# 2025 Workshop: KiTS-RX-MESO-CEDAR Part 2

Long title
KiTS-RX-MESO-CEDAR session on substorm onset Part 2
CEDAR-GEM
Conveners
Harry Arnold
Anton Artemyev
Jason Derr
Akhtar Ardakani
Bea Gallardo-Lacourt
Gareth Perry
Emma Spanswick
Yi Qi
John Dorelli
Katherine Goodrich
Chen Shi
M. Hasan Barbhuiya
Krishna Khanal
Toshi Nishimura
harry.arnold@jhuapl.edu
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 second session, we plan to give presentations ~10 minutes each (including questions) to explore substorm onset and continue the conversation from the first session. 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

(04:00-04:05): Jason Derr - Introductory Remarks

(04:05-04:15): Andy Marshall - Pseudobreakup vs Substorm: MMs observations and MAGE simulations of two tail reconnection events

(04:15-04:25): Harriet George - multi-constellation analysis of bursty bulk flows and tailward jets

(04:25-04:35): Tuija Pulkkinen - TBD

(04:35-04:45): Katherine Davidson - substorm onset influence from polar cap flows

(04:45-04:55): Weiqin Sun - Dynamics of energetic electron fluxes in the magnetotail on growth and expansion phases of substorm

(04:55-05:05): Xiaojia Zhang - Relativistic elecron bursts in the substorm magnetotail

(05:05-05:15): Vincent Ledvina - Auroral beads

(05:15-05:25): Mikhail Sitnov - overstretched thin current sheet/DM reconsturctions

(05:25-05:35): Christine Gabrielse - TBD

(05:35-05:45): Yi-Hsin Liu - x-line spreading

(05:45-06:00): 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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Keywords
Substorm Onset, Magnetosphere-Ionosphere Coupling
Focus Group and Group Leader

KiTS Harry Arnold
MESO Bea Gallardo-Lacourt
RX Yi Qi

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