Issues Associated with Steady State Turbulence Simulations*

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With the recent advent of massively parallel computing platforms available to fusion research, global gyrokinetic simulations of turbulent transport in tokamak plasmas have become an essential tool for microturbulence studies [1,2]. However, accompanied with this advance is the question of validity of using these codes in long-time steady-state turbulence simulations. One question that has been raised for the past year is the intrinsic particle noise in gyrokinetic PIC codes [3,4]. The other is the phase-space resolution problem facing gyrokinetic continuum codes [5,6]. In this talk, we will discuss these issues in terms of fluctuation-dissipation theorem [7] and entropy balance [8] as well as their impact on the implementation of these codes on modern supercomputers. Moreover, the importance of parallel velocity space nonlinearity for steady state transport [9] and its impact on the zonal flow residual [10] will be discussed,

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