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Gyrokinetic Particle Simulation of Spectral Cascade and Collisionless Dissipation in Kinetic Alfven Wave Turbulence XI CHENG, Univ. of California Irvine, ZHIHONG LIN COLLABORATION — The issue of spectral cascade and plasma heating in Alfvenic turbulence is a major unsolved problem in plasma physics. The possible heating mechanisms depend on direction of spectral cascade, i.e. perpendicular vs. parallel, and could be Landau damping of kinetic Alfven waves (KAW), ion cyclotron resonant heating and the stochastic heating by dispersive Alfven waves. Our work is focusing on perpendicular cascade to KAW. A massively parallel 3D gyro-kinetic particle-in-cell (PIC) code is developed to study spectral cascading and dissipation of Alfvenic turbulence with fully self-consistent nonlinear kinetic effects. From the gyrokinetic simulation we observed a magnetic energy spectrum with an index of "-5/3" in the inertial range, which recovers MHD model results. We also observed a break point at ion gyro-scale followed by a steepened spectra at $k_\perp \rho_s \sim 0.4$ and decouple of the electric and magnetic energy spectrum at $k_\perp \rho_i \sim 1.0$,which suggest that Landau damping of KAWs due to wave-particle resonance is a plausible mechanism of heating and collisionless dissipation complement with ion cyclotron resonance and nonlinear stochastic heating.

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