Title: Twisted dust-acoustic waves and kinetic instability in a dusty plasma

Abstract

The kinetic instability of twisted dust-acoustic (DA) wave with distinct orbital angular momentum (OAM) states is studied in an unmagnetized multi-components dusty plasma. For this purpose, the linearized Vlasov-Poisson equations are solved together by expressing the perturbed distribution function and electrostatic potential in terms of Laguerre-Gauss functions or solutions. A generalized plasma dielectric constant is derived and the existence conditions for damping/growth rates are discussed showing significant modifications in twisted dusty modes as compared to straight propagating modes. The impact of streaming speed and twist parameter are numerically examined on the growth rate instability. It has been found that parametric variation significantly modifies the threshold conditions and associated growth rate instability of twisted DA waves. The relevance of the present results to interstellar dust clouds and in laboratory plasmas is illustrated, where massive dust grains follow a Maxwellian distribution in addition to streaming electrons and non-streaming ions.