2025 Workshop: Reconnection simulation

Long title
How to set up the initial condition for simulations of magnetic reconnection?
GEM-only session
Conveners
Krishna Khanal
M. Hasan Barbhuiya
Chen Shi
Yi Qi
John Dorelli
Katherine Goodrich
yi.qi@lasp.colorado.edu
Description

Magnetic reconnection spans a wide range of scales, from large-scale fluid (MHD) behavior to small-scale particle (kinetic) dynamics. Numerical simulations have become increasingly advantageous for studying complex, multiscale reconnection physics, which cannot be fully explored through analytical or experimental/observational methods. The first critical step in a reconnection simulation is initializing a current sheet within a background plasma and magnetic field. Then, small “seed” perturbations are introduced in the current sheet to trigger reconnection. The system is subsequently allowed to evolve within a predefined computational domain. In this student-oriented session, we invite presenters to discuss the fundamental steps involved in setting up reconnection simulations.

Agenda

Zoom link:

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

Justification

Numerical simulations are valuable tools for testing physical models, predicting reconnection dynamics, and interpreting observational data. Successful simulations require careful consideration of the numerical model, boundary conditions, background magnetic field, and plasma properties, the geometry of the computational domain, etc. The choice of these parameters is primarily driven by the specific problem at hand and the computational resources available. The session will bring together the experts of reconnection simulations to share their knowledge and insights. The tutorial will be highly valuable to current as well as prospective student researchers, providing them with the fundamentals of performing the reconnection simulations.

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reconnection, space plasma, numerical simulation
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