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Finite Time Step and Finite Grid Size Numerical Analysis of Warm Plasmas in δf Simulations BENJAMIN STURDEVANT, SCOTT PARKER, YANG CHEN, Univ of Colorado - Boulder CIPS — The effects on the dispersion relation for warm plasmas due to numerical time integration methods and finite spatial grids can be analyzed for many conventional particle in cell(PIC) models using the mathematical framework developed by Langdon [1,2]. This analysis can be useful to gain an understanding of overall system accuracy and nonphysical behaviors including instabilities caused by numerical integration and finite difference methods. To derive a numerical dispersion relation for δf method simulations, however, a different approach is required for the time integration analysis. Here, this analysis is performed using a discrete version of the method of characteristics applied to an implicit δf particle weight equation. A numerical dispersion relation including both finite time step size and finite grid size effects has been derived for an implicit ion acoustic wave model which shows agreement with simulation results and reduces to the continuous result in the limits that the discrete time and spatial sizes go to zero. Comparisons with conventional PIC will be performed to determine differences in the numerical dispersion between the two simulation models.

[1] A.B. Langdon, J. Comput. Phys. 6 (1970), 247
[2] A.B. Langdon, J. Comput. Phys. 30 (1979), 202

Benjamin Sturdevant
Univ of Colorado - Boulder

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