Response to “Comment on ‘Ion–acoustic waves in dusty plasma with charge fluctuations’” [Phys. Plasmas 11, 849 (2004)]

J. Vranješ, B. P. Pandey, and S. Poedts

Citation: [Phys. Plasmas](#) 11, 852 (2004); doi: 10.1063/1.1639019

View online: <http://dx.doi.org/10.1063/1.1639019>

View Table of Contents: <http://pop.aip.org/resource/1/PHPAEN/v11/i2>

Published by the [American Institute of Physics](#).

Related Articles

Study of envelope electron acoustic solitary waves under transverse perturbations having kappa distributed hot electrons

[Phys. Plasmas](#) 19, 062109 (2012)

Dust acoustic shock waves in two temperatures charged dusty grains

[Phys. Plasmas](#) 18, 113702 (2011)

Parameteric studies of nonlinear oblique magnetosonic waves in two-ion-species plasmas

[Phys. Plasmas](#) 18, 062303 (2011)

Electromagnetic effects of kinetic geodesic acoustic mode in tokamak plasmas

[Phys. Plasmas](#) 18, 052506 (2011)

Ion-acoustic waves in a nonstationary ultra-cold neutral plasma

[Phys. Plasmas](#) 18, 042101 (2011)

Additional information on Phys. Plasmas

Journal Homepage: <http://pop.aip.org/>

Journal Information: http://pop.aip.org/about/about_the_journal

Top downloads: http://pop.aip.org/features/most_downloaded

Information for Authors: <http://pop.aip.org/authors>

ADVERTISEMENT

AIPAdvances

Special Topic Section:
PHYSICS OF CANCER

Why cancer? Why physics? [View Articles Now](#)

Response to “Comment on ‘Ion–acoustic waves in dusty plasma with charge fluctuations’” [Phys. Plasmas 11, 849 (2004)]

J. Vranješ

Center for Plasma Astrophysics, K. U. Leuven, Celestijnenlaan 200B, Leuven 3001, Belgium

B. P. Pandey

State University of New York at Buffalo, 124 Sherman Hall, Buffalo, New York 14214

S. Poedts

Center for Plasma Astrophysics, K. U. Leuven, Celestijnenlaan 200B, Leuven 3001, Belgium

(Received 22 October 2003; accepted 24 October 2003)

[DOI: 10.1063/1.1639019]

We appreciate the efforts of Lee aimed at establishing a proper physical model for charging processes in dusty plasmas. However, we note that Lee uses a physically inappropriate model.

First, Lee includes dust grain dynamics *together* with the charge fluctuation on grains, see his Eqs. (3), (4), (6), etc. These two processes are separated by many orders of magnitude, making such an approach non-physical. This is well known from the existing literature and it has been clearly pointed out throughout our paper¹ commented on by Lee. In our work dust grains are taken as stationary. Further, Lee uses a different charging equation than in Ref. 1. The appearance of similarity of Eq. (6) in his Comment and our equation (5) causes the confusion. In fact our equation (5) tells that over a collision time scale ν_{ed}^{-1} electrons relax to the Maxwellian distribution function. A similar assumption is made for the ions. Equation (6) of Lee is somewhat different. He assumes a form $\nu f - \nu_0 f_0$. Such a form requires his assumption (7) for deriving Eq. (6). His charge fluctuation Eq. (6) does not necessarily require that the sum of electron and ion current to the grain surface in equilibrium should be zero. The sum of electron and ion currents should be tied to the

charge dynamics. The only additional assumption we have used was a constant supply of light plasma particles, or the case when various terms, that can appear on the right-hand sides of electron and ion continuity equations, balance each other, which is frequently used in the literature.

Second, Lee takes into account only the charging collision frequencies in his sink terms of continuity equations, while a real physical system includes quite a number of effects, so that the appropriate term would be called a source/sink term. Here we mention just a few, like the ionization which in the ion continuity introduces a source term of the form $\nu_{\text{ion}} n_e$, the volume recombination, ambipolar diffusion, etc. Continuing the same logic one could write new papers (or comments) dealing with each of these processes separately. Yet, that was not the aim of our paper (Ref. 1) in which we emphasized some other physical effects.

The collision term used by Lee is just another model, which cannot be derived from the general Boltzmann kinetic equation (that is why it is called *model*), and its scope is limited by various effects that are not included.

¹J. Vranješ, B. P. Pandey, and S. Poedts, Phys. Plasmas **9**, 1464 (2002).