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Numerical modeling of turbulence in magnetized plasmas[1] JEAN C. PEREZ, STANISLAV BOLDYREV, University of Wisconsin-Madison — We investigate the structure of turbulence in strongly magnetized plasmas through extensive high resolution numerical simulations. Such turbulence plays a significant role in laboratory plasma experiments, solar wind, as well as the interstellar medium. At large scales, above any characteristic plasma scale, the plasma is modeled as a Magnetohydrodynamic (MHD) fluid, while at smaller scales reduced models are used to capture two fluid effects. These models have been derived to describe various regimes observed in laboratory experiments, including tokamak devices in the quest for nuclear fusion. Most numerical turbulence studies of these models have been limited to the field-perpendicular plane under the assumption that the strong magnetic field renders the dynamics two dimensional. However, recent analytic and numerical results indicate that even in the presence of a strong large-scale magnetic field, the field-parallel dynamics play a crucial role in MHD turbulence. We investigate the turbulence cascade transition from the large MHD scales to smaller scales and correctly capture the parallel dynamics in the small scale regime.

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