Abstract Submitted
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High-order continuum kinetic Vlasov-Poisson simulations of magnetized plasmas[1] G.V. VOGMAN, Applied Science & Technology Program, University of California - Berkeley, P. COLELLA, Computational Research Division, Lawrence Berkeley National Laboratory, U. SHUMLAK, Aerospace & Energetics Research Program, University of Washington — Continuum methods offer a high-fidelity means of simulating plasma kinetics as modeled by the Boltzmann-Maxwell equation system. These methods are advantageous because they can be cast in conservation law form, are not susceptible to noise, and can be implemented using high-order numerical methods. Thereby the methods can conserve mass, momentum, and energy to a high degree. A fourth-order accurate finite volume method has been developed to solve the continuum kinetic Vlasov-Poisson equation system in one spatial and two velocity dimensions. The method is validated in cartesian coordinates using the Dory-Guest-Harris instability, which is a special case of a perpendicularly-propagating kinetic electrostatic wave in a warm uniformly magnetized plasma. The instability dispersion relation, and its generalization to arbitrary distribution functions, are demonstrated to be well-suited benchmarks for continuum algorithms in higher-dimensional phase space. The numerical method has also been extended to two spatial dimensions, and has been implemented in cylindrical coordinates to simulate axisymmetric configurations such as a Z-pinch.

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