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Improving the sub cycling technique with delta-f kinetic electron physics in XGC PALLAVI TRIVEDI, JULIEN DOMINSKI, SEUNG-HOE KU, AARON SCHEINBERG, CHOONG-SEOCK CHANG, Princeton Plasma Physics Laboratory, JUNYI CHENG, YANG CHEN, SCOTT PARKER, University of Colorado — The High-Fidelity Whole Device Modeling (WDM) project models the whole device of tokamaks with core and edge gyrokinetic simulations coupled together. Successful core-edge coupled simulation of DIII-D like plasma including the X-point has been achieved with adiabatic electrons [wdmapp.pppl.gov]. Currently, the work on coupled simulations with kinetic electrons is ongoing. The difficulty in coupling the edge gyrokinetic code XGC with the core gyrokinetic codes GENE or GEM arises due to the use of different numerical schemes for pushing electrons. For instance, XGC sub-cycles the electrons using a direct delta-f scheme for evolving electron weights, whereas both GENE and GEM, in their original version, push the electrons consistently with the field using a reduced delta-f weight evolution equation for evolving electron weights. In order to have the possibility of evolving the electrons with the same reduced delta-f equations, this reduced delta-f scheme for electron weight evolution has been implemented in XGC, as will be presented. This particular scheme is also being optimized on GPU using advantages of the Particle-in-Cell(PIC) representation. XGC kinetic electron physics with the reduced delta-f equaiton is cross-verified against the gyrokinetic code GEM.

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