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The Connection Between Upwind Dissipation, Entropy Production, Velocity-Space Resolution and Steady-States of Turbulence in GYRO Simulations<sup>1</sup> J. CANDY, General Atomics — The connection between dissipation and steady states of turbulence in gyrokinetic simulations has been discussed by Krommes [1] who argued that nondissipative simulations cannot achieve a true turbulent steady state. The issue was revisited in the context of Eulerian simulations by Watanabe [2], providing a clear and precise confirmation of Krommes' analysis. In this presentation we show how the upwind advection schemes used in GYRO [3] provide the dissipation required for the achievement of steady states of turbulence. These steady states are grid-converged not only with respect to transport coefficients but also with respect to entropy. We put to rest the commonplace but ill-founded notions that Eulerian simulations (a) require velocity-space dissipation and (b) miss important velocity-space structure.

[1] J.A. Krommes and G. Hu, Phys. Plasmas 1, 3211 (1994).

[2] T.-H. Watanabe and H. Sugama, Proc. of 20th IAEA Fusion Energy Conf., Vilamoura, 2004, Paper TH/8-3Rb.

[3] J. Candy and R.E. Waltz, J. Comput. Phys. 186, 545 (2003).

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