2025 Workshop: Ionospheric Conductivity

Long title
Drivers, Control, and Effects of the Ionospheric Conductance and Conductivity in the Magnetosphere-Ionosphere-Thermosphere Systems
CEDAR-GEM
Conveners
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Description

Ionospheric conductivity is a key parameter in understanding the complex coupling between the magnetosphere, ionosphere, and thermosphere systems. Its spatiotemporal variability is driven by plasma and neutral parameters such as temperature, density, and velocity, making it a dynamic and challenging factor to quantify. Additionally, its intricate relationship with ionospheric currents and electric fields defines the characteristics of plasma continuity and transport but remains poorly understood due to the lack of a global, three-dimensional characterization of these parameters. Various new methodologies have been proposed recently to aid our understanding of ionospheric conductivity, such as using radio occultation techniques, data assimilation with high fidelity data sets, using co-located instruments, utilizing higher spatiotemporal resolution boundary conditions for numerical simulations, and improved physical descriptors for the models. These efforts improve upon our ability to characterize the ionospheric conductivity and our attempts at understanding its drivers and impacts on the variability of the Ionosphere-Thermosphere system. This session aims to address the overarching goal of describing ionospheric conductivity by bringing together researchers working on observational, theoretical, and modeling approaches from magnetosphere, ionosphere, and thermosphere communities.

Agenda

1. Christine Gabrielse, What we’ve learned so far measuring conductance in 2D with ASIs during the 2013 March 17 Storm?
2. Karl Laundal, Deriving Conductance Maps from IMAGE FUV Data

3. Liang Wang, OpenGGCM-GITM Coupling Through Conductance
4. Jude Salinas, Severe Geomagnetic Storms Reduce Daytime E-region Electron Density over the Mid-latitudes
5. Alex Mule, Auroral arc-scale Pedersen conductance
6. Aaron Bukowski, Impacts of different auroral representations on the IT system
7. Sreelakshmi Jayaraman, Evaluation of modeled auroral precipitation patterns using DMSP
8. Ari Gottesman, Electron pressure in MHD and its effects on conductance

Justification

This workshop aims to bring the CEDAR and GEM communities together to make progress on the quantification of the spatial and temporal variability of conductivity across all scales and relate this variability to physical processes in the ionosphere and magnetosphere. The 2024 Decadal Survey theme on “Sun-Earth-Space: Our Interconnected Home” identifies three guiding questions, which are all related to the proposed workshop theme on ionospheric conductivity. As it exists in the intersection of magnetosphere, ionosphere, and thermosphere, ionospheric conductivity acts as a key player in the coupling of these three systems, driven by various physical processes and controlling energy and momentum flow to neutral and charged populations. Additionally, the proposed workshop is convened by a group of investigators who act at various capacities in the NASA Living with A Star (LWS) Focused Science Team (FST) on “Ionospheric Conductivity and its Variability”. Therefore, the session will further support the dissemination of the investigations of the LWS FST groups across the community. Overall, findings and discussions presented in this joint workshop proposal will benefit the communities working with the EZIE, TRACERS, GDC, and DYNAMIC missions.

Related to CEDAR Science Thrusts:
Encourage and undertake a systems perspective of geospace
Explore exchange processes at boundaries and transitions in geospace
Explore processes related to geospace evolution
Fuse the knowledge base across disciplines in the geosciences
Workshop format
Short Presentations
Round Table Discussion
Focus Group and Group Leader

"Magnetospheric Sources of Particle Precipitation and Their Role on Electrodynamic Coupling of Magnetosphere-Ionosphere-Thermosphere Systems", Dogacan Ozturk

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