Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Gyrokinetic Dynamic Fidelity Refinement WILLIAM DORLAND, Univ of Maryland-College Park, NOAH MANDELL, Princeton University, MATT LANDREMAN, MICHAEL MARTIN, MICHAEL NASTAC, JOEY TAYLOR, Univ of Maryland-College Park — Gyrokinetic Dynamic Fidelity Refinement is described and demonstrated. The basic problems are familiar from AMR techniques, but there are differences. Our proposed method is pseudo-spectral in all five dimensions $(x, y, z, v_\parallel, \mu B)$. Mesh refinement occurs by changing the number of Fourier, Hermite, or Laguerre basis functions, according to a dynamic target refinement metric. Low amplitude turbulence (near marginal stability) requires relatively high resolution in Hermite-Laguerre space, but modest resolution in k-space. High amplitude turbulence (away from marginal stability) requires relatively low resolution in Hermite-Laguerre space, but higher resolution in k. Stochastic echoes limit the v-space resolution requirements at high amplitude. Nonlinear phase-mixing ultimately limits the required $k_\perp$ resolution, as it provides a physical hyperviscosity mechanism. Depending on the quality of the closures available at low v-space resolution, GKDFR should be the optimal algorithm for evaluating small ρ_*, electromagnetic, gyrokinetic turbulence within the TRINITY multiscale transport framework.

William Dorland
Univ of Maryland-College Park

Date submitted: 14 Jul 2017 Electronic form version 1.4