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Numerical source and marker density evolution in global gyrokinetic delta-f Particle-in-Cell simulation YANG CHEN, JUNYI CHENG, SCOTT E. PARKER, University of Colorado, Boulder — Global gyrokinetic simulation of micro-turbulence without a source does not reach a steady state due to density/temperature profile relaxation. Numerical sources can be used to prevent profile relaxation. Several common forms of energy/particle source have been implemented in the gyrokinetitc δf-PIC code GEM. The rate of the source is often chosen somewhat arbitrarily, e.g a fraction of the maximum linear growth rate, or a fraction of the inverse eddy turnover time. We will compare simulations using different forms of source, and simulations using the same form of source but varying source rates, and answer the question whether there exists a regime where the steady state heat flux is insensitive to the exact form and value of source. This insensitivity is needed to DEFINE a steady state turbulence and anomalous transport. We will also investigate the closely related problem of the evolution of the marker density in phase-space. It is shown that, in partially-linearized PIC simulations, the marker density necessarily evolves away from the initially loaded marker distribution. Such evolution invalidates the typically used weight evolution equation. Techniques to mitigate this problem will be discussed.

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