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Finite dissipation and nonuniversality in magnetohydrodynamic turbulence MORITZ LINKMANN, ARJUN BERERA, MAIRI MCKAY, ERIN GOLDSTRAW, Univ of Edinburgh, W. DAVID MCCOMB, Retired — A model equation for the Reynolds number dependence of the dimensionless dissipation rate C_ε in homogeneous magnetohydrodynamic turbulence in the absence of a mean magnetic field is derived from the real-space energy balance equation, leading to $C_\varepsilon = C_{\varepsilon,\infty} + C/R_- + O(1/R_-^2))$, where R_- is a generalized Reynolds number. The constant $C_{\varepsilon,\infty}$ is here defined in terms of the Elsässer fields and is shown to describe the total energy transfer flux. This flux depends on magnetic and cross helicities, because these affect the nonlinear transfer of energy, suggesting that the value of $C_{\varepsilon,\infty}$ is not universal. Direct numerical simulations for freely decaying and stationary MHD turbulence were conducted on up to 2048^3 grid points, showing good agreement between data and the model for both cases, different initial values of cross and magnetic helicities and different forcing schemes. The ideas introduced here can be used to derive similar model equations for other turbulent systems.

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