

One-dimensional three-fluid cosmic ray-plasma flows

In the hydrodynamic approach to cosmic-ray propagation, cosmic rays and self-excited Alfvén waves are considered as massless fluids. We study the three-fluid model, which comprises thermal plasma, cosmic rays and forward propagating Alfvén waves. The coupling of cosmic rays to the plasma or their diffusion coefficient depends on the waves. We have classified all possible physically allowable non-uniform flows. If the diffusion coefficient remains finite even if the waves vanish, the only possible solutions are monotonically decreasing supersonic flows. On the other hand, if the diffusion coefficient becomes infinite when the waves vanish, there are two more types of flows, monotonically increasing supersonic and subsonic flows. The parameter space of allowable flows can be described analytically.

Section

High Energy

Primary author: KO, Chung-Ming

Presenter: KO, Chung-Ming

Session Classification: Poster-HE