2019 Workshop: Atmosphere vertical coupling

Long title
Vertical Coupling between Troposphere, Mesosphere, and Thermosphere via Acoustic-Gravity waves and MSTIDs
Conveners
Fabio Vargas
Pedrina Santos
Christiano Brum
Julio Urbina
Description

We want to discuss in this workshop the dynamical coupling processes between the troposphere, mesosphere, and the thermosphere-ionosphere systems. We want to understand how Extreme Weather Events, namely, sources of highly energetic waves, affect the upper levels, mainly the Thermosphere/Ionosphere system via MSTID observations. These waves are detected frequently on the mesosphere and thermosphere via imagery of the airglow layers, incoherent scattering radars to sense the ionosphere plasma electron density and temperature, VLF receivers sensing the plasma at D region altitudes, and GPS receivers via the total electron content measurements. Waves impose dynamical variability in a wide range of scales, perturb densities in the MLT and upper thermosphere modulating the atmospheric fields in the D, E, and F region as well. This workshop will emphasize state-of-the-art investigations of atmospheric weather-related processes that enable or indicate coupling within the atmosphere layers. It will be composed of short presentations (~10 minutes). We welcome presentations on methodologies, including theory, modeling, observation, and experiment.

Agenda

Modeling

- 1:30-1:45 > Jonathan Snively.....(ERAU)....."**Evidence of Nonlinearity in AW/GW-TID Signatures Above Strong Forcing**"
- 1:45-2:00 > Fabio Vargas.....(UIUC)....."**Simulation of TIDs' Signature on Ground-Based Observations of the O(1D) Nightglow**"

Modeling + Observation

- 2:00-2:15 > Federico Gasperini..(UCAR)..."**Preliminary Evidence of MJO Effects on Ultra-Fast Tropospheric Waves in the Thermosphere**"

Observation

- 2:15-2:30 > Irfan Azeem.....(NRL)....."**Convectively Generated Acoustic Waves in the Ionosphere**"
- 2:30-2:45 > Carlos Martinis.....(BU)....."**E- and F-region coupling leading to bright airglow MSTIDs**"
- 2:45-3:00 > Asti Bhatt.....(SRI)....."**Observations of Vertical Coupling for Waves Generated from Convective Sources**"
- 3:00-3:15 > Pedrina Santos.....(AO)....."**MSTIDs Detected at the ROF during Solar Minimum: An Overview**"
- 3:15-3:30 > Christiano Brum.....(AO) ....."**On search of tropospheric extreme weather signatures on mesosphere and above or What did we learn from Hurricane Maria…**"
- 3:30-3:35 > Gary Swenson.....(UIUC)....."**O Mesosphere Reservoir versus Solar Cycle**"

Justification

In this workshop, we seek to understand the vertical propagation of atmospheric waves from their sources in the troposphere all way up to the thermosphere, what characterizes a vertical coupling of the atmospheric layers. There are unknowns on how waves reach the higher altitudes up to the thermosphere and are detected as oscillations in the local plasma and temperature, usually referred to as MSTIDs. We want also to emphasize the coupling during Extreme Weather Events, such as deep convection systems, hurricanes, and tropical storms because these large systems generate energetic oscillations that have the potential to drive the upper layers via momentum flux and heat deposition. These goals are in accord with CEDAR Strategic Thrust #1 (viz., to “Explore system characteristics of the space-atmosphere interaction region in terms of nonlinearities, preconditioning and memory, feedback, instabilities, emergent behavior, and cross-scale coupling”), and Thrust #2 (“Explore Exchange Processes at Interfaces and Boundaries”).

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