Abstract Submitted
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First-Principles Spatial Coupling of Core and Edge Gyrokinetic Simulations[1] J DOMINSKI, PPPL, J CHENG, UC Boulder, G MERLO, UT Austin, V CAREY, UC Denver, J CHOI, ORNL, R HAGER, S KU, A MOLLEN, P TRIVEDI, PPPL, E SUCHYTA, ORNL, F JENKO, UT Austin, IPP Garching, S KLASKY, ORNL, SE PARKER, UC Bouler, CS CHANG, A BHATTACHARJEE, PPPL — The Exascale High-Fidelity Whole-Device-Modeling project aims at delivering an application composed of many physics components coupled together at the first-principles level. We study the spatial coupling of two gyrokinetic codes, one for the core (such as GENE or GEM) and one for the edge (XGC). The new generalized coupling scheme, which is introduced, combines the coupling of Poisson equation [Dominski et al, Phys. Plasmas 072308 (2018)] with the new kinetic coupling of particle distribution functions. The coupling of particle distribution functions is performed only once in multiple time-steps, by interfacing the core and edge simulations with a flexible 5D grid. This generalized interfacing enables the coupling of different models, such as delta-f and total-f, as well as the coupling of particle-in-cell and continuum codes. The transfer of the particle distribution function between marker particles and the 5D grid is based on a new resampling technique. A first demonstration of first-principles spatial coupling in a DIII-D like plasma will be shown, by using the XGC suite of codes for core and edge sides

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