2016 Workshop: Thunderstorm Ionosphere Coupling

Long title
Coupling from Lightning and Thunderstorms into the Upper Atmosphere and Lower Ionosphere
Conveners
Robert Marshall
Erin Lay
Description

This workshop focuses on the effects of lightning in the atmosphere and ionosphere and the coupling of energy due to lightning and thunderstorms into and through the upper atmosphere ionosphere. Lightning electromagnetic (EM) and electrostatic (ES) fields are responsible for producing Transient Luminous Events such as sprites, elves, and gigantic jets, and produces collisional heating of the lower ionosphere. Lightning is also responsible for Terrestrial Gamma-Ray Flashes, the most energetic photons produced on Earth, which are detected from spacecraft. Furthermore, the EM energy couples through the lower ionosphere and into the upper ionosphere and magnetosphere. Gravity waves (GWs) and acoustic waves (AWs) generated by the thunderstorm also affect the mesosphere and ionosphere and deposit large amounts of energy and momentum in the upper atmosphere. To address the outstanding questions currently under investigation in this field, this workshop will include short presentations covering all of the aspects of thunderstorm-atmosphere-ionosphere coupling, including TLEs, TGFs, GWs, AWs, effects on the lower ionosphere, and coupling into the upper ionosphere and magnetosphere. The workshop will also include discussion of the major outstanding questions in this field.

Agenda

- Bob Marshall / Erin Lay: introduction
- Astrid Maute, National Center for Atmospheric Research
- Greg Lucas, University of Colorado Boulder (student)
- Morris Cohen, Georgia Institute of Technology
- Caitano da Silva, Dartmouth College
- Ningyu Liu, Florida Institute of Technology

- Levi Boggs, Florida Institute of Technology (student)
- Asti Bhatt / Elizabeth Kendall, SRI International
- Irfan Azeem, ASTRA
- Erin Lay, Los Alamos National Laboratory
- Jonathan Snively, Embry-Riddle Aeronautical University
- Jaroslav Jansky, Pennsylvania State University

Justification

This workshop addresses coupling processes in the Space-Atmosphere Interaction Region (SAIR) and the quantification of energy and momentum coupling across the boundary posed by the lower D-region ionosphere. Lightning and thunderstorms couple into the upper atmosphere and ionosphere through electrodynamic, chemical, and neutral wave effects.

This workshop addresses the Decadal Survey AIMI Science Goal 2: Meteorological Driving of the IT System, and the specific question: How does lower-atmosphere variability affect geospace? The lower atmosphere affects geospace through meteorological forcing from convective gravity waves and lightning; this workshop addresses the effects of lightning and thunderstorms on the geospace environment. It directly pertains to the CEDAR Strategic Thrust #1: "Encourage and undertake a systems perspective of geospace," Thrust #2 "Explore exchange processes at boundaries and transitions in geospace," and Thrust #6 "Fuse the knowledge base across disciplines in the geosciences."

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