Contribution ID: **1778** Type: **Oral**

Fire Hose Mode Instability in Anisotropic Cosmic Plasma

Tuesday 29 October 2024 13:00 (15 minutes)

This study investigates the stability of anisotropic collisionless plasma layers to small disturbances within the magnetohydrodynamic (MHD) framework. We focus on the fire hose mode instability, particularly in the context of shear flows in cosmic plasmas. Our analysis is based on moment equations derived from the Vlasov kinetic equation, taking into account heat flow along spatially shearing flows.
We solve the boundary value problem for a smooth hyperbolic velocity profile using WKB approximation, resulting in a general integral dispersion equation. This equation describes various types of body and interface instabilities in the presence of heat flow along the magnetic field. Our findings indicate that reducing the layer width significantly enhances mirror instability while suppressing oblique fire-hose instability.
The study particularly examines how spatial gradients in plasma flow affect the properties of aperiodical oblique fire-hose instability in a limited layer. We demonstrate that spatial gradients in flow velocity greatly enhance this instability. Furthermore, as the shearing layer width narrows and velocity gradients increase, body hose modes transform into surface Kelvin-Helmholtz modes at the interface between flow regions with different velocities.
This research contributes to our understanding of plasma instabilities in cosmic environments, such as the solar wind and astrophysical jets, where anisotropic, collisionless plasmas with shear flows are common.

Primary author: SAMADOV, Jannat (Shamakhy Astrophysical Observatory)

Presenter: SAMADOV, Jannat (Shamakhy Astrophysical Observatory)

Session Classification: Theoretical Physics

Track Classification: Theoretical Physics