2015 Workshop: Lightning Effects on the Ionosphere

Long title
Lightning and thunderstorm effects in the mesosphere and 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 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 also produces 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. To address the outstanding questions currently under investigation in this field, this workshop will include short talks 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. The workshop will also include discussion of the major outstanding questions in this field.

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 gravity waves and lightning; this workshop addresses the effects of lightning 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."

View PDF