Abstract Submitted
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Grid-Free Lagrangian Plasma Simulations with Dynamic Point Insertion[1] ANDREW CHRISTLIEB, BENJAMIN SONDAY, ROBERT KRASNY, University of Michigan — We describe a grid-free Lagrangian particle simulation method for collisionless plasmas. The method is O(N log N) and couples a treecode field solver with a boundary integral method to efficiently solve Poisson's equation without using an underlying mesh [1]. Our previous results were obtained using a fixed number of Lagrangian particles. During a long simulation this eventually leads to lower resolution as gaps appear in the particle distribution. The present approach avoids this problem by adaptively inserting new particles to maintain resolution in phase space. The initial particle position is viewed as a Lagrangian parameter and new particles are inserted using local interpolation from current particles with respect to this parameter [2]. We consider two examples. First we present simulations of charged particle dynamics in a Penning-Malmberg trap and study phenomena such as crystal formation. Next we look at the two stream instability for cold and warm plasmas. Adaptive particle insertion allows one to capture details that are difficult to resolve with traditional particle simulations.

REFERENCES

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2) Lindsay, K., Krasny, R. (2001) J. Comput. Phys., vol. 172, p. 879

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