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Interactions of eddies and waves in magnetohydrodynamic turbulence ANNICK POUQUET, NCAR, PABLO MININNI, Universidad, Buenos Aires — Direct numerical simulations of three-dimensional magnetohydrodynamic turbulence at a Taylor Reynolds number of 1100 on a grid of 1536^3 points are reported (arXiv:0707.3620 astro-ph, submitted to *Phys. Rev. Lett.*). The flow is incompressible and decaying in time, and the initial condition is a superposition of large scale ABC flows for wavenumbers $k \leq 4$ and random noise at small scales with a k^{-3} spectrum, with negligible correlation between velocity and the magnetic field ($\rho_C \sim 10^{-4}$) and equal kinetic and magnetic energies; finally, no uniform magnetic field is imposed. At peak of dissipation, the resulting energy spectrum is a combination of two components, each moderately resolved. Isotropy obtains in the large scales, with a spectrum compatible with the Iroshnikov-Kraichnan theory stemming from the weakening of nonlinear interactions due to Alfvén waves and leading to a $\sim k^{-3/2}$ law; scaling of structure functions confirms the non-Kolmogorovian nature of the flow in this range. At small scales, weak turbulence emerges with a $k_\perp^{-2}$ spectrum, the perpendicular direction referring to the local quasi-uniform magnetic field. Whether such results are universal is not clear, and several parameters may play a role, such as ρ_C or the amount of magnetic helicity in the flow. Thus, high-resolution parametric studies are needed in order to understand in detail the interactions of turbulent eddies and Alfvén waves.

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