Vlasov-kinetic computer simulations of multicomponent plasma dynamics: a survey of recent results

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A series of numerical simulations based on a recurrence-free Vlasov kinetic model using kinetic phase point trajectories are presented [1]. Electron-ion plasmas and three-component (electron-ion-dust) dusty or complex plasmas are considered, via independent simulations. Considering all plasma components modeled through a kinetic approach, the linear and nonlinear behavior of ion acoustic excitations is investigated. Maxwellian and Kappa-type (superthermal) distribution functions are assumed, separately, as initial conditions. The focus is on the parametric dependence of ion acoustic waves on the electron-to-ion temperature ratio and on the dust concentration [2,3,4].

1) Phys. Rev. E 84, 036702, (2011) H. Abbasi, M. H. Jenab, H. Hakimi Pajouh "Preventing the recurrence effect in the Vlasov simulation by randomizing phase points velocities in phase space"

2) Phys. Plasmas 18, 073703, (2011) S. M. Hosseini Jenab, I. Kourakis, H. Abbasi "Fully kinetic simulation of ion acoustic and dust-ion acoustic waves"

3) In preparation, S. M. Hosseini Jenab, I. Kourakis "Multicomponent kinetic simulation of BGK modes associated with ion acoustic and dust-ion acoustic excitations in electron-ion and dusty plasmas"

4) International Topical Conference on Plasma Science (Faro, Portugal. 24-28 September 2012) S. M. Hosseini Jenab, T. Baluku, M.A. Hellberg, I. Kourakis "Kinetic simulation approach to studying the Landau damping rate of dust-ion-acoustic waves in kappa-distributed plasmas"