2025 Workshop: Electron-only reconnection

Long title
Beyond semantics: when is reconnection “electron-only” in observations and simulations?
GEM-only session
Conveners
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Description

Electron-only reconnection has emerged as a key process in weakly collisional space plasmas, where ions do not participate in the reconnection dynamics. Observations and simulations have provided evidence of electron-only reconnection in Earth's turbulent magnetosheath and space-relevant laboratory experiments. However, recent discussions based on kinetic simulations and observations have highlighted that the term “electron-only” is being used to describe two distinct phenomena: (1) reconnection where ions never participate due to the constraints of the reconnection domain size, and (2) an early phase of ion-coupled reconnection where only electrons initially participate. This session aims to bring together experts in theory, simulations, and observations to examine case studies, clarify terminology, and refine the use of the phrase “electron-only”. By fostering discussions, we aim to establish a clearer framework for future early-phase and small-scale reconnection studies.

Agenda

Zoom link: https://cuboulder.zoom.us/j/92875278306

- Yi-Hsin Liu: *electron only reconnection: scene-setting 1*
- Shan Wang: *electron only reconnection: scene-setting 2*
- Dominic Payne: *TBD*

- Sohom Roy: *TBD*
- Subash Adhikari: *Scaling of Pressure-Strain Interaction in Guide Field Reconnection*
- Prayash Pyakurel: *TBD*

Justification

The conflation of the term “electron-only” risks misinterpretation and hinders progress in understanding the role of electrons in space plasma reconnection. To advance the field, it is crucial to establish clear distinctions, ensuring terminology accurately reflects the underlying physics. Clarifying these definitions will provide a more coherent framework for studying reconnection phases and energy conversion in both electron-scale and ion-coupled reconnection. Furthermore, this discussion will have broader implications for understanding the interplay between reconnection and turbulence. Given the rapid growth of studies in this area, this session is timely and necessary to promote clarity and consistency within the GEM community.

Related to CEDAR Science Thrusts:
Explore exchange processes at boundaries and transitions in geospace
Explore processes related to geospace evolution
Workshop format
Panel Discussion
Keywords
reconnection, space plasma
List GEM Focus Groups (if any) you wish to avoid being in concurrent sessions with (due to overlapping research interests)
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