2025 Workshop: KiTS-RX-MESO-CEDAR Part 1

Long title
KiTS-RX-MESO-CEDAR session on substorm onset Part 1
CEDAR-GEM
Conveners
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Description

Substorms are one of the main processes in which Earth's magnetosphere-ionosphere system responds to driving from the solar wind. During the substorm growth phase energy is stored in the magnetotail lobes before releasing during the expansion phase. However, the onset mechanism that triggers the explosive expansion phase is not well understood. While magnetic reconnection is known to play a role in the explosive release of energy, there may be a separate mechanism for onset (e.g. current disruption or ballooning/interchange instability). Other questions include the role of preconditioning during the growth phase that determine the properties of the pre-onset magnetotail current sheet. To complicate matters further, observations of the aurora mapped to the magnetotail can have large errors in their location.

Due to the breadth of this topic, we will have 2 joint sessions. In these sessions we hope to bring together researchers from both GEM and CEDAR communities to share their expertise on this topic. Linking dynamics between the ionosphere and magnetotail is a key part of understanding the magnetospheric system-of-systems response to solar wind driving. In this, the first session, we will invite four panelists to give presentations to set the stage for a discussion on the topic of substorm onset, the mechanisms involved, their location, and the importance of the pre-onset magnetotail configuration. In these sessions, we aim to highlight the importance of satellite and ground-based observations, along with magnetospheric and ionospheric modeling, in understanding the coupled magnetosphere-ionosphere system and unraveling substorm dynamics.

Agenda

All times are approximate

(1:30-1:40): Introductory Remarks - Jason Derr

(1:40-2:05): Larry Lyons

(2:05-2:30): Jesper Gjerloev

(2:30-2:55): Tuija Pulkkinen

(2:55-3:20): Mikhail Sitnov

(3:20-3:30): Discussion

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Justification

Understanding substorm onset is an active topic in both the GEM and CEDAR communities and will make a compelling joint session. It is clearly relevant to the Kinetic Plasma Processes in the Magnetotail during Substorm Dynamics focus group, but is also applicable to the Magnetic Reconnection: The Key to Understanding Earth's Space Environment focus group as reconnection is a possible onset mechanism. The nightside transition region has also been proposed as the location of onset making this session relevant to the Mesoscale drivers of the nightside transition region: ionospheric and magnetotail evaluations focus group. Finally, the CEDAR community makes an excellent addition to link auroral manifestations of onset to the magnetotail.

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Workshop format
Panel Discussion
Keywords
Substorm onset, Magnetosphere-Ionosphere Coupling
Focus Group and Group Leader

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