Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Hermite-Laguerre Spectral Velocity Formulation of Gyrokinetics NOAH MANDELL, Princeton University, BILL DORLAND, MATT LANDREMAN, University of Maryland - College Park — First-principles simulations of tokamak turbulence have proven to be of great value in recent decades. We develop a spectral velocity formulation of the turbulence equations that smoothly interpolates between the highly efficient but lower resolution 3D gyrofluid representation and the conventional but more expensive 5D gyrokinetic representation. Our formulation is a straightforward projection of the nonlinear gyrokinetic equation onto a Hermite basis in parallel velocity and a Laguerre basis in perpendicular velocity. This results in a system that describes the evolution of an arbitrary number of gyrofluid-like velocity moments of the kinetic distribution. We address issues related to collisions, closures, and free energy. The final model is appropriate for the study of instabilities, turbulence, and transport in a wide range of geometries, including tokamaks and stellarators. We provide numerical results from a new code that solves the 5D gyrokinetic equation in our Hermite-Laguerre spectral velocity basis.

Noah Mandell
Princeton University

Date submitted: 14 Jul 2017 Electronic form version 1.4