Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Vlasov simulation of 2D Modulational Instability of Ion Acoustic Waves and Prospects for Modeling such instabilities in Laser Propagation Codes[1] RICHARD BERGER, T. CHAPMAN, Lawrence Livermore Natl Lab, J.W. BANKS, Rensselaer Polytechnic Institute,Troy, NY, S. BRUNNER, Ecole Polytechnique, Lausanne, Switzerland — We present 2D+2V Vlasov simulations of Ion Acoustic waves (IAWs) driven by an external traveling-wave potential, $\phi_0(x,t)$, with frequency, ω, and wavenumber, k, obeying the kinetic dispersion relation. Both electrons and ions are treated kinetically. Simulations with $\phi_0(x,t)$, localized transverse to the propagation direction, model IAWs driven in a laser speckle. The waves bow with a positive or negative curvature of the wave fronts that depends on the sign of the nonlinear frequency shift $\Delta\omega_{NL}$, which is in turn determined by the magnitude of ZT_e/T_i where Z is the charge state and $T_{e,i}$ is the electron, ion temperature. These kinetic effects result can cause modulational and self-focusing instabilities that transfer wave energy to kinetic energy. Linear dispersion properties of IAWs are used in laser propagation codes that predict the amount of light reflected by stimulated Brillouin scattering. At high enough amplitudes, the linear dispersion is invalid and these kinetic effects should be incorporated. Including the spatial and time scales of these instabilities is computationally prohibitive. We report progress including kinetic models in laser propagation codes.

[1]This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract No. DE-AC52-07NA27344 and funded by the Laboratory Research and Development Program at LLNL under project tracking code 15

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Date submitted: 23 Jul 2015 Electronic form version 1.4