2021 Workshop: Multi scale IT system System Dynamics

Long title
Grand Challenge: Multi-scale Ionosphere-Thermosphere System Dynamics
Grand Challenge
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Description

It has been recognized that there are various scales in the thermosphere and ionosphere system, and that a variety of processes interact across these scales, depositing energy and momentum at different levels. Until recently, researchers who study larger- scale processes and researchers who study smaller-scale processes have not interacted much at all, since there was little ability to apply lessons learned on meso/small scales to the large scales and vice-versa. With the advent of more global scale networks of sensors (all sky imagers, GPS receivers, SuperDARN, Iridium, etc.), and large-scale models that can be run at fine resolution (less than 100 km) and local-scale models that can be run over fairly large scales, it has become possible to explore the coupling between scales.

Justification

Community-wide discussions and collaborations among observers and modelers across regions and scales are required to address the challenge of understanding

geospace across scales (i.e., multi-scale). At previous CEDAR meetings, multi-scale discussions have taken place in a rather ad hoc, uncoordinated, and disjointed manner. Multi-scale coupling is a Grand Challenge because the technologies for bridging the different scales do not exist in our community, either on the observational or the modeling side. Despite understanding of potential and auroral patterns on global scales, existing models cannot specify meso-scale (a few 10s and a few 100s km) and small-scale (<~10 km) in the context of the large-scale system. On the modeling side, we have large-scale and meso/small-scale models that have never been compared, since the systems have been operated independently. This subject is timely, since both observation and modeling systems are increasingly sophisticated and capable to explore a variety of scales and the CEDAR community needs to develop the tools to bridge this knowledge gap. We propose a workshop-style format that consists of a coherent discussion of activities, identification of science questions and diversified solution methodologies, implementation and evaluation amongst relevant experts who otherwise are not usually deliberately aligned in a single session.

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