Warm ion effect on the dust ion-acoustic surface wave in a half-space

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Propagation of the surface wave in a sharply bounded half-space dusty plasma is investigated. We present a general description of the surface dust ion-acoustic wave propagating at the interface of a vacuum and a plasma whose constituents are warm ions, thermal electrons and cold dusty grains. The physical characteristics of the surface wave and the corresponding Landau damping including the effects of ion temperature and the dusty charges are derived by employing the specular reflection boundary condition and the transverse truncation method. We have found that the increase of ion temperature takes a significant role in reducing the Landau damping rate the surface waves. The effect of ion temperature on the wave frequency is stronger in the large wave number range as expected. However, the reduction of Landau damping due to the increase of ion temperature is significant in the domain where the wave length of the surface is smaller than the electron Debye length. In such a domain, we also found that the reduction of electron density by either increase of the dusty charge density or the increase of dusty number density yields a significant enhancement of the Landau damping rate.