
Dust-Lower-Hybrid Instability in Streaming Dusty Plasma

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Abstract

The dispersion relation of the dust-lower-hybrid wave has been derived using the magneto-hydrodynamic model of plasmas in a dusty plasma in the presence of a uniform external magnetic field. Electrostatic dust-lower-hybrid waves have frequency below the ion-cyclotron frequency but above the dust-cyclotron frequency. Using linear first order perturbation theory, a dispersion relation of the low-frequency electrostatic dust-lower-hybrid wave is obtained accounting for the streaming of electrons and dust charge fluctuations in a finite temperature and collisionless magnetized dusty plasma. It is found that the damping of this mode is the sum of the Landau damping and the charge fluctuation effect. The dust-lower-hybrid mode can be excited when the electron streaming velocity in the direction of the magnetic field exceeds the parallel phase velocity of the mode. The mode is also excited when the magnitude of the Landau damping exceeds the magnitude of the damping due to the dust charge fluctuation.

References

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