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A direct Vlasov simulation of nonlinear plasma waves[1] KENTARO HARA, IAIN BOYD, University of Michigan, IGOR KAGANOVICH, Princeton Plasma Physics Laboratory — A direct Vlasov simulation, which solves the collisionless Vlasov equation directly on a discretized phase space, achieves good resolution of velocity distribution functions in comparison to particle methods. In this presentation, nonlinear electron plasma waves (EPWs) and ion acoustic waves (IAWs) are investigated with a fully-kinetic one-dimensional Vlasov simulation. A parallelized Vlasov simulation is employed since grid resolution of the discretized phase space is required to be fine enough in order to capture the nonlinear waves with higher harmonic modes. The primary goal is benchmarking our simulation with results obtained from another Vlasov code and verification with the nonlinear theories [R. L. Berger *et al.*, Phys. Plasmas, **20**, 032107 (2013)]. The frequency shift of nonlinear plasma waves is investigated by applying an initial density perturbation or an external driver potential. It has been observed that the plasma frequency decreases for EPWs and increases for IAWs for $T_e/T_i = 10$, which agrees with Berger's simulation and theories. A further investigation varying the generation of the nonlinear wave such as driver amplitude and duration time will be performed and discussed.

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