Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Gyrofluid-Gyrokinetic Hybrid Turbulence Model WILLIAM DORLAND, University of Maryland, NOAH MANDELL, Princeton University — Gyrofluid models of tokamak turbulence are efficient compared to gyrokinetic models, in three senses. First, it is typically easier to develop one's intuition from fluid equations than kinetic equations. Second, because gyrofluid equations are only three-dimensional (instead of 5D or 6D), simulations with gyrofluid models require less memory than kinetic simulations and can therefore more easily fit on highly-optimized computing hardware, such as graphics processors. The third advantage is a result of the first two: one can develop and test ideas quickly with gyrofluid models. The disadvantage of gyrofluid models is their potential lack of physics fidelity. In this poster, we present our attempt to take full advantage of gyrofluid models, without sacrificing physics fidelity. Our approach is encapsulated in the Gryf-X code, which is an implementation of hybrid gyrofluid/gyrokinetic equations. The key improvements that we have brought to bear are: an improved understanding of the cascade of free energy simultaneously in $k_\perp$ and $v_\perp$; an improved model of zonal flow physics; and an implementation of the equations on modern heterogeneous computing platforms, both as a standalone simulation tool and as a component of TRINITY (a transport modeling code for tokamaks).

William Dorland
University of Maryland

Date submitted: 24 Jul 2015 Electronic form version 1.4