2019 Workshop: IT

Long title
Multi-instrument investigations pertaining to the Earth’s upper atmosphere at low and mid-latitudes
Conveners
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Description

The main scientific objective of this session is to investigate aeronomical processes that are crucial for advancing our knowledge of the atmosphere-ionosphere system, and how best to study them by combining incoherent scatter radar (ISR), lidars, GPS, airglow, and other instruments.

We solicit short presentations that highlight new observations using radio, optical and other techniques. Topics may include, but need not be not limited to: (a) latitudinal/longitudinal coupling, for example via transport of energy through TIDs/TADs; (b) ion-neutral coupling and coupling between ionospheric regions; (c) the effects of high energy input either through solar/geomagnetic variability or locally via artificial methods such as ionospheric modification experiments; (d) the generation of plasma instabilities and ionospheric irregularities through natural processes and radiowave heating experiments, and their aeronomical consequences; and (e) other dynamical processes in the Earth’s atmosphere that can influence global ion transport processes.

We encourage presentations that utilize the Arecibo ISR and high-frequency heating experiments, as well as observations or techniques using other instrument clusters at low and mid-latitudes. Radiowave heating can be used both as a diagnostic of atmospheric parameters and as an experimental probe of ionospheric space plasma processes, and presentations highlighting both usage modes are encouraged.

Agenda

1. Ruth Leiberman : The Grand Challenge Initiative – Mesosphere / Lower Thermosphere

2. William Archer: Steve: The optical signature of extreme subauroral ion drifts

3. Gary Swenson: O in the MLT and Kzz

4. Pratik Joshi/L. Waldrop: Ionosphere-Plasmasphere coupling via O-H+ and H-O+ charge Exchange

5. E. Miller: Passive HF and Optical Observations of F-region Dynamics from Culebra, PR

6. Justin Mabie: Infrasonic waves and multiple cusps in ionograms

7. Jim Labelle: Using natural auroral radio emissions to remotely sense ionospheric density

8. Scott England: Observations of TADs with GOLD

Justification

Identify the relevant CEDAR Science Challenge that the workshop addresses and describe: The workshop aims at addressing: (a) Impact of geomagnetic variability on the ionosphere. (b) Coupling processes between different regions of the ionosphere/atmosphere; and mechanisms responsible for mid and large scale variability in ionospheric parameters. (c) Interactions between ions and neutrals in the mesosphere and the lower thermosphere region.

Relevance to the 2011 CEDAR Strategic Plan

The instrument clusters at Arecibo Observatory and other locations are being utilized to address the scientific goals as mentioned in Thrusts 1 and 4 as listed below. Strategic Thrust 1: Encourage and undertake a systems perspective of geospace to understand global connectivities and causal relationships involving the space and atmosphere interaction region (SAIR) to determine their influences on the whole Earth system. Strategic Thrust 4: Develop observational and instrumentation strategies for geospace system studies capable of measuring system properties necessary to examine the coupling mechanisms and complexity within the different atmospheric regions.

1. How the associated questions will be addressed:

To address the above challenges, recent progress made by instrument clusters using multiple measurement techniques will be presented. The short talks will include observations using ISR, lidars, FPIs, imagers, and other instruments, that sample different regions of the space and atmosphere interaction region (SAIR).

2. What resources exist, are planned and/or are needed:

The incoherent scatter radar (ISR) at Arecibo is the most sensitive in the world and can make unique contributions to observations made using a wide variety of other instruments. Similar situations exist at other ISRs, which collect data from the D, E, F, and topside ionospheric regions of the Earth’s atmosphere. The results of combined observations, and their implications for advancing our current knowledge of the atmosphere at low and mid-latitudes, will be discussed.

3. How progress should be measured:

Progress will be measured by the variety of instruments used and the methods developed to analyze and interpret the combined data for new results. Fruitful discussions leading to new collaborations lead to progress of science.

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