Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Integrated multi-scale simulations of drift-wave turbulence: coupling of two kinetic codes XGC1 and XGCa[1] SALOMON JANHUNEN, ROBERT HAGER, SEUNG-HOE KU, CHOONG-SEOCK CHANG, PPPL, JAN HESTHAVEN, EPFL, JONG CHOI, ORNL, FAN ZHANG, MANISH PARASHAR, Rutgers — A novel technique for acceleration of gyrokinetic total f particle simulations in diverted geometry has been developed, based on the XGC1 code and its axisymmetric version XGCa. Both XGC1 and XGCa calculate particle motion in a 5-dimensional (5D) phase space, but while XGC1 is equipped with a full turbulence solver, XGCa has an axisymmetric Poisson solver and is generally used for the simulation of neoclassical transport. Here, acceleration in transport calculations is achieved through relaxed constraints on numerical requirements in XGCa, such as mesh resolution and total number of markers. Coupled simulations have been performed for ITG turbulence, where long-term evolution is obtained by periodically calling XGC1 to obtain turbulence-driven transport while evolving the neoclassical equilibrium with XGCa. We present results from simulations with long-term evolution of the microscopic plasma state while using this technique in the presence of sources and sinks. We also introduce in-memory techniques used in the coupling between the fine-scale and coarse models, applicable for massively parallel simulations of long term evolution of kinetic plasma equilibria in the presence of turbulent and neoclassical transport processes.

[1]SciDAC Center for Edge Physics Simulation

Salomon Janhunen
PPPL

Date submitted: 24 Jul 2015 Electronic form version 1.4