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Implicit δf Lorentz Ion Sub-Cycling and Orbit Averaging SCOTT PARKER, BENJAMIN STURDEVANT, YANG CHEN, BENJAMIN HAUSE, Univ of Colorado - Boulder CIPS — A second order, implicit Lorentz ion drift-kinetic electron model has been developed to study low-frequency, quasi-neutral plasmas [1,2]. This model is useful, for example, as an alternative to gyrokinetics in the tokamak edge region where gradient scale lengths are short. In the presence of a strong guide field, however, the applicability of the model is limited due to the time step size required to fully resolve the ion gyromotion. The aim of this research is to develop GPU accelerated sub-cycling and orbit averaging methods to be used with the Lorentz ion model making its utilization more viable. Sub-cycling pushes computational particles independently over several micro time steps for each macro time step interval over which the fields are advanced. Orbit averaging uses the deposition data from the sub-cycled particles to obtain time averaged source terms used in the field solving stage. This provides a filtering effect, allowing for clean simulations at low frequencies. Simulation results and analysis for an ion acoustic model are presented along with performance results for GPUs.

[1] Y. Chen, S.E. Parker, Phys. Plasmas 16 (2009).
[2] J. Cheng, S.E. Parker, Y. Chen, D. Uzdensky, J. Comput. Phys. 245 (2013), 364

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