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Development of Multi-Scale Temporal Coupling Methods for XGC BENJAMIN STURDEVANT, Princeton Plasma Physics Laboratory, SCOTT PARKER, University of Colorado at Boulder, ROBERT HAGER, CHOONG-SEOCK CHANG, JULIEN DOMINSKI, SEUNG-HOE KU, Princeton Plasma Physics Laboratory — The development of multi-scale time integration methods for XGC is reported, including a recent implementation of an equation-free algorithm for XGCa. In this work, XGCa is used to evolve a 4D distribution function over short time intervals. The distribution function is then restricted to a set of low-order fluid moments, which are projected over a large time step. Finally, the fluid moments are transformed back to a fine-scale 4D distribution function to restart the simulation at the next time step. By enabling the use of a time step size much larger than in standard PIC methods, this algorithm has promise for large computational savings in transport time scale simulations. For the tokamak edge, however, the use of low-order fluid moments is inadequate, since the distribution function can be far from Maxwellian. In this case, coupling between a fine-scale kinetic code and a coarse-scale kinetic code is of interest. A key tool for accurate kinetic-kinetic coupling is particle resampling. Recent methods for particle resampling have been developed which accurately preserve low-order velocity moments and local features of a kinetic distribution function [1]. We include plans to further develop this work for kinetic-kinetic coupling. [1] Faghihi, et al. (2017). arXiv:1702.05198

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