionosphere-thermosphere (IT) system several networks of small instruments have been deployed around the Earth. Coherent scatter radars, ionosonde networks, Fabry-Perot interferometers, all-sky imagers, GPS receivers, and multiple RF receivers have been fielded to probe areas or volumes of the IT system, and produce continuous real-time observations. Some of these networks are linked to incoherent scatter radars being able to measure the ionospheric physical parameters (e.g., densities, drifts, and temperatures) and thus increasing their capabilities of observation with the resolution needed to resolve mesoscale phenomena and track their dynamic evolution. These observatories provide regional, continental, and in some cases global observations that enable monitoring of the temporal evolution of density or velocity structures across extended distances. The first part of this session will introduce the science that has been accomplished and projects that are currently conducted with distributed observatories and incoherent scatter radars. The second part will consist of a round-table discussion to elucidate the measurements, processing techniques, and observational campaigns that are required to advance our knowledge of the coupled ionosphere-thermosphere system. This session aims to answer two fundamental questions: 1) What observational capabilities are needed to resolve the temporal and spatial variabilities of Traveling Ionospheric Disturbances (TID) that are characteristic of the coupled I-T system at all local times and during all geomagnetic conditions? 2) What are the prospects for developing a first-principles physics-based assimilation model of the low and mid-latitude ionospheres that accurately express these variabilities?

Justification

This workshop will address several points described in the Strategic Thrust #4 “to develop Observational and Instrumentation Strategies for Geospace System Studies” and # 6 “to manage, Mine and Manipulate Geoscience Data and Methods.” Specifically, we will discuss coordinated multi-instrumented campaigns and perform statistical analysis that uses more than one type of instrument. We will also present results of data mining that include extensive resources provided by distributed observatories and incoherent scatter radars and conduct: • Continued evolution of data assimilation schemes to integrate data with physics-based models for improved predictive capability. • Develop advanced analysis techniques needed for efficient fusion of observations into sophisticated inference models. • Discussion of data distribution and network management required for long-term science and space weather support. This workshop is also directed to the study of the ionosphere-thermosphere system in an integrated fashion and to improvement in the space weather, and climatology capabilities emphasized in the 2013-2022 Decadal Survey. The format of the meeting will consist of short presentations (10 min) followed by a panel discussion. The questions will be formulated during each presentation and then will be addressed during the discussion part of the workshop. Progress will be described in the final report of the workshop.

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