



Contribution ID: 15

Type: oral

First-principle simulations of cosmic-ray transport in the self-confinement regime

Monday, 29 May 2023 16:10 (20 minutes)

Cosmic-rays (CRs) have been recognized to play an important role in the galactic ecosystem through CR feedback. The key underlying microphysics lie in the CR gyro-resonant instabilities, which trigger the growth of Alfvén waves that lead to energy and momentum exchange between the CRs and the background plasmas, as well as CR self-confinement. I will present simulations of the CR gyro-resonant instabilities using the magnetohydrodynamic-particle-in-cell (MHD-PIC) method in a variety of simulation settings. By designing a streaming box and an expanding box framework, our simulations achieve the steady-state balance between wave growth and damping, as well as between driving CR streaming/anisotropy and isotropization via wave scattering. It allows us to measure the CR transport coefficients from first principles as a function of background environment, which will offer reliable subgrid prescriptions for macroscopic studies of CR feedback and transport.

Summary

Primary author: BAI, Xuening (Tsinghua University)

Co-author: Mr SUN, Xiaochen

Presenter: BAI, Xuening (Tsinghua University)

Session Classification: Afternoon session I

Track Classification: Cosmic Ray Physics